ISTANBUL TECHNICAL UNIVERSITY ★INSTITUTE OF SOCIAL SCIENCES

METHODS FOR CREATING MELODIC PATTERNS USING *PARMAK VURMA* TECHNIQUE IN *SAZ* (*BAĞLAMA*) PERFORMANCE

Ph.D. THESIS by

Sinan AYYILDIZ

Department of Music

Music Ph.D. Programme

AUGUST 2018

<u>ISTANBUL TECHNICAL UNIVERSITY ★INSTITUTE OF SOCIAL SCIENCES</u>

METHODS FOR CREATING MELODIC PATTERNS USING *PARMAK VURMA* TECHNIQUE IN *SAZ* (*BAĞLAMA*) PERFORMANCE

Ph.D. THESIS by

Sinan AYYILDIZ

(409142006)

Department of Music

Music Ph.D. Programme

Thesis Advisor: Prof. Erol PARLAK

AUGUST 2018

İSTANBUL TEKNİK ÜNİVERSİTESİ ★SOSYAL BİLİMLER ENSTİTÜSÜ

SAZ (BAĞLAMA) İCRASINDA *PARMAK VURMA* TEKNİĞİ KULLANARAK EZGİ KALIPLARINI ÜRETME YÖNTEMLERİ

DOKTORA TEZİ

Sinan AYYILDIZ

(409142006)

Müzik Anabilim Dalı

Müzik Doktora Programı

Tez Danışmanı : Prof. Erol PARLAK

AĞUSTOS 2018

Sinan Ayyıldız, a Ph.D. student of ITU Graduate School of Arts and Social Sciences student ID 409142006, successfully defended the thesis/dissertation entitled "METHODS FOR CREATING MELODIC PATTERNS USING *PARMAK VURMA* TECHNIQUE IN *SAZ* (*BAĞLAMA*) PERFORMANCE", which he prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

Thesis Advisor : **Prof. Erol PARLAK**
Ankara Music and Fine Arts University

Jury Members : **Prof. Dr. M. Safa Yeprem**
Marmara University

Prof. Adnan Koç
Istanbul Technical University

Assoc. Prof. Tolgahan Çoğulu
Istanbul Technical University

Dr. Eray Altınbüken
Istanbul Technical University

Date of Submission : 26 July 2018
Date of Defense : 29 August 2018

FOREWORD

This doctorate thesis, titled “Methods for Creating Melodic Patterns Using *Parmak vurma* Technique in *Saz (Bağlama)* Performance” was prepared at the I.T.U. Social Sciences Institute, Dr. Erol Uçer Center for Advanced Studies in Music (MIAM).

Firstly I would like to thank my advisor Prof. Erol Parlak and members of thesis committee Prof. Dr. M. Safa Yeprem and Dr. Eray Altınbüken for their leading and advice. I also would like to thank Assoc. Prof. Okan Murat Öztürk his advices on terminology and theoretic issues.

I want to thank especially my student Mücahit Kol who took photos and shoot videos for this thesis, Abdullah Ereren for his aid in the medical literature search.

I would also want to thank Assoc. Prof. Tolgahan Çoğulu, Adem Tosunoğlu, Ali Kâzım Akdağ, Erdem Şimşek, Evrim Yener, A. Ozan Baysal, Zeki Çağlar Namlı, Erhan Uslu, Faruk Çalışkan, Dursuncan Çakın, Kenan Tülek, Koray Berat Sarı, Güven Türkmen, M. Evren Hacıoğlu, Taylan Ergen, Hakan Eren and Mengü Gülmen.

Finally, I thank my family for their moral support and I would like to thank *Refika* for her deep support, patience and understanding.

July 2018 Sinan Ayyıldız

(Musician)

TABLE OF CONTENTS

Page

ABBREVIATIONS

AEU	: Arel-Ezgi-Uzdilek
a-DMP	: *Ascending Directional Melodic Pattern*
a-DRMP	: *Ascending Directional Repeating Melodic Pattern*
cc	: Chromatic Column
CH	: Cross-hands Posture
DMP	: *Directional Melodic Pattern*
d-DMP	: *Descending Directional Melodic Pattern*
DRMP	: *Directional Repeating Melodic Pattern*
d-DRMP	: *Descending Directional Repeating Melodic Pattern*
***f*-PDC**	: SOP&PGTOP structures with Fixed PDC
FPU	: *Final Pattern Unit*
FTS	: *Fret Tuning System*
IPU	: *Initial Pattern Unit*
ITU	: Istanbul Technical University
LH	: Left Hand
LMP	: *Looped Melodic Pattern*
PDC	: *Position difference class*
PGT	: Pitch Generation Technique
PGTOP	: *Pitch Generation Technique Order Pattern*
PT	: *Pençe* Technique
PVT	: *Parmak Vurma* Technique
RH	: Right Hand
RPU	: Repeating Pattern Unit
SOP	: *String Order Pattern*
TÇT	: *Tel Çekme* Technique
TFM	: Turkish Folk Music
TLMP	: *Tonally Linked Melodic Patterning*
TMSC	: Turkish Music State Conservatory
TPU	: *Transitional Pattern Unit*
TUMP	: *Tonally Unconnected Melodic Patterning*
YTU	: Yıldız Technical University

SYMBOLS

ΔP : Position difference symbol

Δcc : The number of chromatic columns between two equal-tempered frets

$>$: Prior than

$\vee$: Or

$\uparrow$: Ascending melodic movement in TUMP

$\downarrow$: Descending melodic movement in TUMP

$\Uparrow$: Ascending melodic movement in TLMP

$\Downarrow$: Descending melodic movement in TLMP

α **:** 1- A special type of SOP&PGTOP structure for scale playing
2- A special type of PDC structure for scale and melodic pattern playing

β **:** 1- A special type of SOP&PGTOP structure for scale playing
2- A special type of PDC structure for scale and melodic pattern playing

$\boxed{0}$ **:** Open string PGT category

a **:** LH fingers' position in fingering type

d **:** RH fingering type

$\boxed{L}$ **:** Left hand PGT category

L **:** Left hand hammer-on technique

L^L **:** Left hand pull-off to an another left hand finger

L^R **:** Right hand pull-off to a left hand finger

L^{LP} **:** Left hand plucking to another left hand finger

L^γ : Glissando via left hand finger

P_L **:** Left hand position

P_R **:** Right hand position

$\boxed{R}$: Right hand PGT category

R : Right hand hammer-on technique

R^L : Left hand pull-off to a right hand finger

R^R : Right hand pull-off to to another right hand finger

R^{LP} : Left hand plucking to a right hand finger

R^γ : Glissando via right hand finger

t **:** LH thumb position in fingering type

LIST OF TABLES

LIST OF FIGURES

Page

METHODS FOR CREATING MELODIC PATTERNS USING *PARMAK VURMA* TECHNIQUE IN *SAZ* (*BAĞLAMA*) PERFORMANCE

SUMMARY

The purpose of this study is to develop methods of performing melodic patterns in *saz* performance, using the *parmak vurma* (two hand tapping) technique. To this purpose, the historical and present status and technical features of the *parmak vurma* technique were examined in detail. Additionally, a large literature review concerning the *saz* was conducted, the history of *saz* playing, the evolution of *saz* morphology, tuning systems and fretting systems were examined, and a *saz model* for which all the technical features are defined was established for this study.

Parmak vurma technique consists of the fingers of both hands hammering and pulling the frets on the neck to produce sounds. Traditionally, *parmak vurma* technique was frequently used by Teke region's Yörük-Türkmen communities to play their *boğaz havası* pieces on the *üçtelli* ("three-stringed"), a small *saz*.

Over time, the technique gained recognition as local artists migrated to cities. Especially *bağlama* masters who have wider audiences outside the region got interested in this technique and transferred the *parmak vurma* technique to large *saz*s. The performance level of the technique became very advanced through academic and musical studies, and its recognition reached national, even international levels.

During the study, we found that the terminology that is necessary to perform analyses on *saz* performance is inadequate and/or deficient. Thus, many terminological suggestions were made in the study. First among these suggestions is a representation system called "Position & Fingering Symbolization System" based on the movements of the hand and fingers, and that precisely identifies the position of fingers on the *saz*. Symbols in this system allow precisely identifying the positions of the right and left hands on the fretboard.

Each posture of pair of two hands on the fretboard offer a "sound palette" to the performer in terms of melodic possibilities. Additionally, the melodic structures that emerge when the hands move in the same direction by maintaining the position difference between the two can be played in different tones. Based on this idea, a "*position difference class*" symbolization system that identifies the position differences and the placements of fingers was developed. The performance of melodic patterns through the *parmak vurma* technique is positionally represented using *position difference class* symbols. Their temporal representation requires the definition of two different patterns. One of these are patterns that the ordering of the pitch generation techniques (*pitch generation technique order pattern*), and the other is the patterns created by the strings that generate the sounds (*string order pattern*). "*Position difference class*" and these two patterns is used to express melodic patterns.

The study examines how heptatonic, hexatonic, octatonic, chromatic scales and "fret tuning systems" for makams can be played using these structures and recommends

some playing structures for them. Examinations of heptatonic scales led to the identification of two playing methods (called "α" and "β") that are suitable for performance. Particularly, we found that all heptatonic scales and "fret tuning systems" for makams can be played using the "α" playing method. All modal expansions of scales were examined, and intermodal relations were evaluated in terms of performance.

Additionally, the study investigates the natural limitations of the technique, and seeks answers to the questions "how can melodic patterns that have degree relationships between pitches be played on every tone and every scale," and "can a single method for each tone and each scale be developed for a specific melodic pattern?" The interval relations between scales reveal a specific interval type. Thus, maximum and minimum intervals that may arise in each degree step/skip/leap for a certain number of scales were identified, and these intervals were compared with the maximum ascending and maximum descending intervals that can be played by a hand in different "*string order pattern*s". Consequently, the melody creation capabilities and the existing possibilities that hands that don't change position have on the *saz model* with specific physical characteristics, using the *parmak vurma* technique. These possibilities were ordered according to *complexity factor criteria* that are created in this study, and the performance methods provided at the end of the study were created based on these criteria.

The methods based on the study in the appendices are an important reference for performers involved with the *parmak vurma* technique because they can be applied to each tone of heptatonic scales and "fret tuning systems".

SAZ (BAĞLAMA) İCRASINDA *PARMAK VURMA* TEKNİĞİ KULLANARAK EZGİ KALIPLARINI ÜRETME YÖNTEMLERİ

ÖZET

Bu çalışmanın amacı *parmak vurma* tekniğini kullanarak, *saz* icrasında ezgi kalıplarını icra etme yöntemleri geliştirmektir. Bu amaçla *parmak vurma* tekniğinin kökeni, *saz* icrası içerisinde geçmişteki ve bugünkü konumu ve teknik özellikleri detaylı şekilde incelenmiştir. Ayrıca *saz*la ilgili geniş bir literatür çalışması yapılmış geçmişten günümüze *saz* icrasının, morfolojisinin değişimi, akort sistemleri, perde dizilimleri irdelenmiş ve bu verilerden yola çıkarak, bu çalışmada kullanılacak tüm teknik özellikleri tanımlanmış bir *model saz* oluşturulmuştur.

Parmak vurma tekniği (PVT), sap üzerindeki perdelere ait sesleri üretmek amacıyla perdeler arasındaki aralıklara, her iki elin parmakları ile vurma ve çekme hareketleri yaparak gerçekleşir.

Geleneksel olarak Teke yöresi Yörük-Türkmen topluluklarındaki Yörük kız çobanları tarafından yapılan vokal icranın temel karakteristik özelliği parmaklar ile boğaza baskı uygulayarak melodik atlamalar elde etmektir. Bu nedenle *boğaz havası* adı verilen bu eserler, yine bu topluluklara ait küçük boy bir *saz* olan *üçtelli* üzerinde sıklıkla *parmak vurma* tekniği ile icra edilir. Zaman içerisinde bu tarz çalım yöre sanatçılarının şehirlere göç etmesiyle müzik camiası içinde bilinir olmuştur. Özellikle yöre dışından daha geniş kitlelere hitap eden *saz* üstatları bu tekniğe ilgi duymuş, *parmak vurma* tekniğini büyük boy *saz*lara aktarmışlardır. Yapılan akademik ve müzikal çalışmalar ile birlikte tekniğin icra seviyesi ileri boyutlara taşınmış ve tanınırlığı ulusal ve hatta uluslararası seviyelere ulaşmıştır. Dolayısıyla bu teknik üzerinde özellikle ezgi üretimine yönelik bir çalışma yapılması ihtiyacı doğmuştur.

Çalışma esnasında, *saz* icrasının analizini yapabilmek için gerekli olan terminolojinin günümüz şartlarında yetersiz ve/veya eksik olduğu görülmüştür. Bu nedenle, çalışma içinde pek çok konuda yeni terminolojik önermeler yapılmıştır.

Çalışmada elde edilen veriler, özellikleri önceden tanımlanmış *model saz* üzerinde elde edilmiştir. *Model saz* üzerindeki mikrotonal perdelerin yeri sabitlenerek çalışma için gerekli olan rakamsal veriler açısından oluşabilecek belirsizlikler ortadan kaldırılmıştır. *Model saz*ın özellikleri günümüzde *parmak vurma* tekniğinin yaygın olarak kullanıldığı saz tipinden yola çıkarak belirlenmiştir. Ancak çalışmada belirlenen *model saz*, bu tip sazlarda var olan "saz tutma problemi" olmayan, boyuna askı sistemi ile tutturulmuş, sağ el ve sol elin aynı anda özgürce hareket edebildiği bir sazdır.

Ezgi kalıplarının *parmak vurma* tekniğinde icrası iki farklı boyutta ifade edilebilir. Bunlar konumsal ve zamansal boyutlardır. Konumsal boyutu ifade etmek için ilk olarak, *saz* üzerinde parmakların kesin konumunu belirten, elin ve parmakların yaptığı hareketleri temel alarak bu çalışmada "pozisyon ve parmak yerleşimi sembolizasyon sistemi" adı verilen bir gösterim sistemi tanımlanmıştır. Bu

sistemdeki semboller ile sağ ve sol el parmaklarının sap üzerinde konumlanışı kesin bir şekilde belirtilebilmektedir. *Saz* icrasında, özellikle sol el üzerinde çok sayıda "parmak yerleşimi tipi" olabileceği tespit edilmiş, bu yapılar tezin ekler bölümünde ayrıntılı olarak verilmiştir. "Pozisyon ve parmak yerleşimi sembolizasyon sistemi" tüm akort sistemlerinde, tüm *saz* boylarında ve *saz* çalım stillerinde icra edilen eserlerin notasyonunda kullanılabilir. Ayrıca, tüm telli çalgıların icrasında parmakların konumsal gösterimi ve konumsal analizi için adapte edilerek kullanılabilecek potansiyele sahip bir sistemdir. Eklerde bu gösterim sisteminin notasyon üzerinde kullanımı üzerine örnekler verilmiştir.

Parmak vurma tekniğinde, "pozisyon ve parmak yerleşimi sembolizasyon sistemi" ile gösterilen iki elin oluşturduğu her yapı ezgisel olanaklar bakımından fikir vermektedir. Ayrıca iki elin pozisyon farkı korunarak eller aynı yönde hareket ettirildiğinde bu melodik yapılar farklı tonlarda (boş tel kullanılmadan) icra edilebilmektedirler. Bu fikirden yola çıkarak pozisyon farklarını ve ellerin parmak yerleşimlerini gösteren "pozisyon farkı sınıfı" (PDC) gösterim sistemi geliştirilmiştir. Konumsal olarak, ezgi kalıplarının *parmak vurma* tekniği ile herhangi bir ton üzerinden icra edilmesi "pozisyon farkı sınıfı" işaretleri ile gösterilmektedir.

Ezgi kalıplarının *parmak vurma* tekniği ile icrasının zamansal boyutta ifade edilmesi için ise iki farklı kalıbın tanımlanması gerekmektedir. Bunlardan birisi seslerin üretildikleri tekniklerin sıralamasının oluşturduğu kalıp, bir diğeri ise seslerin üretildikleri tellerin oluşturduğu kalıptır.

Telli sazlardaki melodi icrasında seslerin/perdelerin üretiminde "titreştirici etki kaynağı" ve "perde belirleyici kaynak" olarak iki faktör bulunmaktadır. "Vurma" gibi bazı alt-tekniklerde bir parmak, bu iki faktöre de kaynaklık edebilir. Ancak çoğu alt teknikte bu iki faktör birbirinden farklıdır. Çalışmada, bu faktörlerden yola çıkarak perde üretim teknikleri için bir kodlama sistemi geliştirilmiş ve bu sistemle elde edilen kodların arka arkaya sıralanması ile ezgi kalıbı icrası esnasında perde üretim tekniklerinin uygulandığı sıra ifade edilmiştir. Bu sıralanmanın oluşturduğu kodlarla ifade edilen kalıba "perde üretim teknikleri dizilimi kalıbı" (PGTOP) adı verilmiştir.

Benzer şekilde, ezgi icrası sırasında kullanılan teller de kullanım sırasına göre zamansal boyutun bir parçası olarak ifade edilmektedir. Teller, yaygın olarak saz metotlarında kullanılan numaralar (1,2,3) ile ifade edilmiş ve bu numaraların arka arkaya sıralanması ile parmak vurma tekniğinde icra edilen ezgi kalıbına ait tel dizilimi ifade edilmiştir. Bu sıralanmanın oluşturduğu kalıba "tel dizilimi kalıbı" (SOP) adı verilmiştir.

Bu çalışmada,"Pozisyon farkı sınıfı" ve bu iki kalıp kullanılarak ezgi kalıplarının *parmak vurma* tekniğinde nasıl icra edileceği ifade edilmektedir.

Çalışmada farklı ezgi kalıbı türleri, hem "örüntüleme yöntemi (patterning)" bakımından, hem de "yönelimsel davranış" bakımından sınıflandırılmıştır. Ezgi kalıbının farklı tonlardan icrası esnasında, "örüntüleme yöntemi" bakımından ezgi kalıbı içerisindeki aralık ilişkilerinin değişmediği, dolayısıyla kromatik transpozisyonun görüldüğü örüntüleme yöntemi "tondan bağımsız ezgi örüntüleme" (TUMP), ezgi kalıbı içerisindeki derece ilişkilerinin değişmediği, bu özelliği ile de modüler transpozisyonun görüldüğü örüntüleme yöntemi "tona bağlı ezgi örüntüleme" (TLMP) olarak adlandırılmıştır. Ayrıca, ezgi kalıpları yönelimsel durumlarına göre "döngüsel ezgi kalıbı" (LMP), "yönelimsel ezgi kalıbı" (DMP), "çıkıcı ezgi kalıbı" (a-DMP), "inici ezgi kalıbı" (d-DMP), "yönelimsel tekrar eden ezgi kalıbı" (DRMP), "çıkıcı tekrar eden ezgi kalıbı" (a-RMP), "inici tekrar eden ezgi kalıbı" (d-RMP) şeklinde sınıflandırılmıştır.

PGTOP, SOP ve PDC yapıları değişmeden farklı tonda yapılan icralar TUMP ile üretilen ezgi kalıplarının ortaya çıkmasına neden olur. Bu şekilde SOP&PGTOP&PDC'nin üçünün bir arada aynı kaldığı farklı varyasyonlar kullanılarak icracılar TUMP ile üretilen ezgi kalıplarını sap üzerinde icra edebilirler.

TLMP ile üretilen ezgi kalıpları ise üzerinde icra edildikleri dizi ya da makam icrasında var olan *düzen* kavramından yola çıkarak günümüz *saz*ının perde özelliklerine göre geliştirilen "perde düzeni sistem"ine (FTS'ye) göre çok çeşitli yapılarla icra edilebilirler.

Bu bakımdan öncelikle SOP, PGTOP ve PDC yapıları kullanılarak heptatonik, pentatonik, hegzatonik, oktatonik, kromatik diziler ve FTS'lerin nasıl çalınabileceği incelenmiş ve bazı çalım yapıları önerilmiştir.

Heptatonik dizilerin ve FTS'lerin çıkıcı ve inici icrası üzerinde yapılan incelemeler sonucunda tarafımızdan "α" ve "β" olarak isimlendirilen iki farklı çalım şeklinin icra açısından uygun olduğu tespit edilmiştir. Özellikle "α" çalım şekli kullanılarak yaygın kullanılan tüm heptatonik diziler ve FTS'lerin çalınabildiği görülmüştür. Bazı dizi ve FTS'lerin icrasında "α" ve "β"' yapılarında ufak değişiklikler yapılarak türetilen çalım şekilleri de tespit edilmiş, böylece heptatonik diziler ve FTS'ler için her bir dizinin çalımına uygun çalım şekilleri ve PDC yapıları önerilmiştir. "α" ve "β" çalım şekli, dizi çalımlarında belirli SOP&PGTOP yapılarını ve bu yapılarla icra edilen (diziye veya FTS'ye göre değişen) PDC yapılarını ifade eder. Bir başka deyişle, bu yapılarla dizi ve FTS'ler icra edildiğinde ortaya çıkan PDC yapıları da "α" ve "β" PDC yapıları olarak ifade edilmektedir. Bu yönüyle "α" ve "β" PDC yapıları, ezgi kalıplarının farklı diziler ve FTS'ler ile değişen konumsal boyutunu ifade eden bir üst kavramdır.

Dizi icrasında, dizilerin tüm modal açılımları ve modlar arası ilişkiler icra açısından incelenmiştir. Bu ilişkilerden yola çıkarak "boş tel" kullanımı, klavye boyunca bir dizinin icrası, bir dizinin o diziye ait bir modun çalımı için önerilen pozisyonunda icrası ve bir dizinin modal açılımlarıyla o diziye ait tüm perdeleri klavye üzerinde ifade eden "haritalar" incelenmiştir. Bu "haritalar", *parmak vurma* tekniği açısından tarafımızdan üretilen "pozisyon farkı sınıfı ağacı" (PDC-tree) yapıları ile ifade edilmiştir.

Ayrıca, bu çalışmada tekniğin doğasından kaynaklanan sınırlılıklar incelenmiş ve "sesleri arasında derece ilişkisi bulunan ezgi kalıpları her tondan ve her dizi üzerinden nasıl çalınabilir?" ve "belirli bir ezgi kalıbı için her tondan ve her dizi üzerinden çalınabilirliği mümkün kılan yöntemler geliştirilebilir mi?" sorularına cevap aranmıştır.

Dizilerin ve FTS'lerin arasındaki aralık ilişkileri incelendiğinde belirli aralık tipi bulundurdukları görülmüştür. Dolayısıyla belirli sayıda dizi ve FTS için her derece atlamasında gerçekleşebilecek maksimum ve minimum aralıklar tespit edilmiş, bu aralıklar farklı tel dizilimlerinde bir elin çalabileceği iki perde arasındaki maksimum inici ve çıkıcı aralıklarla karşılaştırılmıştır. Sonuç olarak, fiziksel olarak özellikleri tanımlanmış *saz modeli* ve *parmak vurma* tekniği özelinde ellerin pozisyon değiştirmeden sahip olduğu ezgi üretme kapasitesi ile ne tür imkânlara sahip olduğu tespit edilmiştir. Bu imkânlar kendi arasında "karmaşıklık faktörü ölçütleri" adı verilen ölçütlerle belirli bir sıralamaya tutulmuştur.

"Karmaşıklık faktörü ölçütleri" parmak yerleşimi açısından ve PGTOP açısından olmak üzere iki farklı kategori altında belirlenmiştir. "Karmaşıklık faktörü ölçütleri", parmak yerleşimi açısından belirlenirken hangi parmak yerleşimlerinin daha etkin ve öncelikli olması gerektiği düşünülmüş ve belli bir sıralama yapılmıştır. Bu sıralama yapılırken elin farklı hareketlerinde "sıkma kuvveti"nin azalması ile ilgili veriler sunan çalışmaların yanı sıra, *parmak vurma* tekniği icracılarının en çok kullandığı parmak yerleşimleri 12 farklı eser üzerinde incelenmiş ve böylece icracıların en çok kullandıkları parmak yerleşimleri tespit edilmiştir. Sol ve sağ el için parmak yerleşimlerinin öncelik sırası bu verilere dayanarak oluşturulmuştur.

"*Karmaşıklık faktörü ölçütleri*" PGTOP açısından belirlenirken, "sessiz çekme" hareketlerini minimuma indiren ve dolayısıyla daha az parmak hareketi ile daha çok sesin üretilebildiği yapıların öncelikli olması gerektiğinin altı çizilmiştir. Bunun yanı sıra sol el ve sağ el için "vurma" tekniğinin ardarda kullanımı için maksimum sınırlar belirlenmiştir. Böylece ezgi kalıplarının yönelimsel davranışına göre bu ölçütlere dayanarak icra yöntemleri geliştirilmiştir.

İcra esnasında pozisyon değişikliği olmayan LMP'ler için PGTOP açısından belirlenen minimum parmak hareketini önceleyen "*karmaşıklık faktörü ölçütü*" daha önemlidir. Diğer melodik pattern tipleri için ise parmak yerleşimi açısından belirlenen "*karmaşıklık faktörü ölçütleri*" hangi icra yönteminin seçilmesi gerektiği ile ilgili belirleyici olmaktadır. Sol el ve sağ el için "vurma" tekniğinin ardarda kullanımı için belirlenen maksimum sınırlar ise tüm ezgi kalıbı tiplerinde geçerlidir.

Bu durum dikkate alınarak, "dizi çalımı"nın dışında *parmak vurma* tekniği ile icra edilebilecek tüm DMP'lerin icrası için belirtilen icra yöntemleri çalışmanın içerisinde verilmiştir. DRMP'lerin *parmak vurma* tekniği ile icrası ise SOP&PGTOP'un sabit tutulması anlayışı ile üretilen "Tekrar eden kalıp birimi" (RPU) yapıları ile yapılan icralara dayalı "strateji-1" ve dizinin çalımına göre şekillenen ezgi kalıbına uygun PDC-ağacı yapısı içinden bir PDC'nin sabit tutulması anlayışı ile üretilen "sabitlenmiş PDC" (*f*-PDC) yapıları ile yapılan icralara dayalı "strateji-2" olarak iki farkli strateji ile gerçekleşmektedir. Bu stratejiler tek başına kullanılabileceği gibi icra esnasında melezlenerek de kullanılabilirler. Ayrıca, icralar esnasında ortaya çıkan "başlangıç kalıbı birimi" (IPU), "son kalıp birimi" (FPU) ve "geçiş kalıbı birimi"(TPU) gibi yapılar tanımlanmış, çalışmanın sonunda verilen icra yöntemleri de bu yapıların yer aldığı formüllerle ifade edilmiştir.

Eklerde verilen performans yöntemleri, herhangi bir ton üzerinde üretilen belirli bir ezgi kalıbı için yaygın kullanılan heptatonik diziler ve "perde düzeni sistemleri"nin tümüne uygun icra yöntemleri önermesi bakımından *parmak vurma* tekniği ile ilgilenen icracılar açısından önemli bir başvuru kaynağı niteliğindedir.

1. INTRODUCTION

Culture is dynamic. It is constantly shaped by conflict and reconciliation between tradition and novelty. The advance in communication tools in the 20th and 21st centuries caused significant changes on the traditional dimensions of culture (Deschenes, 2005). One of the greatest beneficiaries of this situation is traditional music; and in terms of Turkish folk music, the central instrument of this music, the *saz*.

Saz is a fundamental folk music instrument that bears and reflects the cultural background, feelings and thoughts of the Anatolian people in a simple and striking manner. In Anatolia, the *saz*'s transformation accelerated after the Turkish Republic was declared, and was affected by non-musical effects such as the institutionalization of folk music, the establishment of some standards for the *saz*, the emergence of different performance styles and *saz* types due to the demands of popular music, technological advances, globalization and various socio-political conditions, in addition to new demands in *saz* performance and repertoire based on musical considerations, and the response of *saz* luthiers to these demands (Parlak, 2016). One of these transformations was the entry of the *parmak vurma* technique, a *saz* playing technique only known in relatively closed Yörük-Türkmen communities into the urban music, and the impact it had on *bağlama* performance (Ayyıldız and Baysal, 2017).

Parmak vurma technique is different from other *saz* techniques both visually and auditorily, and its adoption in urban musical culture and the recognition of its melodic and harmonic possibilities created new paths for *saz* performance. Academic studies were conducted and training methods were written on the subject over time. These methods demonstrate the practice methods of the technique and offer a select repertoire.

Melodic pattern studies are studies that are routinely carried out by performers of many instruments, and that offer many references. However, the melodic pattern studies in Turkish music, which has a very strong melodic character, are very inadequate and there are no studies on the melodic possibilities of the *parmak vurma* technique. This study is carried out to investigate the playing methods of melodic patterns in the *parmak vurma* technique and constitutes a reference for studies in this field.

The thesis study consists of 5 chapters. The first chapter defines the purposes and methods of this study, its terminology, and its limitations. This chapter also defines the terms scale, mode, and makam, in addition to the melodic concepts that are frequently used in musical pieces. Additionally, examples of the use of melodic patterns in musical genres are provided.

The second chapter is about the *saz* and the *parmak vurma* technique, which constitute the subject of the thesis. Chapter 2.1 offers general information about the historical use of the terms *saz* and *bağlama*, the transformation of *saz* performance throughout history, and the factors that affected this transformation, the concept of *saz* family and the transformation of the traditional *saz* family, *saz* playing styles, *saz* strings, fretting systems and tuning systems. Chapter 2.2 addresses the origins of the *parmak vurma* technique which is the subject of this thesis, its transfer into urban music, its training, notation, and types of *saz* on which this technique can be performed.

The third chapter introduces the new terminology and the updated notation, that are used in the thesis, and then explains the theoretical framework that is used to obtain reliable data, along with its justifications. This chapter addresses the melodic pattern types, the patterning types of melodic patterns, and the encoding of these types. Hence, it explains the position and fingering type symbolization system that is necessary in order to represent the structures that emerge when these patterns are performed through the *parmak vurma* technique, and the encoding system that is adopted to represent these structures. This chapter also presents encoding systems to explain order of techniques and strings that is used playing melodic patterns

The fourth chapter discusses the implementation of the data that is obtained in chapter three to performance. It also defines the concept of *fret tuning system* to explain makam-based melody in *saz model*. After investigating types of melodic movements and how they are obtained with *parmak vurma* technique and anatomically most suitable fingering types and most used fingering types in PVT, the *complexity factor criteria* is defined for melodic patterning in scales, using the mathematical method that is obtained by intersecting the interval data for scales, modes and makam *fret tuning systems* (FTSs) with the mechanical performance restrictions of PVT. *Complexity factor criteria* provide to establish priorities among the structures that emerge during performance.

The final chapter of the study discusses the results of the study, and our suggestions.

1.1 The Objective of the Study

The objective of this study is to examine the melodic pattern creation methods using the *parmak vurma* technique, and to develop an approach to determine the most appropriate methods. The criteria that are considered in this process are the following:

1- Applicability in every chromatic tone: The melodic pattern creation method has to cover the performance of the melodic pattern on 12 tones.

2- Adaptability to every scale: The melodic pattern creation method has to cover the performance of the melodic pattern on every scale. In this study, this phenomenon was only examined in terms of heptatonic scales and *fret tuning systems*. The study's methods can be applied to obtain this data for other scale types.

3- Minimum hand repositioning: Performances that require few position (or position difference) changes were given priority.

4- Performing with the less complicated structures in terms of positions within the anatomical limitations of the hand and/or in terms of less finger movements: A melodic pattern can be performed in several ways via PVT. The positions established by the hand during performance were identified to determine these criteria, and some fingering types were given more priority than others due to anatomical reasons and/or the methods provide fewer movements of fingers were given more priority. Moreover, various musical pieces were examined, and the most frequently used fingering types were determined. These factors were taken into consideration when applying these methods.

1.2 The Methods of the Research

The methods used in this study can be categorized under literature reviews, communications, performance studies, mathematical methods, and transcription studies.

- The data obtained through literature reviews in the following subjects are analyzed:
  - The history, and structural and performance characteristics of the *saz*.
  - The cultural origin of the *parmak vurma* technique, its adoption in urban music culture, its notation, and the morphology of *saz*s on which it is performed.
  - The symbolization systems that are used and the position concept that is adopted in various *saz* training methods.
  - Definitions of concepts that relate to melody in musical literature, the use of melodic patterns in various musical genres.
  - The anatomy and biomechanics of the body parts that are actively used during *saz* performance.
- Personal Communications were conducted with Erol Parlak, Okan Murat Öztürk, Tolgahan Çoğulu, Adem Tosunoğlu, Ali Kâzım Akdağ, Evrim Yener, Ahmet Gökhan Coşkun, Güven Türkmen and Mehmet Evren Hacıoğlu on *bağlama* performance, fretting systems of *saz*, the makam concept, the *parmak vurma* technique, its education, and the use of musical notations.
- A large body of musical pieces that are performed with PVT was performed. Additionally, many melodic patterns that emerged from the study were also performed. 12 musical pieces that use PVT were analyzed in order to determine the most frequently used finger positions. The datas in tables in Appendix G is obtained from position symbols in scores of the musical pieces in Appendix F. The fingering use of every beat in the pieces is recorded with Microsoft Excel program and percentage datas were obtained with this program. The findings from these performances were especially important in determining the *complexity factor criteria* in the study.
- Development of methods that are suitable for all scales and tones during performance. The mathematical relations between the interval structures

between the degrees of scale types in which the melodic patterns are applied, and the *saz*'s mechanical performance limitations were analyzed. After this process, proposed performance methods of a certain melodic patterns are given in the appendices.

- Transcription studies were conducted to test performance methods, based on the encoding system that was developed through performance.

Moreover, seminars and workshops were organized in order to test the pedagogic approaches to the study results, and teaching them.

1.3 The Hypothesis

A melodic pattern in PVT performance is described with fingering types and position difference of two hands, order of techniques that is used for generating pitches/notes and order of strings of these pitches/notes.

Parmak vurma technique is used to create methods of producing melodic patterns that cover all scales and tones in *saz* performance. These methods are extracted from the relationship between the interval structures of the degrees of scale types, and the *saz*'s mechanical performance restrictions.

1.4 Terminology

Since this study is not focused on melodic patterns in a specific musical genre, it uses terminology from many different musical fields and styles such as Turkish Folk Music, Turkish Makam Music, Western Classical Music etc. Definitions for some of the musical terminology are presented in Chapter 1.6.

Additionally, the study is multi-disciplinary, and also includes terms from anatomy and kinesiology. These terms are used to describe the performance according to right-hander PVT performers. The terms used in the study are presented in detail in Chapter 3.3.

In addition, we preferred to use original *saz* terminology in terms of subtechniques of pickless *saz* playing styles such as *parmak vurma* technique, *pençe* technique, *tel çekme* technique because they are traditional terms and their meanings show some differencies with English equivalent-terms *finger tapping*, *strumming* and *string pulling*, respectively.

Many new terms were created for this study, because the subject was not studied before. Chapter 3.1. discusses a new terminology to build a *saz model* and updated microtonal notation for contemporary *saz* fretting. Chapter 3.2 presents an encoding system for melodic patterns based on patterning method and offers new terms to describe melodic pattern types. Chapter 3.3. presents a symbolization system for position and fingering types for both hands. Definitions for the structures that emerge when melodic patterns are performed on *saz* are provided in Chapter 3.5. These definitions are necessary in order to express the results of the study.

Chapter 1.6.3 brings *fret tuning system* (FTS) term that is based *düzen* concept to explain makam-based melodic patterns and Chapter 4.4.1.4 presents all FTSs in *saz* performance. A new term *PDC-tree* emerges to explain all positions based on scales/modes or FTSs in Chapter 4.4.2.4. Some terms are built to explain reflections of directional repeating melodic patterns in PVT in Chapter 4.4.6

1.5 Limitations of the Study

The results of this study are based on the characteristics (number of strings, melodic range, fretting system, and tuning system) of the *saz model* that is defined in Chapter 3.1. Expanding on the methods of this study may allow it to be adapted to *saz*s with different tuning systems, different fretting systems, different size, different number of strings, and various melodic ranges.

The data from the study is provided for the tuning system *bağlama düzeni* and the fretting system "contemporary *saz* fretting system" that are commonly used today. Preserving methodology, these results can be expanded to include other rarely used fretting systems and other tuning systems.

All commonly used pentatonic, hexatonic, heptatonic, octatonic scales, FTSs and the chromatic scale are examined in terms of scale playing in PVT performance. On the other hand, methods for creating the study melodic patterns are determined by examining the complexity factors that melodic patterns emerging on only heptatonic scales and FTSs. Similar factors may be extrapolated to pentatonic, hexatonic, octatonic, etc. scales that contain different numbers of pitches in an octave.

1.6 Descriptions

1.6.1 Melodic structures

"The main dimensions for sound description are melody, rhythm, harmony, timbre and spatial location" (Gomez et al., 2003). Among these dimensions, melody plays an important role in conveying the musical piece. Selfridge-Field explains the difference between melody and other elements of music: "It is melody that enables us to distinguish one work from another. It is melody that human beings are innately able to reproduce by singing, humming, and whistling. It is melody that makes music memorable: we are likely to recall a tune long after we have forgotten its text." (as cited in Gomez et al., 2003).

Patterning is a frequently used method of composition in musical pieces. Melodic patterns are especially used as a mnemonic device in the transfer of oral traditions (Forest, 1980). According to Rowe (2001, p. 168), "Music is composed, to an important degree, of patterns that are repeated and transformed. Patterns occur in all of music's constituent elements, including melody, rhythm, harmony and texture" Wilson (1989) cites two different factors as potential reasons for the frequent use of patterning in music. The first is the possibility of musically mirroring the patterns of the human body such as heartbeats, breathing, gait, sexual activity, working-eating-sleeping schedule, and the female menstrual cycle. Another factor is that music, as a language, uses different phrase structures in different cultures.

Musical pieces refer to melodic patterns using various terms. Chief among them is "motif." Some definitions of motif are listed below:

"A short musical idea, melodic, harmonic, rhythmic, or any combination of these three" (Drabkin, 2001a). Motif is the smallest divisible part of a theme or a phrase, and its size can vary. The motif concept is usually considered melodically, but it is also referred to as "figure" in this context (Drabkin, 2001a). "Motif is the smallest melodic germ, made of a few tones and rhythms"(Jones, 1974, p.102). Various motifs combine to create larger melodic structures such as phrases, periods and sentences.

Various definitions of motif emphasize its "repeating/recurring" characteristics. One example is presented below.

"A *motive* (or motif) is a short, recurring figure that appears throughout a composition or section of music. It is considered to be the germinating cell or organic unit that unifies a larger expanse of music. Distinctive melodic and/or rhythmic patterns form the underlying structure of a motif" (Benward and Saker, 2008, p.119).

Schoenberg (1970) also emphasizes the repetitive character of the motif, and suggests that the secondary variations in the repetitions of the same motif can be defined as "variants."

"A motif appears constantly throughout a piece: it is repeated. Repetition alone often gives rise to monotony can only be overcome by variation" (Schoenberg, A.1970, p.8).

Structures that emerge when the motif is repeated once or multiple times, are called "sequences" (Hidayetoğlu, N., 1999, p.178). The repeating modules of a sequence are directional (Benward and Saker, 2008, p. 122). Motifs that repeat with the same or a similar rhythmic pattern are also called "melodic motif" (Benward and Saker, 2008, p. 119) (Figure1.1.).

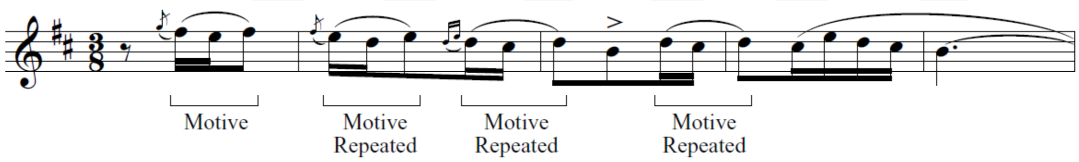


Figure 1.1 : Melodic motif in *Scheherazade* by N.R. Korsakoff, op.35, measures 26-30 (Benward and Saker, 2008, p.119).

Melodic pattern is also sometimes used to refer to motif, due to its repetitive nature (Taylor, B., p. 169). However, the term melodic pattern emphasizes the concept of melody, which is defined as "a sequence of pitches." Melodic patterns can be described through a temporal sequence of "gamuts." Gamut is described as a selection of some available notes (Cochrane, 2012). Cochrane's definition (2012) does not entail any rhythmic emphasis. The term melodic pattern in this study is defined as follows, in line with this interpretation:

Melodic patterns are structures created by pitches that are homorhythmically sequenced laterally in the musical texture, and that are repeatable (cyclically or through chromatic transposition or modal transposition to different pitches).

Application of different rhythmic patterns to these structures produces motifs and other melodic structures that are used in musical pieces. In that regard, melodic patterns can be considered melodic raw materials.

The reason for using the term “melodic pattern” instead of “motif” is that the subject of our study is sequential pitches, and that the application of the structures in the study to different rhythmic variations does not affect the study results.

1.6.2 Scales and modes

The “gamut” created by the sounds in a melodic pattern is generally located in a scale, mode or *fret tuning system* depending on the musical genre of the piece.

Various ideas were presented in history on the definition of the scales, modes. The following is one of the widely adopted definitions of the term scale, which is one of the most important structures in melody organization:

> A sequence of notes in ascending or descending order of pitch. As a musicological concept, a scale is a sequence long enough to define unambiguously a mode, tonality, or some special linear construction, and that begins and ends (where appropriate) on the fundamental note of the tonality or mode; a scale, therefore, is usually thought of as having the compass of one or more octaves. (Drabkin,2001b)

Scales can consist of two to eight or more notes, and are commonly named after the number of notes they contain. For example, a scale consisting of three adjacent notes is called “trichordal”, and a scale consisting of interleaved tones is called “tritonic.” The same is valid for four notes (tetrachordal) - four tones (tetratonic); five notes (polychordal) - five tone (pentatonic), etc. (Öztürk, 2014).

Scales can similarly be classified according to the number of pitches they encompass in an octave. Pentatonic scales contain 5 pitches in an octave, hexatonic scales contain 6, heptatonic scales contain 7, and octatonic scales contain 8 pitches (Nettl, 1964, p.144) Almost all regions in the Earth have scales that contain varying numbers of pitches in an octave.

The major and minor scales that constitute the concept of tonality, the fundamental scales of Western classical music, are heptatonic scales. Greek modes historically have had a major role on the way these scales take their dominant position in the Western classical music. (Yeprem, 2013, p.1) Greek modes are based on combining tetrachords to establish a seven note scale, and are scales in which full and half notes constitute a uniquely descending sequence. These scales are named after Greek civilizations such as Phrygia, Lydia, and Dorian, were especially played on string instruments, and through Byzantine music, they constituted the basis of church modes and church music (Mimaroğlu, 1970, p. 20). These modes were transformed into church music with the wrong names due to an error in the examination of Greek modes in Roman Boethius' time (480-524 AD) (Mimaroğlu, 1970: Yeprem, 2013). Modes that were identified in Saint Ambrosius' time were named "authentic modes," and the side modes with different root notes in various degrees are named "plagal modes," that are named with the "hypo-" prefix (Say, 2002, p. 159). Adoption of the Aeolian and Ionian scales that are frequently used in pre-16th Century secular music repertoires (Yeprem, 2013, p. 4), the musical development mainly advanced through major and minor tone pairs, and the system called "tonal harmony" or "harmonic tonality," which would dominate until the 19th century, was born (Powers as cited in Öztürk, 2014).

Scales and modes constitute a very detailed subject with many different dimensions, in parallel with developments in jazz music theory, and the currents in contemporary music. Modes were assigned different names throughout history, and are used both in melody construction, and in improvisation as jazz modes (Yavuzoğlu, 2016, p.2). Today, modes left their historical "directional" characteristics, and the term is used to refer to side scales that are created from beginning various degrees of the main scale. With this approach, the most frequently used modes in jazz music are the modes of major scales, melodic minor scales, and harmonic minor scales.

According to contemporary modal theory, one of the methods (chromatic method) that heptatonic modes can generate is the combination of two different tetrachords through a connection (Miller, 1996a). Accordingly, the heptatonic mode can be created as follows (Equation 1.1.):

$$\text{Heptatonic Modes} = \text{1. Tetrachord} + \text{Connector Interval} + \text{2. Tetrachord} \qquad (1.1.)$$

The position of modes in relation to the main scale from which they are derived, and to other modes that are derived from the same scale never changes. Thus, when the tonic note is chromatically changed, the formula can be applied to obtain modes on different tones. This is why this method is also called the chromatic method (Miller, 1996a, p. 16).

The following points have to be considered when creating a diatonic scale on tetrachords : 1 - The sum of the semitones should equal 12, 2 - Seven different scale degrees are necessary, 3- All sounds have to be within one octave (Miller, 1996a, p. 17).

The connector interval is the connecting interval that joins the two tetrachords, and can be a semitone, whole tone, or 3 semitones. 8 different tetrachords are used in this formula to produce the modes of major scales, melodic minor scales and harmonic minor scales, which are the most frequently used heptatonic scales in western music. These tetrachords contain intervals with 1, 2 or 3 semitones. Figure 1.2 presents the names of these tetrachords, and their representation on the stave.

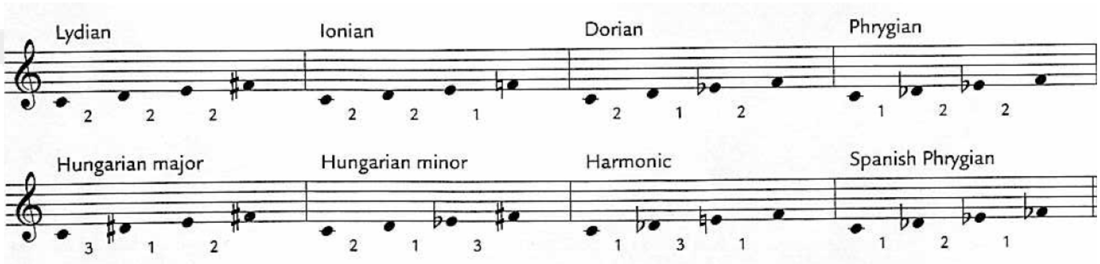


Figure 1.2 : Tetrachords (Miller, 1996a).

When the major scale itself is used modally, it is named the Ionian mode. The tetrachordal form of the major scale is as follows (Equation 1.2.):

$$\text{Major Scale (Ionian)} = \text{Ionian Tetrachord} + 2\ \text{semitone} + \text{Ionian Tetrachord} \qquad (1.2)$$

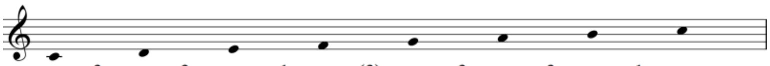
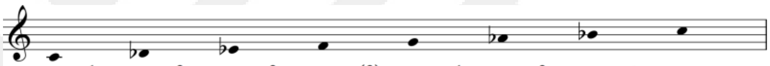
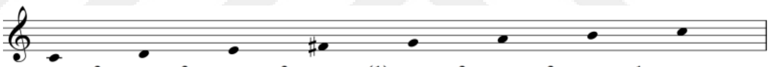
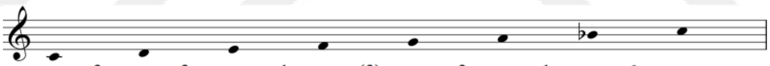
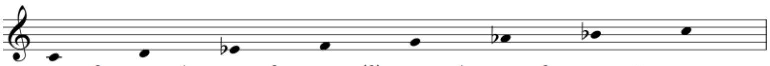
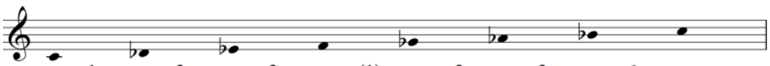
In this study, degrees of a scale will be named according to major scale degrees. Accordingly, while the distance of the intervals in the major scale with the tonal note will be represented only with Arabic numerals, the distance of notes that are not in the scale will be represented by using the sharp or flat symbols along with the Arabic numeral (Table 1.1).

Table 1.1 : Encoding scale degrees.

Interval (semitone(s)) between scale degree and tonic note	0	1	2	3	4	5	6	7	8	9	10	11	12
Symbols of scale degree	**1**	**♭2**	**2**	**♭3** **♯2**	**3**	**4**	**♭5** **♯4**	**5**	**♭6** **♯5**	**6**	**♭7** **♯6**	**7**	**8** **(1)**

The following table lists the modes in major scales and their modes, and specifies the connector intervals. The modes of major scale built on the note C is also presented in the table (Table 1.2). The major scale as presented as its Ionian mode in the modes table. Numbers under the staves shows interval between two degree in units of semitones. Connectors are represented between parentheses.

Table 1.2 : Modes of major scale.

Major Scale Modes	**Tetrachords**	**Connector**	**Representation on Stave (on C)**
Ionian	Ionian&Ionian	**2**	 2 2 1 (2) 2 2 1
Dorian	Dorian&Dorian	**2**	 2 2 1 (2) 2 1 2
Phrygian	Phyrgian& Phyrgian	**2**	 1 2 2 (2) 1 2 2
Lydian	Lydian&Ionian	**1**	 2 2 2 (1) 2 2 1
Mixolydian	Ionian&Dorian	**2**	 2 2 1 (2) 2 1 2
Aeolian	Dorian&Phyrgian	**2**	 2 1 2 (2) 1 2 2
Locrian	Phyrgian&Lydian	**1**	 1 2 2 (1) 2 2 2

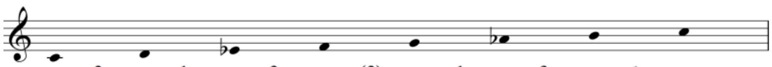
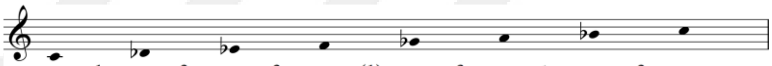
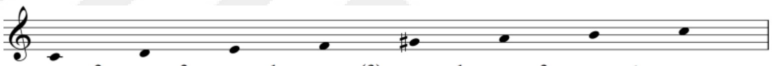
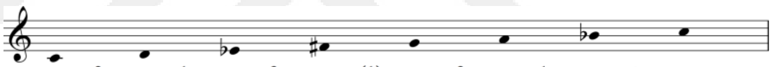
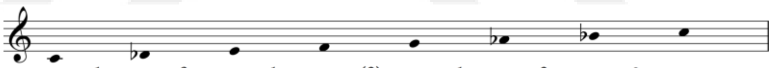
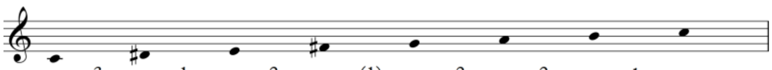
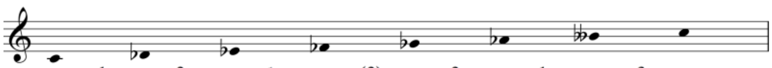
The natural minor scale is derived from the Aeolian scale. This is why it is also called the Aeolic minor (Cangal, 2008, p. 30). There are two versions of the minor scale that can be used depending on its suitability for tonal harmony and/or melodic usage. These are the melodic minor, and the harmonic minor scales.

The harmonic minor scale is obtained by increasing the pitch of the seventh degree of the Aeolian scale in order to strengthen cadential points in minor musical pieces (Jones, 1974, p. 33). The tetrachordal form of the scale is as follows (Equation 1.3):

$$\text{Harmonic Minor} = \text{Dorian Tetrachord} + 2\ \text{semitone} + \text{Harmonic Tetrachord} \qquad (1.3)$$

Due to the 3 half-note intervals that harmonic minor modes contain, in addition to other tetrachords, Hungarian Maj., Hungarian Min., and Harmonic tetrachords are also used in tetrachord formulas. Harmonic minor chords that are built upon the note C using the tetrachords and connection intervals in the harmonic minor scale and mode generation formula are presented in Table 1.3.

Table 1.3 : Modes of harmonic minor scale.

Harmonic Minor Scale and Its Modes	Tetrachords	Connector	Representation on Stave (on C)
Harmonic Minor	Dorian& Harmonic	2	 2 1 2 (2) 1 3 1
Locrian ♮6	Phyrgian &Hungarian Major	1	 1 2 2 (1) 3 1 2
Ionian ♯5	Ionian& Spanish Phyrgian	3	 2 2 1 (3) 1 2 1
Dorian ♯4	Hungarian Minor& Dorian	1	 2 1 3 (1) 2 1 2
Phrygian ♮3	Harmonic& Phyrgian	2	 1 3 1 (2) 1 2 2
Lydian ♯2	Hungarian Major&Ionian	1	 3 1 2 (1) 2 2 1
Super-Locrian	Spanish Phyrgian& Hungarian Minor	2	 1 2 1 (2) 2 1 3

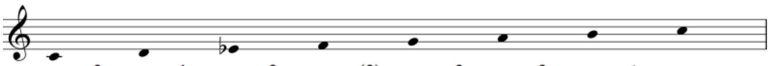
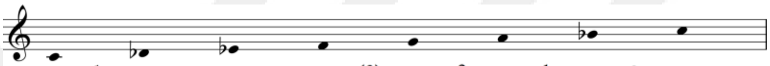
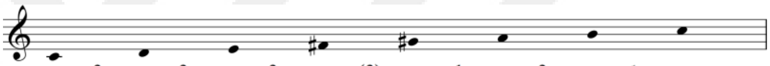
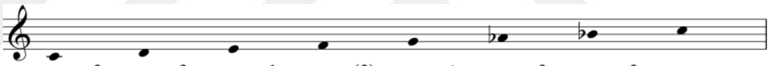
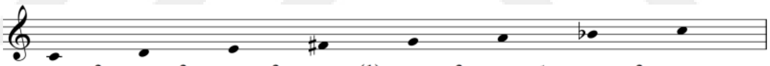
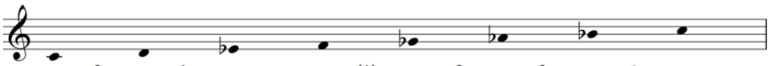
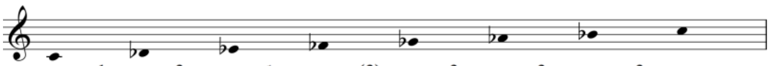
Particularly in vocal music, another adjustment is made to avoid the “awkward” 3 half-tone intervals in the harmonic tetrachord, and the 6th degree of the scale is sharped (Jones, 1974, p. 33). This produces the formula for melodic minor scales. The tetrachordal form of the scale is as follows (Equation 1.4):

$$\text{Melodic Minor Scale} = \text{Dorian Tetrachord} + 2\ \text{semitone} + \text{Ionian Tetrachord} \tag{1.4}$$

The melodic minor scale is a natural minor scale with the 6th and 7th degrees sharped. It is also called Ionian ♭3 due to the similarities between its sounds and the major scale. Since the melodic minor scale is an altered scale, its modes have different characteristics. Table 1.4 presents the tetrachords and connector intervals that are used to produce melodic minor scale modes. The melodic minor scale modes based on the note C are also presented in the Table 1.4.

In addition to major, melodic minor, harmonic minor scales and modes, many heptatonic scales derived from these scales can be produced.

Table 1.4 : Modes of melodic minor scale.

Melodic Minor Scale and Its Modes	**Tetrachords**	**Connector**	**Representation on Stave (on C)**
Melodic Minor	Dorian&Ionian	2	 2 1 2 (2) 2 2 1
Phyrigian♮6	Phyrgian &Dorian	2	 1 2 2 (2) 2 1 2
Lydian - Augmented	Lydian& Spanish Phrygian	2	 2 2 2 (2) 1 2 1
Mixolydian ♭6	Ionian& Phyrigian	2	 2 2 1 (2) 1 2 2
Mixolydian ♯4	Lydian&Dorian	1	 2 2 2 (1) 2 1 2
Aeolian ♭5	Dorian&Lydian	1	 2 1 2 (1) 2 2 2
Super-Locrian	Spanish Phyrgian &Lydian	2	 1 2 1 (2) 2 2 2

One of the frequently used scale groups apart from heptatonic scales, are pentatonic (5-sound) scales. They have been in use in many different regions and cultures such as Far East, Central Asia, Eastern Europe, Middle East, Latin America and Africa since prehistoric ages (Say, 2002, p. 149). One of the common pentatonic scales is the major pentatonic scale, and its modes. The 5th mode of the major pentatonic scale is also known as the minor pentatonic scale (Figure 1.3.).

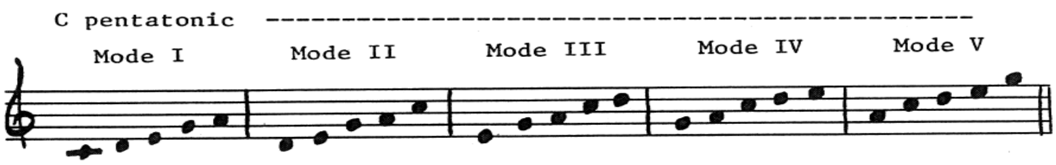


Figure 1.3 : Major pentatonic scale and its modes (Ricker,1976, p.2).

Many scales that contain a different number of pitches than 5 and 7 in an octave can also be produced. The most commonly used ones among these are the symmetrical scales that exhibit symmetrical properties (Figure 1.4.). A scale that contains whole tones between all their degrees is a hexatonic scale known as the "whole tone scale" (Figure 1.4-a). Symmetric octatonic scales are known as diminished scales, and they are called half-whole (HW) diminished scale (Figure 1.4-b), and whole-half (WH) diminished scale in jazz theory (Figure 1.4-c) (Levine, 1995). These scales are interconnected. This means that a scale built upon the second degree of a WH diminished scale is a HW diminished scale. A scale that contains semitones between all their degrees is a dodecatonic scale known as the "chromatic scale" (Figure 1.4.-d)

Figure 1.4 : Common symmetrical scales : (a) Whole tone scale. (b) Half-whole diminished scale. (c) Whole half diminished scale. (d) Chromatic scale.

1.6.3 Makam

Makam is one of the most debated and controversial concepts in our country. The concept of makam was considered and defined variously throughout history[1]. Makam (maqam) is a word of Arabic origin, and derives from the verb qāma. Qāma literally means “the place on which the foot rests, sitting place, position, location, rank” (Bardakçı, 1986, p. 63). The meaning of the word expanded in time to be used as a musical term (Öztürk, 2014, p. 17). Öztürk (2014) states that these approaches can

---

[1] For detailed information about makam model approaches in history, see (Tohumcu, 2013) and (Öztürk, 2014).

be classified in four groups based on “school”: interval based “*Devir*/*Daire*/*Şedd* (Cycle/Circle/Tying) Model” of Safiyüddin Urmevî (d. 1294) and Abdulkadir Meragi (d. 1435), known as the “founders of the systematic school;” the fret and tuning system based “Makam Model Based on Esoteric Symbolism” used by theorists such as Hızır Bin Abdullah, Yusuf Kırşehri, Ladikli Mehmet Çelebi and Seydi; the *seyir* (journey, direction, route) based “Makam Model Based on Compositional Route” represented by theorists such as Dimitri Kantemiroğlu, Nayi Osman Dede, Tanburi Küçük Artin, Kemani Hızır Ağa and Abdulbaki Nasır Dede; and the “Tonality Based Makam Model” that was shaped by Rauf Yekta, Saadettin Arel and A. Suphi Ezgi, and that is commonly used in education today[2].

Based on the usage of the term makam in the *edvar* tradition that started with Al-Qındi around the 9th century, the first use of the term makam was used by 14th century theorist Safedi, to correspond to the concept described by *devir* or *şedd* (Tekin, 2007, p. 119).

Makam was defined in many different ways depending on the school in which the makam models are developed. After the institutionalization of makam education, especially in the founding years of the republic and afterwards, the “Tonality Based Makam Model” founded by Rauf Yekta, systematized by S. Arel and A. S.Ezgi with the physics and mathematics contributions of Uzdilek came to be adopted as the primary model in education. The definitions of makam that are made in this period are explanatory definitions that explain the model through the model, or complementing/constructive definitions that complete the missing parts of this model, or critical/destructive makam definitions that completely oppose the model. Some definitions of makam in the period are as follows:

“Makam is a style of being. It is a specific form of the musical scale that exhibits its qualities through various proportions that constitutes it, and the arrangement of its intervals (Yekta, 1986, p. 67). According to Hüseyin Saadettin Arel "The phenomenon that arises from the interaction of sounds with a *durak* (karar, tonic note) or *güçlü* (the junctore of the 4th and 5th degrees of the makam scales) in the scale is called makam." (Kutluğ, 2000, p. 76). “Thus makam is a journey that creates

---

[2] For detailed analysis of makam models, see Öztürk, 2016.

melodies by stating the importance of *durak*s and *güçlü*s and by abiding by other rules" (Özkan, 1998, p. 77).

In the foregoing definitions, the sound organization of a makam in a scale is defined through *güçlü*[3] and *durak*.

Cinuçen Tanrıkorur emphasizes the concept of *seyir*, in the definition of makam, in contrast to Rauf Yekta and Hüseyin Saadettin Arel. "The set of rules that arise from the use of musical scales that are arranged according to certain interval systems, according to patterned melodic route (seyir) types" (Tanrıkorur, 2003, p. 140) is called a makam.

Other definitions of makam that emphasize seyir are as follows: "Makam is the flavored mixture (*çeşni*) of musical phrases that abide by a special *seyir* rule in a scale that consist of harmonious sounds with certain intervals in Turkish music" (Karadeniz, 2013, p. 64). "We know that the song type that is produced by starting at certain points (or areas) on certain types that consist of certain pitches and certain intervals, journeying through various areas and directions, pausing in some pitches (*asma karar* - hanging tonal note), and assigning a pitch as the tonal note is called makam" (Tura, 1988, p.140-141). According to Oransay "Makam is a journey (seyir) on one or more specific *aşıt*[4]s" (Uz, 1964, p.42).

Today, the "Tonality Based Makam Model" that is created with a structuralist and eclectic approach that combines "the fourths and fifths concept" of the "*Daire/Devir/Şedd*" model by "systematic school" , the tonality concept in the Western music, and the makam definition that includes concepts such as *seyir* from the "Makam Model based on Compositional Journey", and *çeşni*s based on fourths and fifths is commonly used in education.

Some important terminologic concepts in the "Tonality Based Makam Model" are makam scales, *seyir* and *çeşni*. New scales called "Hüseyni scale," "Rast scale, "Hicaz scale," etc. that consider makams as the makam scales on which the melody journeys emerged.

[3] A degree that undertakes a tonal function in dominant tonal music.
[4] Another term for scale

In folk music literature, which constitutes the *saz* repertoire, the term *ayak* is used instead of makam in order to identify scales during the radio-focused institutionalization of education (Doruk, Özbek, Şenel, as cited in Öztürk, 2014). An important reason for this is the fact that the sound organization of many *türkü*s did not overlap with the makam definitions in KTM, and the reluctance to use the term makam (Karaduman, 2014, p. 587). Many researchers think that the main reason for not using the term makam was the Republican Era culture policies' aim to separate the terminology for the two musical genres (Sümbüllü, 2006, p. 74; Öztürk, 2014). Şenel's (1997) observation on the matter is noteworthy:

> Especially some artists who are professional performers adopted new terms instead of terms that will allow recognition in the region of origin, as a means of communication among themselves, and began to use half-heard terms regardless of their etymologies and uses in colloquial speech, even assigning them different meanings. In conclusion, misused terms that particularly spread out from radio people inexorably penetrated virtually all of the society, and the term *ayak* is but one example. Today, the fact that the term *ayak* as a synonym for the term makam in Classic Turkish Music is used in education and art institutions, textbooks, and even the most serious academic works(!) makes the problem very difficult to solve. (Şenel, 1997:378)

Popularization of the term *ayak* in education caused scales that are used in *türkü*s to be called with names such as "Yahyalı Kerem ayağı," "Kesik Kerem ayağı," "Kalenderi ayağı," etc. However, the term *ayak* is used with different meanings in traditional folk music circles.

In Aşık literature, ayak means rhyme (Sümbüllü, 2006, p. 25). Süleyman Şenel literarily and musically investigated Kastamonu region's Aşık music in his arts thesis titled "Kastamonu Region Aşık Music Types and Forms," and observed that aşıks use the term *ayak* as an equivalent of rhyme as a lyric element, and that the concept of ayak was used as a musical rhyme that is used in the beginning, middle and end, just like lyric rhymes (Şenel, 1992a, p. 322). Moreover, the term *ayak* in this context can lend its name to styles such as Urfa Divan Ayağı, Konya Divan Ayağı, etc., in addition to whole musical pieces (Ekici, 2009).

Many studies (Şenel, 1997 ; Sümbüllü, 2006 ; Öztürk 2014) unearthed this fact, and the use of the term *ayak* has largely decreased today. However, the terminologic void was filled with the word *dizi* (scale), and hybrid uses such as *Yahyalı Kerem dizisi*, *Kesik Kerem dizisi*, and *Kalenderi dizisi* emerged.

Cinuçen Tanrıkorur (2003) states that in contrast to the claims of some folklorists, Turkish folk music is also based on makams like Turkish classical Music, and that the fact that a folk music *ayak* corresponds to many makams in Turkish classical Music is because naming was not considered important.

Many sources discuss this relationship between makam and melody. Based on the "stereotyped motives" approach, Signell (1976) thinks that makams have some fixed melody patterns or motifs (As cited in Öztürk, 2014, p. 22). According to 20th century theorist Kazım Uz (1964), makams are "certain melodies that are performed in a certain part of the musical sound chain, based on specific conditions" (As cited in Can, M.C., n.d)

These definitions also demonstrate that there is a certain harmony with the term makam that is used in Aşık tradition. Sümbüllü (2006) offers the following observations about the makam concept in Aşık tradition:

> ...We see that *saz* poets in the rural area, in small communities, use the term makam to an extent. However this term has a different meaning in this region, and is used to refer to a part of fixed melodic patterns (Sümbüllü, 2006, p. 75)...Makam-*hava* (air) concepts are used as melodic elements in Aşık tradition. These concepts contain some specific melodic patterns. The makam-*hava* types that are commonly used are generally the same around the country. However they are far more numerous in the Eastern Anatolian region. Due to the influence of Traditional Turkish classical Music in the Central Anatolia, the makam concept is more important there than it is for Eastern Anatolian Aşıks. During the performance of sample melodies, we observed that their makam knowledge was not parallel to Traditional Classical Turkish Music makams. (Sümbüllü, 2006, 117)

Sümbüllü (2006) states that *aşık*s don't use a specific term to name their scales, and use the terms *makam* or *hava* to define certain melodic patterns.

Öztürk (2014; 2015) also argues that folk music has to be based on makams, that the traditional folk music repertoire complies completely with the "melodic nuclei that develop around frets/pitches that are centered on a specific fret system." definition of makam, and that the reason for non compliant situations is the current definition of the term.

Okan Murat Öztürk (2014) states that the scale-based approach that was developed for makams emerged in mid-19th century, and was adopted in our musical culture as an extension of the westernization approach in his doctoral thesis, and defines makam as follows:

> Makam represents the location, position and condition of a pitch or melody with "specific" characteristics within TFS[5]. In makam music, pitches that are located on the *tam perde*s[6] allow certain melodies to develop "on" them. Thus, some frets/pitches/notes can become more "central" in terms of the melody, and can create context in terms of the other frets/pitches/notes. Makam concerns these pitch centralizations, melodic phenomena that occur around the centers, and the relationships that are built between centers by the melody. Moreover, the locations and positions of these centralizations and relationships within the TFS in terms of their beginnings and endings exhibit the fundamental characteristic referred to by the term makam. A makam is a pitch-melody combination with a singular character, and this character of being singular imparts uniqueness to it. (Öztürk ,2014, p.17)

This approach explains makam based on melody, and emphasizes the concept of *düzen* beyond the concept of scales (Öztürk, 2014). Öztürk's definition for *düzen*, which is a term used for fret-tuning systems (or "*tunings"* in short), is striking among historical theoretical sources: "*Düzen* is established based on the frets (pitches/sounds) that the makam *has to use*. However, each *düzen* is basically a collection of makams."(Öztürk, 2014).

The importance of frets/pitches in terms of makam is due to the *düzen* it created within the musical culture. Without the *düzen*, melodies and makams cannot be developed. After all, all melodies and makams exist in a *düzen*.

In order to avoid confusion between this definition of *düzen*, and the definition of *düzen* as a tuning system, the abbreviation FTS "Fret Tuning System[7]" was used in this study. The meaning of FTS in this study is one octave span section/variation of *düzen* for fretting systems of *saz model*[8]. After the light of all datas above, we also think that makam concept have to be expressed with FTSs in *saz model*. In conclusion, this study adopts the following definition and properties of the term makam by Öztürk (2018):

> Basically, any makam is the definition of a typical manner of melodic motion (nağme). Thus, all makams outline specific melodic formations and their positional peculiarities in the fret system. They are essentially recognized by melodies (Bayraktarkatal and Öztürk, 2012). As a foundational concept, makam describes and classifies the special positions and the formations of the melodies in definite tunings. Theoretically it is always related to the

[5] *Traditional Fret System*, See Section 2.1.5. for detailed information
[6] *Tam perde (Complete note)* : The frets/pitches/notes on "Traditional Fret System".
[7] See Section 4.4.1.4. for detailed information
[8] See Section 2.1.5. and Section 3.1. for detailed information

> concept of melody and usually it has the same meaning. Each makam has its own place and position (hâne/ev, 'house') and tunes. Generally speaking, in 'makam music' (such as Turkish, Iranian, Turkic, and Arabic musics), certain fret centralizations, melodic motives, figures, lines, or sections in compositional or improvisational melodies or songs can be understood as a discrete makam. Therefore, when we talk about makam, we specifically refer to at least one of these basic features: (i) any fret centralization in the traditional fret system and tuning; (ii) a typical melodic formation that is shaped around a central fret; (iii) a typical usage of (one or more) incomplete note(s)[9] in a tuning. Essentially, the concept of makam-tunes is not structural, but positional, motional, and most importantly relational. Understanding of these tunes as fixed or stereotyped melodies (or melodic patterns) is neither sufficient nor correct (Signell, 1986). However, it is true that makam-tunes have specific tendencies with regard to fret/note centralizations and melodic formations. (Öztürk, 2018)

We classified FTSs that are frequently used in contemporary *saz* performances considering "performance practicality," based on this definition[10].

1.6.4 Melodic patterns on music literature

In the previous section, we mentioned about relationship between maqam and melodic motion and we noted that *Aşık* makams correspond to certain melodic patterns. Additionally, the melodic patterns are used in almost every form in Turkish music.

Giydirme (literally "clothing") compositions are common in Turkish folk music. New lyrics are attached to a well-known tune from a master to create a new piece (Uslu, 2012). The TRT Archives contain some *türkü*s that are collected in this manner[11]. The thinking here is that since music is the common property of the people, this does not constitute plagiarism. Some researchers think that some tunes are named *karacaoğlan havası*, *köroğlu havası*, and *kerem havası* may be a tribute to the original of the tune, or the lyrics (Uslu, 2012, p. 155). Melodies may sometimes change depending on the musical culture of the location where they are re-composed. This is called *çeşitleme* (variation). In this context, a melody can spread out from its

---

[9] *Nim perde* (*Incomplete note*) : The frets that constitute after tuning change of a *tam perde.*

[10] See Section 4.4.1.4. for detailed information.

[11] Aşık Davut Sulari's (Erzincan 1925-1985) "Dost Bağından Bir Gonca Gül" and Sivas local Aşık Muhlis Akarsu's (Sivas 1948-1993) "Aşıklarda olan efkar" have different lyrics, but share the same melody. Another example from TRT Archives is that Aşık Ali İzzet Özkan's (Sivas 1902-1984) "Dert satıyom dert tüccarıyım ben," Erzurum's Aşık Reyhani's (1932-2006) "Benden aşıklara bir selam götür," and Bayburt local Vasfi Akyol's "Söyleyim Bayburt'un vasf-ı halini" have the same melody and rhythm structure (Eke, 2010).

source to wide regions and cultures. For example, the *türkü*s Katibim (Istanbul), and Sarı Gelin (Erzurum) have variations in various languages and regions.

Original compositions are more important in Turkish classical Music. While compositions called “nazire beste” (imitation compositions) existed, these were songs inspired by the rhythm and makam of the composition, with different melodies (Uslu, 2012).

Melodic patterns are frequently used in freestyle instrument playing forms such as *açış* or *gezinti (A rhythm-free prelude)*. In *açış*, the melodic nuclei of the piece that are played after açış are performed differently and free in time. One of the frequently used melodic patterns in Turkish Folk Music are structures called *hayal* (image) or *hayalleme* (imagination) (Parlak, 2000, p. 154). These motifs are placed between periods, sentences and phrases in order to allow the performer of songs to relax, especially in genres such as *deyiş* and *semah,* and to allow the performer to remember the poem that accompanies the melody (Figure.1.5) (Eroğlu, S. 2011, p. 30).

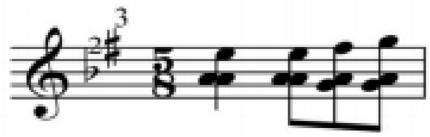


Figure 1.5 : Hayalleme (Eroğlu, S. 2011, p.30).

Melodic patterns are frequently used in the living traditional music of many regions in the world. For example the Indian *rāga* system constitutes a song classification and identification method as advanced as the makam, and is the basis of melody production (Öztürk, 2014, p. 61). The units that provide the necessary melodic material for composition or improvisation is called *rāga* in traditional Indian music. *Rāga*s are characterized by the fundamental pitch sequence, the emphasis on various degrees on the sequence, and the motifs that emerge on this scale (Widdess, 2001). Ragas evolved in hundreds of years within a tradition, and constitute the source of melody production through rhythmic patterns that are expressed with the term *tāla*.This process is carried out with *rāga* and *tāla*, and constitute a part of *rasa*, that expresses the aesthetic framework of Indian music (Wilson, 1989).

In this regard, it has a function that is similar to the qupai[12] system of Chinese music (Öztürk, 2014, p. 62). The term *dromoi* that is used for makam-like structures in Greek music also expresses melodic formulae[13] and progressions (Pennanen, 1997).

Since in traditional Javanese Gamelan music, elaborating instruments are one of the divisions of instruments (panerusan instruments), there are aurally learned melodic patterns. A terminology has emerged for pattern types in this musical culture. Terms such as *cengkok, wiletan, lagu,* etc. are used to define the melodic and rhythmic pattern types (Forest, 1980).

We also find melodic patterning in different polyphonic musical cultures. A technique that is especially used to create multi-part structures in vocal music is *ostinato*. *Ostinato* is a type of polyphony where a melody that is shorter than the main melody is used as a static support for the main melody with certain rhythmic patterns, in one or more parts. While *ostinato* consists of melodic movements, it is a strong reference point in the scale for the main tune to lean on, like a drone. Additionally, it provides rhythmic organization in the music, and offers a rhythmic reference point. Ostinato is present in almost every musical culture with a polyphonic tradition. While *ostinato* is usually in the bass partition, it is sometimes used in the highest partition, and rarely in middle partitions (Ayyıldız, 2013). Melodic patterns are also observed in canonic polyphonic traditions such as Lithuanian *sutaritine*s and North Japanese Ainu music (Jordania, 2006, p. 27).

Examination of the written sources of Western art music reveals that melodic patterns were always present in music since the monophonic Gregorian Chant era. The rule was to build a polyphonic piece based on an existing melody (*cantus firmus*) (Hanning, 2010, p. 61). The melodic patterns that could be present with different rhythmic patterns in different parts after the invention of the organum, and began to be used more systematically along with the emergence of the motet genre. Influenced by the Ars Nova style after the Renaissance, and especially the structure

[12] Qupais are short tunes that are performed at medium tempos, and counted with fixed beats. The qupai system encompasses the existing/known tunes of traditional Chinese music repertoire (Öztürk, 2014, p. 62).

[13] Lilliestam (1995:30) has defined musical formula as a characteristic motif or pattern that has an easily recognisable nucleus, although the exact realization of a formula may vary within certain limits" (As cited in Pennanen, 1997)

of the isorhythmic motet genre, known through Philippe de Vitry's works are based on melodic and rhythmic movements that repeat in different parts of the motet. The repeating rhythmic units are called *talea*, and the repeating melodic units are called *color* (Hanning, 2010p. 70). Musical genres such as *caccia* and *rondellus* (Mann, 1987, p.9), strict canon derivatives in which a melodic pattern is usually repeated successively in different times, began to emerge in 14th century secular music. *Ricercare*, developed based on motet script, is based on determining melodic motifs successively (Hanning, 2010, p. 220). This form usually carries many motifs.

Single motif repetitions led to the fugal composition. This melodic imitation approach was developed in time. *Fugue* is a term derived from the verb fugare (to escape) in Italian (Mimaroğlu, 1970, p.64). *Canzona*, a genre that was based on vocal styles, is also an example of the imitation script. Additionally, fugal composition was also used in parts of pieces in genres such as *toccata*, *fantasia*, and *praeludium*. *Fugue*, as a musical genre, had its golden days in the Baroque Period, with the works of J. S. Bach (Kaya, 2009). *Fugue* heavily uses counterpoint techniques, and the melodic pattern known as the 'subject' is played in different partitions and tones during the *fugue*. This makes the melodic patterns important compositional tools for the creation of a polyphonic texture.

This approach gradually lost traction in terms of polyphonic texture during the Classical Period, and were used for different purposes in the musical pieces that artists applied a homophonic texture in the following periods. Musical pieces in the Romantic Period, during which programmed music was developing, associate a melodic pattern with a certain character, and use it in different parts of the music in a manner reminiscent of this character. This type of expression that is characterized with the insistent repetition of the melodic pattern that represents love in different parts of Berlioz's Fantastic Symphony, and is termed *idefix* (fixed idea) (Burdurlu, 2016,p.5).

A similar use is seen as *leitmotif* in the work of Wagner, who used different motifs for different characters or concepts. Franz Liszt uses motifs that he calls *motto-theme*s, that are transformed through the compositional method called thematic transformation (Hanning, 2010).

With the deformation of all the elements of music in the 20th century, melodic pattern usage also saw serious transformations. One of the most important musical events in this period is the serialism movement of Arnold Schoenberg. Wilson (1989) explains serialism's relation with melodic pattern:

> This is simply the deployment of motifs, or 'cells', comprised of a few or several pitches or rhythms (or, later, of other parameters such as dynamics), throughout a composition. Interest was provided by inverting (an upward leap became a downward leap, for example), retrograding (lines were played 'backwards') and retrograde-inverting, as well as by manipulating other musical parameters such as tone-color (instrumentation). (Wilson, 1989 p.103)

The "minimalism" movement of Philip Glass and Steve Reich in the 1960s usually slowly and imperceptibly shifts the harmony and rhythmic patterns within a continuously repeated musical phrase or shorter motifs. The performance of different rhythmic versions of the same melodic patterns to establish a "phase" is a compositional technique that is used to enact this transformation (Güleryüz, 2014, p. 12).

The improvisation based jazz genre that developed out of the vocal based blues music heavily includes melodic patterns (Kaplan, 2017). Wilson (1989) discusses the use of patterns in jazz:

> The various styles of jazz are musically definable largely in terms of the patterns upon which they rely for unity and expression. Furthermore, a study of the drums, bass, piano and melodic instrument (or voice) would reveal that each instrument has a specific role that is based largely on the type of pattern it performs. (Wilson, 1989)

The most recommended method for good jazz improvisations is the practice of melodic patterns. Some musicians think that the increased use of these lowers the quality of improvisation (Taylor, 2000.; Kaplan,2017, p. 11). However, there are still many books that include melodic pattern practices that may be helpful for improvisation. The most prominent among these books are: *The Thesaurus of Scales and Melodic Patterns* by Nicolas Slonimsky (1947), *Patterns for Jazz* by Jerry Coker et al. (1970), *Repository of Scales and Melodic Patterns* by Yusuf A. Lateef (1981), *Mel Bay's Encyclopedia of Scales and Melodic Patterns* by Arnie Berle (2010). Additionally, there are many workbooks for specific instruments. All the efforts to expand this melodic vocabulary show the importance of melodic patterns in jazz music. In that regard, Werner's (1996) statement is worth noting:

> You may think that you can never repeat yourself, but jazz is not total improvisation. If you listen to any great improviser, from Art Tatum to Charlie Parker to John Coltrane, you'll

notice that they always repeat themselves. Transcribe their solos and you'll find that they are always playing the same lines. Sometimes they are even playing the same things in the same places. (Werner, 1996, p. 55)

2. GENERAL INFORMATION ON *SAZ* AND ITS *PARMAK VURMA* TECHNIQUE

2.1 *Saz* (*Bağlama*)

The terms *saz* and *bağlama* refer to instruments that can be classified in the long necked hemipyriform bowl or box lute category (Picken, 1975, p.209).

The parts of *saz* are called by many names. The body part is called *tekne* (vessel), *gövde* (body) and the soundboard is called *göğüs* (breast) or kapak (cover), while the term *sap* (handle) is used for the fretboard; *eşik* (threshold) or *alt eşik* (lower threshold) for the bridge; *üst eşik* (upper threshold) for the nut, *takoz* (chock) for the tailpiece, *kulak* (ear) or *burgu* (corkskrew) for the tuning pegs; and *tel* (wire) for the strings (Fig. 2.1).

Figure 2.1 : *Saz* and name of its parts.

According to the instrument classification system suggested by Hornbostel and Sachs (1914), the *saz* is classified in the Necked Bowl Lutes (Chordophones) class with the code number 321.321 (Table 2.1).

Table 2.1 : The class to which *saz* belongs according to the Hornbostel-Sachs system

Code No	Class Name	Description
3	Chordophones	Instruments in which sound is produced by one or more vibrating strings
32	Composite Chordophones	Instruments in which the resonator and body are physically united and can not be separated without destroying the instrument
321	Lutes	Instruments in which the strings run in a plane parallel to the sound plate
321.3	Handle Lutes	Instruments in which the string bearer is a plain handle
321.32	Necked Lutes	Instrument in which the handle is attached to, or carved from, the resonator, like a neck
321.321	Necked Bowl Lutes	Instrument whose body is shaped like a bowl

Table 2.2 :

2.1.1 History of *saz*

Today, *saz* and *saz*-like long-necked lutes are included in the musical cultures of a landscape from Central Asia to Middle East, North Africa and Europe bearing various names. This is why it is difficult to pinpoint the origin of *saz*, and to determine where it's born, and in which directions it spread out. The main reason for the variety of opinions concerning the origins of the *saz* family is that *saz*-derived instruments are identified at various locations at varying times.[14]

Findings from archaeological studies in Anatolia, Mesopotamia and Egypt reveal that long-necked lutes similar to the *saz* were played by Hittites, Akkads, Babylonians, and Ancient Egyptians. The oldest of these sources come from Mesopotamia (Turnbull,

[14] In addition to views that suggest that *saz* was derived from Central Asia's kopuz, coming to Anatolia to develop further, views that argue that the shape of this *saz* was first conceived in Anatolia, Mesopotamia and neighbouring ancient civilizations also exist.

1972). Lawergren (2004) visualized the existence of the lute in ten regions of the world through charts with a striking method, based on previous studies on the existence of the necked lute in historical documents (See Appendix A). These charts demonstrate that the ratio of the number of lute images from historical remains to the total number of string instruments that were identified varied over historical periods. Lawergren makes the following observations based on these charts : According to Lawergren (2004), necked lutes emerged in Mesopotamia and Iran around 2,300 BCE. Their numbers increased in Mesopotamia until about 1,300 BCE. The only type of string instrument in Iran in the 2nd millennium BCE was the lute. Necked lutes were also spread very wide in Anatolia[15].The Ancient Greek civilization adopted instruments such as the harp or the lyre, did not use lute-type instruments. Lute-type instruments disappeared in Anatolia in the period that it was under Greek dominance. Lawergren suggests that this may be caused by a prohibition in the period[16].The proportions of these *saz*s in Near East, Iran and Egypt decreased a little before 1,000 BCE. A while later, Central Asia that was protected from Hellenistic influences became the center for the necked lute. The ratio of lutes in this region increased from 1,000 BCE progressively until the present. According to Lawergren (2004), the necked lutes probably arrived at Central Asia via the Silk Road, or were reinvented here and later returned to its birthplace with the migration of Central Asian tribes towards Iran and Anatolia (Lawergren, 2004, p. 19).

Review of the literature reveals many sources that trace the ancestry of the *saz* to the Central Asian *kopuz*. The heavy presence of *saz*-like instruments in Central Asia, and the existence of many similar aspects between the playing styles, fretting system[17], musical and morphological characteristics of Central Asian *saz*s and the Anatolian *saz* are emphasized as supportive of this argument.

Kopuz types played with fingers or bows were one of the most important elements of old-Turkic Shamanism (Parlak, 2000). Shamans perform their shamanic acts with a drum or kopuz. In Shamanism, the Shaman has the person who has the power to

---

[15] 3 of 9 string instrument depicted on the vase from İnandık are lutes.

[16] The attitude of Greeks towards lutes (towards many-stringed and necked instruments) can be observed in Platon's *Republic* (III, 399c), where he states that the use of "instruments containing all modes" was forbidden (As cited in Lawergren, 2004).

[17] The fretting system of *üçtelli* (three-stringed) *saz* of yörük Turkmen from Teke Region in Anatolia, and the Uyghur Dutars have a non-fully-chromatic temper. None of these *saz*s have a fret that corresponds to the diminished five range in relation to the open string.

interject between the humans, and the gods and souls, and is called with various names, such as *kam, oyun, udagan, bö, böğe, baksı, bahşi* in Turkic societies. This character performed different functions in different regions at different times, and its extensions as the "*saz* player,""poet-musician," and "traveller" were kept alive in Anatolia in the character *Ozan*[18] of the past, and *Âşık* (Ashik) of the present *Âşık* tradition (Özdemir, 2013).

Kopuz was called *kubuz* in Mahmut Al-Qashqari's Dīwān Lughāt al-Turk, and this work included some musical terms concerning the kopuz (Gazimihal, 2001). Kopuz was the favourite instrument of *ozan*s in Dede Korkut tales and Yunus Emre poems (Çoğulu, 2010).

Meragî mentions two types of *kopuz* in the 15th Century: *kopuz-ı rumî* and *kopuz-ı ozan* (Feldman, 1996, p.119). The type of kopuz that was made famous as the accompaigning instrument of *ozan*s was *kopuz-ı ozan*. *Kopuz-ı rumî*[19] was an instrument that was similar to the *oud*, and was described as having 5 strings, and being tuned with 4th intervals. Instruments similar to *kopuz-ı ozan* that were played at court are called with various names such as *tanbura*, *çöğür* and *bozuk*. These instruments were not part of the *fasıl* (Turkish classical Music performance), and were essentially used in the performance of folk music (Soydaş, 2007, p. 39).

In addition to *kopuz*, general names used to refer to *tanbura*-type instruments in Anatolia include "*saz*" and "*bağlama*." The absence of any information that suggests that *tanbura*-type *kopuz* derivatives were called *saz* or *bağlama* before metallic strings began to be used indicates that these terms were only used to refer to the *kopuz* approximately after the 17th Century (Parlak, 2000). The fact that while the travelogues of Evliya Çelebi mention many instruments, they don't include the terms *saz* or *bağlama*, supports this argument. According to Parlak (2000), the bad reputation that was given to the *kopuz* in the 17th Century was a factor in accelerating the disappearance of term *kopuz* in favour of the terms *saz* and *bağlama.*

The word *saz* refers to reeds that grow in swamps is of Turkish origin. The word *sâz* of Persian origin means instrument, order, or mechanism. It is widely thought that the

---

[18] *Ozan* can be interpreted as *aşık* in contemporary Turkish. However, it was also semantically expanded to act as a synonym for poet. Modern poets are sometimes referred to as *ozan*s.
[19] An instrument called Kopuz and Şeşhane (6-Stringed Kopuz) entered the Ottoman Court ın the 15th, 16th, and 17th Centuries. This instrument is believed to be the *kopuz-ı rumi*.(Soydaş, 2007)

name *saz* was adopted for this instrument due to this etymology. Gazimihal doubts this argument, and states that the Persian word *sâz* has an elongated vowel, but the Turkish word *saz* is not elongated, and argues that the use of the word *saz* originates with the "reed" meaning of the word, and that the word could have been adopted because of the similarity between the sounds of reed swamps and the sound of the *saz*'s metallic string (Gazimihal, 2001, p. 139).

In Anatolia, the word *saz* came to be interpreted as the general name of string instruments that are used by *ozan*s when they sing their *koşuk*s (ballads), such as *kopuz*, *cura*, *çöğür*, and *bağlama* (Parlak, 2000). Literature historians used the term *saz şairi* (*saz* poets) for ozans and âşıks who perform their poems in the company of a *saz*, and the term *âşık edebiyatı* (*âşık* literature) for the literature they created. The term *saz* is also used in the poems of *âşık* literature.

> "Şahinim var bazlarım var
>
> Tel alışkın *saz*larım var"[20] (From Karacaoğlan)
>
> "Ben gidersem *saz*ım sen kal dünyada
>
> Gizli sırlarımı aşikar etme"[21](From Âşık Veysel)
>
> "Şu *saz*ıma bir düzen ver
>
> Teller de muradın alsın"[22] (From Âşık Ali İzzet)

In these examples, *saz* is used to refer to *bağlama*, not to its "any instrument" meaning. *Divan Sazı* and *Meydan Sazı*, members of the *saz* family, contain the word *saz* in their names. Even today, workshops where *bağlama*s are made are called *sazevi* (*saz* house). The term *saz* gained adoption in the daily language after it appeared in folk literature. There are many idioms and proverbs about the *saz*.

Another term for *saz*, is *bağlama*. The basic meanings of the word *bağlama* are listed in the Turkish Language Society (TDK) as follows: "*Bağlama*: 1. The act of tying. 2. A *saz* with three double strings, that is played with a pick. 3. Beam, girder, etc. that connects the walls in buildings. 4. *grammar* Liaison" (TDK Online Current Turkish Dictionary, Url-1).

---

[20] (In English)I have falcons, I have hawks
I have *saz*s used to strings
[21] (In English)If I leave, stay my *saz* in the world
Don't manifest my hidden secrets (In English)
[22] (In English)Tune my *saz*
Strings too, should get their wish

Gazimihal (2001, pp. 106-107) states that the term *bağlama* was identified in a manuscript from 1762 that was found in the Bursa city library. Western sources first mention *bağlama* in Blainville's book in 1767, and its first depiction was as a small, short-necked *saz* along with *tambura* and *çöğür* in French author De Laborde's *Essai sur la musique* in 1780 (Kurt, 2016, p. 49).

The term *bağlama* was frequently used in the folk literature and *türkü*s (folk songs)

> "*Bağlama*m var üçtelli imanım
> Aman borcum var beşyüzelli"[23](*Türkü* from Muğla)
> "*Bağlama*m perde perde
> Düşürdün beni derde[24] (*Türkü* from Giresun)
> "Alıverin *bağlama*mı oymadan
> Gidiyorum ben sılama doymadan"[25](*Türkü* from Kırşehir)

There are varying opinions on the emergence of the term *bağlama* in reference to *saz*. One of these views suggests that the term *bağlama* may have originated with the attachment of frets, called *bağ* (tie) on the *bağlama*'s previously fretless neck (Parlak, 2000, p. 59). Another view argues that closing (tying) the body of the *saz* with wood instead of leather may have given birth to this name (Parlak, 2000, p. 59). However, the fact that the idea of frets is relatively recent, that other fretted *saz*s are not called *bağlama*s, and that other *saz*s with wood enclosed bodies are not called *bağlama*s casts doubt upon these claims. Another recent opinion is that the *deste bağlama* tradition of the Alevi-Bektaşi music culture may be the origin of the term *bağlama* (Kurt, 2016). However, this argument is weakened by the fact that the term was also used by communities, who were not Alevis like Yörük (Nomad) Türkmen communities who had only limited contact and cultural interaction with other communities. In conclusion, while its exact origin is uncertain, the term *bağlama* was adopted by the common people, and began to be used as a secondary term in addition to the term *saz*.

---

[23] (In English)I have a *bağlama* with three strings, my friend
Oh but I'm in debt, five hundred and fifty

[24] (In English)Frets are many on my *bağlama*
You drove me to trouble

[25] (In English)Take my carved *bağlama*
I'm going still thirsty for my home

Today, the term *bağlama* is frequently used for pear body shaped, *tanbura*-type instruments in urban language, academic circles and state choirs, while the term *saz* is more common in colloquial language.

Additionally, the term *saz* is also used for "instrument," in order to refer to all instruments in modern Turkish. The term *saz* was adopted in the cultural environment of the court and its surroundings to refer to all instruments, and the semantic scope of the word expanded through new terms such as *sâzende* (instrument player), *saz semaisi* (a musical genre), *saz eseri* (*saz* piece), *saz takımı* (*saz* band), *incesaz* (low-volume, private musical event), *kabasaz* (high-volume, outdoor/public musical event). However these terms were not known, nor adopted by the people of Anatolia. Moreover, "In the demotic (colloquial) axis, the term *saz* was never used for any other instrument (for example reed pipe or piano)" (Ersoy, 2007, p.6).

Thus, for the Anatolian people, *saz* means *bağlama*. This is why the term *saz* is used in this study along with the term *bağlama*, and as a primary term.

Today, many people from many ethnic origins such as the Turk, Kurd, Armenian, Arab, Greek, Georgian, Circassian, and Laz people, who maintain their different musical cultures play *saz*. While the musical traditions of the Laz, Arab, Circassian and Shafi Kurd peoples do not employ the *saz*, the instrument is known, listened to, liked and even played in these communities (Duygulu, 1998).

The most powerful *saz* traditions in Anatolia include "Anatolian Alevi-Bektaşi Âşık-Zakir" tradition, "Northern Anatolian Âşık tradition", "Central Anatolian Abdals' and others' player-singer tradition", "Aegean-Southwestern Anatolian Yörük Türkmen Tradition" (Parlak, Personal Communication, 2017).

"The Alevis are heterodox, Shi'a-related communities found in Central and Eastern Anatolia as well as in Thrace and the Aegean regions" (Markoff, 1990, p.143). *Saz* is played as an instrument of worship in the Alevis' religious meetings called *cem*, their dance rituals called *semah* and their mystical *türkü*s. The *saz* is considered holy because it carries the "holy words" of these *türkü*s (Benli, Y., 2016). Almost all terms related to the *saz* were associated with a religious essence and became symbols. The name "stringed Qur'an" that is used for the *saz* is the most famous example of this (Koçak, H, 2003).

Saz also has a very important function in the Âşık tradition. Şenel explains the relationship between *âşık*s and music:

> "While mastery of an instrument was considered a feature of the power of the *âşık*'s art, it was not a characteristic of all *âşık*s and was not the sole factor in demonstrating the value of the âşık. *Âşık*s actually used their instruments as a medium of inspiration in order to prepare their their *deyiş*s in their minds, and to ornament their words with melodies from the instrument. The instrument is both a source of inspiration, and an accessory that imparts/defines an identity for the âşıks. The task of keeping the audience busy while the *aşık*s prepare their *deyiş*s in their minds belonged (for the most part) to the instrument. (Şenel, 2009, p. 74)

In relation to all these traditions, the *saz* that was used in Anatolia underwent some changes through time. Traditionally, the hair-, sinew- or silk-stringed *saz* was played without a pick (Parlak, 2000, p. 221).

The greatest change of style that the Anatolian musical culture underwent was in the playing style of *saz*, after metallic strings began to be used. Parlak explains that the idea of playing the instrument with a pick emerged in 17th century Ottoman musical tradition, and dominated the Ottoman *fasıl* culture in the 18th century only after metallic strings began to be used, and that the pick was adopted in the Anatolian music and regional culture much later:

> The Anatolian peasantry who went through hard times and became poorer due to wars, only had the chance to obtain and use metallic strings after the Republican Era, near the mid-20th Century. While this material was easily obtained by the urban population, didn't reach rural areas until much later, and it took much time to be widely adapted. Additionally, the adoption of the pick by the Anatolian people, who are strictly bound in tradition and are reluctant to let it go, also took time and was not easy. The first reflections of this phenomenon, which emerged in the Ottoman court and its surroundings, were observed in certain hubs in nearby cities that were popular regions for the Ottomans. Thus, it emerged the approach of playing the *bağlama* (that was only played with fingers for thousands of years) by systematically striking the strings with a pick/plectrum. (Parlak, 2016, p. 220)

Mass adoption of picking methods for the *bağlama* actually happened only through the cultural policies that emerged after the Republic of Turkey was instituted, and mass-communication tools were used in accordance. These policies were the fruits of ideas that sprouted during the fall of the Ottoman Empire, and they changed not only the playing style of the *saz*, but also its morphological structure, timbre, fretting system and ultimately its music. In this period, the use of pickless playing techniques, including the *Parmak vurma* Technique (PVT) declined to the point where they were almost completely forgotten.

The current of nationalism that emerged after the French Revolution deeply influenced the Ottoman State, and caused its constituent elements to declare their independences and their secessions. The Turkism ideology that developed in response ideologically influenced the founding elements of the Republic of Turkey. Okan Murat Öztürk examined the modernization process in the Republican Era and its influences on folk music based on various sources, explains the influence of Ziya Gökalp, one of the foremost ideologists of Turkism, on the formation of national music in the Republican Era as follows:

> One of the ideologists who deeply influenced the founding cadre of the Republic was, doubtless, Ziya Gökalp. As he stated in his book *Türkçülüğün Esasları* (Principles of Turkism) he emphasizes the difference between "culture" and "civilization." According to Gökalp, Turkish state with a national character will be possible through the "marriage" of Turkish culture and Western civilization. Gökalp goes even further by predicting that "national music" can be created by compiling folk *türkü*s and harmonizing them with the Western methods. Gökalp's formula probably deeply influenced Mustafa Kemal, since he stated almost the same formula in 1934: *"We need a new music, and this will be a polyphonic music that is rooted in folk music."* Indeed, shortly after the republic was established, one of the high-priority projects of the new state was the ideal of "the creation of a national music" through the compilation of folk music. (Öztürk, 2005)

The idea of modernizing the Turkish Music actually emerged with the modernization movement that began in the *Tanzimat* (Reform) Era. This period saw efforts to modernize especially the court music and military music through polyphonization, but folk music, which was not part of the urban culture, was not really affected. In contrast, the founding ideology of the Republic was the idea that cultural modernization had to be based on "folk culture." According to Öztürk (2005), the issue of folk music was the cement of the Turkish identity and nation that the Republican ideology was trying to create by purifying it from its Ottoman identity.

"Radio" had an important role in modernization and the implementation of the Republican interpretation, and began broadcasting in 1927. However, due to the lack of sufficient staff and data in terms of folk music, folk music only began having significant air-time after 1938 (Koç, 2016).

The first target in building the "Modern Turkish Music" in the republican era was to collect musical products through the compilation of folk music (which was termed "national music") and convert them polyphonic musical products. Thus began the rapid work of compiling folk music melodies. Under the direction of Yusuf Ziya Demircioğlu, Darûlalehan organized four compilation trips between 1925 and 1929. The folk music that was compiled in these trips was considered a sub-category of *makam* (modal) music, and was described in makam-music terminology (Öztürk, 2002). All these products that were compiled from various regions and cultural traditions of Anatolia were included in the "Turkish Folk Music" category, and the first terminologies of the ideological approach to the subject were established in the scope of this concept (Parlak, 2016, p.212).

Ankara State Conservatory accelerated the compilation studies in 1937, and invited Paul Hindemith and Bela Bartok to Turkey to guide these studies. Following 17 years in the Ankara State Conservatory[26], compilation studies continued in institutions such as the Turkish Radio and Television Institution, Music Division of the National Library[27], and the Ministry of Culture's Folk Culture Research and Development General Directorate (HAGEM)[28], which resulted in a significant amount of data on folk music (Tan, 2003, pp. 53-55).

Folk music met radio broadcasting in the explained radio programs broadcast by Sadi Yaver Ataman in 1938. Folk music gained importance through the works of the Turkish classical Music group under the direction of Mesut Cemil until 1940. However, musician groups were separated a while later, based on the idea that the simultaneous execution of these two types of music was improper. The radio programs "Biz Türkü Öğreniyoruz" (We Are Learning *Türkü*s) and "Yurttan Sesler" (Sounds from the Homeland) were left to the folk music group. The musical ensemble that carried out these works was called "Yurttan Sesler Korosu" (Choir of Sounds from the Homeland) (Parlak, 2016, p. 213).

---

[26] Compilation studies were conducted between 1937 and 1953.
[27] Between 1957 and 1968, *türkü*s were blended with other elements of folk culture (tales, stories, riddles).
[28] This institution was established under the name "National Folklore Institute" in 1966, then renamed to National Folklore Research Office (MİFAD) and finally to HAGEM.

Most *saz* players in the "Yurttan Sesler Korosu," which worked along with the Turkish Classical Music choir during its first years, were city-born, and used picks while playing. Just like the *tanbur*, the main tuning system of *tanbura* (the form of *saz* that was played on a single string (lowest string), and that was adopted in urban music), called "Bozuk Düzen" was adopted as the common system in these works (Ersoy, 2014), and was even used for the performance of works that were originally played in other tuning systems in Anatolia. The only instrument that accompanied the performances of "Yurttan Sesler Korosu" was the *saz* for many years. The instruments of the band that were tuned to the *saz* tuning system called "bozuk düzen" or "kara düzen" were influential to transfer "bozuk düzen" outside the radio (Alpyıldız, 2012, p. 88-89). In conclusion, the musical preferences of state institutions directly influenced the preferences of the public.

In this period when musical concepts such as notation and ensemble performance, and the essence of folk music were only beginning to be understood, this ensemble consisted of performers who carried out the already rapid compilation studies, and who had different performance styles tried to understand many local *tavır*s[29] that would normally take decades to understand, in a very short period of time. At the end of this period, a standard *türkü* interpretation called "Radyo Ağzı" (Radio Dialect), which was relatively distant to the original forms of *türkü*s, emerged in the radio environment (Parlak, 2016, p. 214).

Still in this period, *saz* continued to change more rapidly due to the increase in number of luthiers influenced by the radio first in Ankara, then in Istanbul. This change occurred due to the requests of radio performers, who actually performed ensemble music, in addition to local artists. The first of the developments and modifications of *saz* was the standardization of the dimensions and structural characteristics of the differing dimensions and structures of *saz* in various regions. The *saz*, which was shaped in a small structural form in the nomad rural culture throughout its history, began to grow in size in cities (Parlak, 2016, p. 215).

Parlak (2016) states that the necks of the *saz*s used by the first radio performers was the size of today's "short necked *bağlama*," and that the *saz*'s neck got longer after a certain period, and adds:

---

[29] tavır : Musical practice. This term is generally used to explain local musical characteristics

> The first attempt to meet the requirements that emerged due to the melodies that were accumulated in Yurttan Sesler, and the phenomenon of transposition that was necessary for the solists' performance was adding frets to the body of short-necked *saz*s, however factors such as difficulty of playing, etc. precluded the usefulness of this approach and resulted in elongating the neck. As a result, the neck was elongated in a manner that will provide the D note in the highest fret of first string. (assuming the open first string is A). (Parlak, 2016, p.)

Different sizes of *saz* were played together in order to achieve different timbres in the band. Thus, a "*saz* family" that is suitable for picking emerged[30]. Moreover, the required volume for the performance of *saz* caused the number of strings on pick-played *saz*s to increase[31]. The first addition to the metal strings was the string called "yellow string," followed by *sırma tel* (silk wounded strings). Additionally, the number of frets of these *saz*s that were used in the ensemble that tried to melt all melodies from all regions in a single pot using the available orchestral abilities also increased in time based on requirements[32]. The usage of the *saz* family in the ensemble can be described as "monophonic texture" in terms of musical texture.

As a result of these modifications, the timbre and sound system, which are among the most important factors that determine the character of traditional music, also changed. Especially when luthiers started to manufacture *saz*s that are suitable for picking with no regard to pickless playing caused the public to adopt picking techniques in time.

The fact that the pick became a "cult" in official circles reduced the concept of *tavır* that emphasizes local musical characteristics to the concept of "picking patterns." The following statement underlines the fact that some picking patterns came to be associated with styles, and even regions:

> Calling a picking pattern "Konya tavrı,""Kayseri tavrı,""Yozgat tavrı,""Zeybek tavrı,""Trakya tavrı," etc. an "tavır," and especially calling a picking style "Yozgat tezenesi[33],""Karadeniz tezenesi,""Azeri tezenesi," etc. is not common among the public, and are mostly terms that are invented by mostly urban artists who learned about folk music on radio. However the fact that this picking perception and musical approach were adopted in a large structure such as Yurttan Sesler without thoroughly investigating their origins, localities, and regional validities are the main reasons of the radio performance and perception in which heavy balances are felt, but the

[30] For detailed information, see: Chapter 2.1.3
[31] For detailed information, see: Chapter 2.1.4
[32] For detailed information, see: Chapter 2.1.5
[33] Picking style of Yozgat

> nuances of the melody are almost completely lost due to time conflicts in the crowded ensemble. (Parlak, 2016, p. 222)

These choices made by the Yurttan Sesler choir were the first steps in standardization. Later, other choirs that were established based on this choir's influence[34], and Turkish Music conservatories were also influenced by these choices. At the end of this process, artists who played "short-necked *saz*," who frequently used the "pickless playing style" and "*bağlama düzeni*," and who were in touch with the radio converted to "pick-playing style,""long-necked *saz*," and "bozuk düzen" (Erol Parlak, personal communication, 2017)

In addition to state institutions, the *saz* found adoption in the album-based musical industry that was based on supply-demand, and was called "market music" ("phonograph record,""45 rpm disc,""long play,""tape," and later "cd"). The accompaniments of türkü performances in the scene were first performed with Turkish classical Music instruments called *incesaz* by urban musicians, but later came to be performed by folk music ensembles established by the *saz* artists who worked in the radio's Yurttan Sesler choir as "market music." However, the requirements of music changed in time and masters of Anatolia who were the sources of this music took their places in the industry, "radio" began to lose its influence in the "market music." Thus a new segregation emerged between the "radio" and the "market music," and musicians split to two mutually disliking groups called "market musicians" and "radio musicians" (Parlak, 2016).

Some folk artists found the opportunity to embark on solo careers in the emerging market conditions. While Âşık Veysel, who was the first example of this phenomenon since the first years of the republic, influenced the public with his strong poetry, he had no major influence on the use of *saz*, apart from ensuring the recognition of *bağlama düzeni*. Bayram Aracı (1920-Ankara), Âşık Davut Sulari (1925-Tercan), Âşık Mahsuni Şerif (1939-Afşin), Neşet Ertaş (1938-Kırşehir), Murat Çobanoğlu

[34] Choirs in Yurdun Sesi choirs of Izmir Radio in 1953 and Istanbul Radio in 1954, "Doğudan Sesler" (Sounds from the East) of Erzurum Radio in 1961, "Radyo Sanatçıları Konseri (Radio Artists Concert),""Bir Dilden Bir Telden (One from the Tongue, One from the String),""Türkü Türkü Türkiyem (Turkey with Türküs),""Türkü Sevdası (Love of Türkü),""Türk Halk Müziği Çalgıları Orkestrası (Turkish Folk Music Instruments Orchestra),""Dem Bu Dem,""Bergüzar,""Bir Türküdür Yaşamak (Life is a Türkü)," etc. were based on the characteristis of the "Yurttan Sesler" choir (Alpyıldız, 2012).

(1940/Kars), Talip Özkan (1939- Acıpayam), Özay Gönlüm (1940-Denizli), Arif Sağ (1945/Erzurum), Musa Eroğlu (1946/Mut) can be listed among local artists from various traditions in Anatolia, who learned about âşıks and music from regional sources and became professionals in the city later in life, and who published records in line with the solo playing/singing tradition in Anatolia and reached the public.

Saz also had an important role in the *arabesk* genre, which arose from "market music."*Arabesk* took its nourishment from Turkish music, but also imitated contemporary popular Arabic music and world music genres such as Flamenco, thus incorporating almost any instrument. *Arabesk* music gave rise to a new performance style where *saz* performance diverged from traditional performance styles, and where techniques from *buzuk*, *bouzouki*, *Spanish guitar*, and later even *sitar* were adapted to picking styles. The *electric saz* was an instrument inspired by the *electric guitar*, "invented" by mounting pickups to the *saz*. It was used in the "Anatolian Rock" genre, but was quickly adopted by *arabesk* musicians due to its ability to adapt to different performances, and by wedding musicians of Anatolia due to its high volume. The timbre, volume level, playing style and shape of this instrument was not similar to *saz*, and was not generally adopted by traditional folk music performers.

By the 1980s, developments such as the polarization and congregationism in the society directly affected folk music and *saz* performances. The Alevi-Bektaşi culture that existed in an introverted, closed form for a long time began to turn outwards with the new socio-political attitude. In parallel, the musical tradition of this structure, which is one of its most special tools of expression, came to be heard in Turkey with its qualities. A period that was termed "*deyiş furyası (deyiş* rush)" in the music market began (Parlak, 2016, p. 227). Especially artists from the Alevi-Bektaşi musical culture diverged from the general *saz* performance style of the day (which was based on the *bozuk düzen*[35]), and veered through the traditional Alevi-Bektaşi music that was performed in the *bağlama düzeni*[36].

Arif Sağ's efforts and guidance allowed the "short-necked" form of *saz* that is suitable for playing in the *bağlama düzeni* reemerged in the musical history scene, and was rapidly adopted by the Alevi-Bektaşi music performers. This development was later

[35] A tuning system. For detailed information, see: Chapter 2.1.6
[36] A tuning system. For detailed information, see: Chapter 2.1.6

considered important by some (Erol Parlak[37] and Emre Saltık[38]), while others considered it a "short-neck trauma" (Öztürk, 2000) or an outright negative development (Orhan Dağlı[39]). While the new *saz* was called with the name "çöğür," one of the members of the *saz* family, this baseless approach did not see widespread use[40].

"Muhabbet," etc. albums that started with Arif Sağ and Musa Eroğlu, and later continued with Muhlis Akarsu and Yavuz Top, are the products of this period. Even today, similar albums are produced although the performance and arrangement structures vary according to the day's conditions.

When we examine "Turkey's traditional musical culture panorama" in the 80s, we observe that the pickless playing style of *saz* was entirely forgotten except the Alevi-Bektaşi music of rural areas in the East, and the Yörük-Türkmen music of Yörük communities in South-western Anatolia; and that a false belief that the "real" playing technique for *saz* is the picking technique that developed in the cities. The inclusion of *saz* in the *Arabesk* movement that was popularized in these years, and the widespread use of electric *saz*, caused "non-traditional" modifications to *saz* picking techniques. Pickless playing techniques that are performed on traditional, small *saz* forms in rural areas reflected on the large *saz* form used in urban music in such a musical environment, and during a long process from the 1970s to today. This process is directly relevant to our subject, and will be examined in detail in Chapter 2.2.2.

In conclusion, today there are many different approaches to playing *saz*. While segregating terms[41] and approaches such as "radioist," "marketist," "long-neckist," "short-neckist," "pickist," "tappist," "arabeskist," "electricist," "deyişist" and "bozlakist" that were historically used are partly still in use among *saz* performers, another approach that considers all these approaches valuable (unless they further

---

[37] From Yanık's(1998) Personal Communication
[38] From Yanık's(1998) Personal Communication
[39] From Yanık's(1998) Personal Communication
[40] Learning method books that were published for short-necked *bağlama* and the *bağlama* order were insistently called "çöğür" methods for a period.
[41] All these terms are defined as such because they are considered to have a contrasting concept. For example the term "long-neckist," is generally used by performers who prefer the short-necked *saz*. While this term describes a performer who prefers the long-neck in his/her performances, it also carries, as a sub-text, the indication of a performer who does not play short-necked *saz*, who ignores short-necked *saz*, or who considers it secondary. The polarizations inherent in these definitions are "radioist - marketist,""long-neckist - short-neckist,""pickist –non-pickist,""türküist - arabeskist,""non-electricists - electricists,""non-deyişists - deyişists," and "non-bozlakists - bozlakists."

corrupt the main culture) is gaining traction, particularly among musicians who perform music in terms of "Artistic Folk Music."

2.1.2 Playing styles

There are two different *saz* performance styles: pick playing style, and pickless playing style. As we discussed in the previous chapter, it is believed that the main playing style of the *saz* is pickless, and that pick playing style began after the adoption of metallic strings (Parlak, 2000).

Pickless playing style of the *saz*, which constitute the basic *saz* technique since the beginning, consists of 3 sub-techniques; namely *pençe*[42] *technique* (PT), *tel çekme*[43] *technique* (TÇT) and *parmak vurma*[44] *technique* (PVT).

All the strings of the *saz* are strummed in the PT, and this technique also consists of various strumming techniques. This technique is called *pençe* or *şelpe* in Eastern Anatolia, while in Western Anatolia (in Teke region) it has no special name. The term *pençe* signifies the hand, and is a word of Persian[45] origin that means "fivesome." Most *saz*-like instruments in Central Asia and Iran are played with this technique. According to Parlak (2000, p. 110), the term *şelpe* term may originate with the Central Asian Turkic *çertme*, which signifies the same action.

The typical position for PT on the *saz* is the position in which the right hand is over the joint area where the neck and the body come together. When the PT is applied after or along with PVT, the right hand is positioned over the fretboard (Fig. 2.2.).

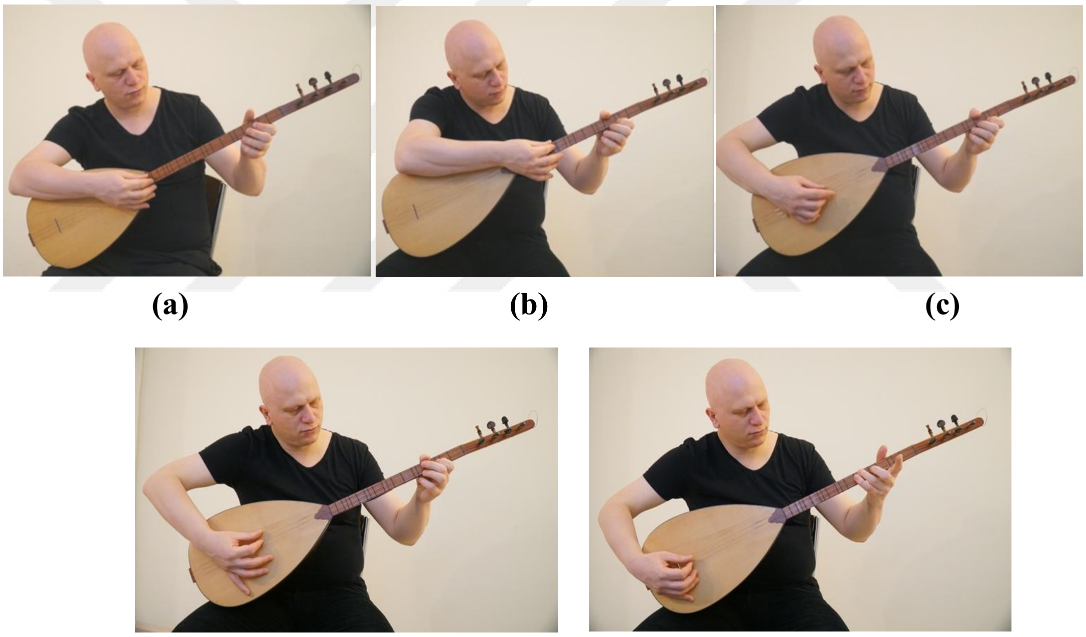
(a) **(b)**

Figure 2.2 : Postures of PT : (a) Typical posture. (b) On fretboard.

[42] Pençe : Claw (In English), *Pençe* technique contains various strumming techniques.
[43] *Tel çekme* can be translated as *string pulling* and it signifies plucking of strings with fingers.
[44] *Parmak vurma* can be translated as *finger tapping.* It signifies two hand tapping technique.
[45] Penç : Five (In Persian)

The *tel çekme* technique is also one of the widespread *saz* playing techniques. Sounds are usually generated by plucking the strings with the finger of the right hand in TÇT (Parlak, 2000, p. 172). Only the inner faces of the right hand fingers are used to produce sound. This feature separates it from the PT (Sağ and Erzincan, 2009, p. 179). Additionally, in contrast to PT, sounds are not produced by strumming all the strings but by plucking only one or two strings with right hand fingers. There are differences in the performance of TÇT between the Eastern regions and the Teke region, and it is sometimes used in conjunction with the PT.

The TÇT is usually applied on the joint area of the neck and the body, although it can also be applied with the right hand over the neck, in the middle of the body, on the bridge while muting the strings, or on the backside of the bridge with the fingers right over the bridge in order to ease or guide the performance (Fig. 2.3.).



(a) (b) (c)

(d) (e)

Figure 2.3 : Postures of TÇT: (a) Typical posture. (b) On fretboard (c)On middle position. (d) On bridge (for muted notes). (e) Backside of bridge.

PVT, which is the main subject of this study, is executed with both the right hand (RH) and the left hand (LH) is over the neck (Fig. 2.4.).

Although the use of pickless playing techniques, which were almost extinct before the 1980s, and entered a period of "rediscovery" in the 1990s, increased in our day, pick playing technique is still the dominant playing style.

Figure 2.4 : Typical posture of PVT.

The picking technique involves a plectrum that is called *mızrap* or *tezene* in Anatolia, which is held in the right hand (Fig. 2.5.).

Figure 2.5 : Mızrap or tezene (pick or plectrum of *saz*).

Mızrap is a word of Arabic origin, from the root *darp* (Picken, 1975). *Tezene* is a Turkish word, and is also colloquially called *tazane, tarzene, teyzine, tazane*, etc. Pick-playing technique had its golden age in the 20th Century, and was developed by many performers in the era to reach its current form. Although it varies according to personal preferences or the desired timbre, in pick-playing the pick is held approximately in the middle of the body (Fig. 2.6.).

Figure 2.6 : Typical posture of pick-playing technique.

2.1.3 *Saz* family

While the term "*saz* family" signifies instruments that are shaped like the *saz*, this term was not known in the *saz* tradition of Anatolia (Duygulu, 2014, p. 67), and only emerged with the "Yurttan Sesler" tradition, to be adopted by professionals. Today, however, this term is being used to encompass all *saz*s, especially in Anatolia, after *saz*s from different musical cultures of Anatolia began to be used in professional performances on stage or in the studio.

It is possible to encounter the members of the *saz* family in Anatolia's various musical cultures under various names. While there are *saz*s that are named after their number of strings, dimensions and tuning systems, some *saz*s have unique names.

One of the important factors in naming *saz*s is the number of strings. According to the tradition called "Asian-Anatolian common nomenclature tradition" by Parlak (2000), these *saz*s are named *ikitelli* (two-stringed), *üçtelli* (three-stringed), *dörttelli* (four-stringed), etc. in the Yörük-Türkmen culture of Teke region (Parlak, 2000, p. 114-116). Following the adoption of pick-playing, some artists named their *saz*s *altıtelli* (six-stringed), *yeditelli* (seven-stringed), *dokuztelli* (nine-stringed), *ontelli* (ten-stringed), and *onikitelli* (twelve-stringed) (Picken, 1975, p. 210).

*Saz*s are named *cura*, *cura bağlama* (Picken, 1975, p. 277), *baz* (Parlak, 2000, p. 131), *baz-bağlama* (Picken, 1975, p. 277), *divan curası* (Picken, 1975), *divan sazı*, *meydan sazı* (Picken, 1975, p. 275), etc. according to their dimensions. The term *cura* means "small", and is used to identify small-sized *saz*s, and other instruments such as the *zurna* (clarion), in reference to their sizes. The term *baz* is used to identify large *saz*s.

Another naming convention is based on the material from which the *saz* is made. According to Picken, while the *saz*s are not specifically named according to the wood species from which they are constructed, *saz*s made from gourd are called *kabaksazı*[46], and those made from tortoise shells are called *bağa*[47] *sazı* (Picken, 1975, p. 206). In Eastern Anatolian Alevi-Bektaşi communities, some *saz*s are called *dede sazı* or *âşık sazı* [48] since they are played by Alevi dedes or âşıks (Parlak, 2000, p. 128). These *saz*s

[46] Kabak : gourd (EN). This is a *saz* made of gourd, which is usually played by kids, but that also has adult versions.
[47] Kaplumbağa : Turtle (EN). *bağa* is a local term used for turtle.
[48] In Azerbaijan, there is a *saz* called *aşık sazı*, which is usually played by aşıks while standing up. These *saz*s differ from each other in every way.

are also known as *ruzba* (Parlak, 2000, p.128), *ırızva* (Picken, 1975, p.277; Parlak, 2000, p.128), *ruzva* (Parlak, 2000, p.128), *ravza* (Parlak, 2000, p.128) and in some regions are called *bulgari* (Parlak, 2000, p.133), *boulghary* (Picken, 1975, p.276), *bulgarı* (Picken, 1975, p.277), *karadüzen* (Picken, 1975, p. 230) (Parlak, 2000, p.128). Some of these *saz*s have a body shaped like an axe and are called *baltasaz*[49] (Parlak, 2000, p. 123), while there is no special name for *saz*s with pear-shaped bodies. Parlak (2000) states that especially Alevi dedes[50] from Malatya (Arguvan), and Kahramanmaraş (Elbistan) had *saz*s with axe-shaped bodies (p. 132).

Additionally, the names *çöğür*[51], *bozuk*[52], and *tanbura*[53] that were used in the Ottoman areas before the terms *saz* and *bağlama* also live on in some Anatolian *saz*s. This is the *saz* family that lives among the Anatolian people.

As an extension of the desire of "playing ensemble music" of the choirs that were established after the Republic (such as "Yurttan Sesler"), the *saz* family was reconsidered, and a size-based standardization was sought. Cafer Açın (1998), one of the prominent luthiers in Turkey, sheds light on the issue in his article "Chaos in our Tanbur and Music"

> At the end of 1953, Muzaffer Sarısözen came to me and said that he had important problems. When I inquired about his problems, he said: "We have three *bağlama* artists in Radio Ankara, Ahmet Gazi Ayhan, Sarı Recep and Mucip Arcuman. All three of them have very different *saz*s, in terms of structure, dimensions, fretting... They can't come together to play a song decently. Even if they do, it doesn't sound good, they can't play harmoniously. We want to join many instruments in order to establish a large band called Yurttan Sesler Ensemble. Only you can help us in this." I told him that this is a national duty for me, and that it would be a pleasure for me. This made him very happy. I proceeded to make a list of what he wanted. I took the fretting system that they wanted to use in Turkish Folk Music, calculated the fret intervals of *saz*s from the *bağlama* family, and determined their places and their frequencies. I determined the standard dimensions of *saz*s from the *bağlama* family, by obtaining the views and opinions of master *saz* artists of the period. I prepared projects for *saz*s such as *meydan sazı*, *divan sazı*, *bağlama*, *tanbura*, *bağlama curası*, *tanbura curası*, etc. that can be played together, based on the dimensions that I determined, and sent the projects to luthiers all around

[49] Balta : Axe (EN)
[50] Socio-religous leaders of Alevi tribes.
[51] It is variously pronounced as çövür, çogur, kövür, çağur, etc.
[52] It is variously pronounced as bozuk, bozok, etc.
[53] It is variously pronounced as tanbur, tanbour çarky, dandıra, damdıra, etc.

> the country. This ensured that the standards were immediately adopted all around the country. (As cited in Erdemir, 2013)

The members of the *saz* family, which are all long-necked, and for which Cafer Açın determined the standards, were named after *saz*-like instruments that already existed in Anatolia. This usage was first adopted in the radio, then in the conservatories influenced by the radio. However this theoretical standardization did not exactly fit the practice due to the accompaniment approach that later developed based on the voice timbre of vocalists (Parlak, 2016).

In later periods, performers made additions/modifications to the *saz* based on their requirements and gave birth to new *saz* types. While some of these *saz*s were only used personally, others became popular and socially adopted. One of the most important examples of these popular *saz*s is the form of *saz* to which electro-magnetic pickups were mounted, called *electrosaz*, which was adopted in popular music. By the 1980s, the short-necked *saz* form that emerged when the neck size of the *saz* approached the old *saz*s in order to perform in the *bağlama düzeni*, is another *saz* form that was rapidly adopted by the public. Today, the *bağlama düzeni* is usually performed on short-necked *saz*s.

The idea of using more than three rows of strings on the *saz* is a very new development. This development picked the interest of artists who perform "*electrosaz* pick-playing techniques," or "pickless *saz* playing techniques," and separately developed in both groups, leading to the emergence of *saz*s with different qualities. Regarding the electro*saz*, the first development was the emergence of 4- or 5-stringed *saz*s in order to be able to use sounds with lower pitches in the melody. 4-stringed *saz*s that developed in the pickless playing technique mostly developed towards harmonic use. A "*guitar*-like" *saz* that was made by Erkan Oğur with six strings (*Oğur Sazı*) gained widespread use today, particularly among the artist's followers. Versions of these *saz*s with eight, ten, etc. rows of strings also are in use.

Another recent development in *saz* is the emergence of instruments that are built by joining two or more *saz*s. The inventor of these *saz*s that offer great advantages, especially in stage performances, is unknown. Picken (1975) mentioned such a *saz* that he encountered near Seyhan, Adana, in his book and called it *çiftsaz* (double *saz*). The recognition of these kinds of *saz*s increased with Özay Gönlüm's *yâren*, which joins the three "main members of the *saz* family": *bağlama, tanbura* and *bağlama curası*.

2.1.4 Strings

Various string materials were used before the adoption of metallic strings for the *saz*. The primary material was horse hair. Ögel, who consulted various historical sources from Anatolia, indicates that hair was used in *kopuz*s in 14th, 15th and 16th centuries (As cited in Eroğlu S.C., 2011).

The second most important string material after horse hair was animal gut. These strings were obtained by processing the guts of various animals such as squirrels, sheep, wolves and donkeys, and were too delicate to be played with picks. Signs of strings made from guts are also observed in Yunus Emre's poetry:

> "Ey kopuz ile çeşte, aslın nedür bu işde.
> Eyüdür aslımdır ağaç, koyun kirişi birkaç"[54] (From Yunus Emre).

Another material used before metal was silk. Silk arrived to Anatolia on the Silk Road, and was a prized material used in Ottoman court instruments such as the *rebab* (Soydaş, 2007, p. 57), and the *çeng* (Soydaş, 2007, p. 78) with the name *ibrişim*. *İbrişim* strings were used in conjunction with brass strings in *ruhefza* (Soydaş, 2007, p.9) and *tanbur* (Soydaş, 2007, p.19), however there is no information about their use in the *kopuz* and other instruments. Bardakçı suggests that this well-known material of the period must have been also used with the *kopuz* (Bardakçı, 1986, p. 104). The silken strings are observed in the Ozbek and Uyghur dutars (Central Asian *saz* derivatives) even today. Verkov's statement that "silk strings were used in Türkmen *dutar*s until 1928," concerning the Türkmen *dutar* that uses metallic strings today is important (As cited in Eroğlu S.C., 2011, p. 32).

The use of metallic strings on the *saz* was revolutionary, and changed not only the timbre of the *saz*, but also its playing style. The initial preferences for metallic strings were brass and copper strings, but these relatively weak strings were replaced by steel strings. Copper strings are still used in the *tenbur*, a widely played Iranian *saz*.

Parlak (2000) suggested that the metallic strings were first used in Anatolia, based on the level of development of structural forms and playing styles. "We think that the *parmak vurma technique* that emerged due to the easy and sustained sound of the metallic string, and that is only observed in South-western Anatolia is not seen in Asia

[54] (In English) O *kopuz* and *çeşte*, what is your truth in this?
Fine, my truth is wood, and some sheep gut

may provide evidence that metallic strings were first adopted in Anatolia" (Parlak, 2000, p.63).

The adaptation of metallic strings to *saz* caused the emergence of the concept of "pick," in the tradition of *saz* that was only played with fingers for centuries. While the approach of three rows of strings that was used in Anatolia for a long time still lives on in pickles played *saz*s, multiple strings began to be used for each row after the pick was adopted. These methods were applied to increase the volume of the *saz*'s sound, beginning with 2 strings for each row, then *saz*s with 3 (9 stringed *saz*), even 4 (12 stringed *saz*) strings to a row, or *saz*s with different string combinations appeared. These practices were later abandoned since they made performance more difficult, and the number of strings was decreased (Parlak, 2000, p. 216).

Metallic strings used in *saz*s that were played in post-Republic radio choirs were called *beyaz tel* (white string), *sarı tel* (yellow string), *cim teli* (*cim* string), etc. based on the material used (Akıncı, 2014). *Beyaz tel*s were made of steel, while *sarı tel*s were made of a copper-tin ally (brass). *Cim teli* was the name given to 0.15 gauge thin strings that are strung to the middle row along with the *sarı tel*. The *sarı tel* was tuned one octave below this string. The use of these strings that were not resistant against pick strikes and that were easily affected by temperature changes was abandoned in time.

Another important change in the *saz*'s timbre occurred with the adoption of strings called "*bam* string" instead of yellow strings. *Bam* string is produced by winding gilded wire over steel strings. Some string makers also added silk strings to the steel string, and obtained the *bam* string by winding lower gauge steel string or gilded string (called *sırma*) over both. The gauges of all three materials are very important. The gauge of the winding wire varies according to the gauge of steel and silk that is used for various gauges of *bam* strings (Akıncı, 2014, p.17). Some *bam* strings are as thick as 1 mm. These strings are also called *bambam* and are usually used in *saz*s with large bodies, such as the divan *saz*.

The *bam* string is usually preferred in the string raw that is responsible for the *dem* (drone) function. Having the *dem* sound in the lowest part is a requirement, especially for *zurna* performers of Anatolia. For example, the performance of a melody without the *dem* sound, which is considered the reference point, causes a feeling of "something missing" according to *zurna* players who play *zeybek* (Öztürk, 2006, 196). We think that the reason for the adoption of the use of the *bam* string is that it is better at providing the feeling of *dem* of the makam-based Anatolian music.

While different numbers of strings are attached to pick-played *saz*s that have three rows of strings based on the performer's preferences, there is a general tendency towards using 7 (3+2+2), and in some cases 6 (2+2+2) strings.

String preferences for finger-strummed *saz*s developed differently. *Bam* strings were not used for *saz*s that are used with hand-playing techniques such as *ikitelli*, *ruzba*, *dede sazı*, etc. While seven-stringed *saz*s featuring both *bam* and steel strings were used with hand-playing techniques following their adoption in cities, this was later abandoned[55]. Generally 3 steel-stringed (1+1+1) or 3 *bam*-stringed (1+1+1) *saz*s are used today with pickless playing techniques. 4 (2+1+1) or 6 (2+2+2) strings are also observed with steel strings, according to the performer's preferences.

Saz players generally use strings that are (or claimed to be) manufactured specifically for the *saz* in their instruments. Some performers may prefer strings that are designed for instruments such as the *electric guitar*, *acoustic guitar*, etc. in special circumstances. *Basssaz (Bass bağlama)*, a recent addition to the *saz* family, generally uses strings manufactured for the *bass guitar*, *cello* or *upright bass.*

2.1.5 Fretting systems

Various researchers and observers remarked on various numbers of frets on the fretboards of *saz*s from various musical cultures around Anatolia such as six (Parlak, 2000; Picken, 1975), seven (Parlak, 2000), nine (Gazimihal, 1975), ten (Markoff, 1986 p.83; Parlak, 2000), twelve (Erzincan 1998; Parlak, 2000) , thirteen (Picken, 1981), fifteen (Gazimihal,1975) seventeen (Parlak, 2000), eighteen (Gazimihal, 1975), twenty (Gazimihal, 1975), and thirty (Gazimihal, 1975) frets.

Picken (1975) wrote "Folk Instruments of Turkey" based on a wide organological review of Turkey, and classified *saz*s with 13-16 frets that he identified in Anatolia as incompletely chromatic, while he classified *saz*s with 17-18 frets as chromatic, *saz*s with 19 or more frets as chromatic including 2 microtonal intervals. He also indicates that rural *saz*s, as a "general rule" have an incompletely chromatic fretting order.

---

[55] Sometimes, PVT is also used with seven-stringed, picked *saz*s because performers avoid bringing another *saz* to the stage.

> Sarısözen (1940,121) reported no difference in construction between town and village *bağlama*, though average length of the latter is less (c. 850 mm as compared with c.1000 mm). His brief statement implies that scaling is chromatic, but he mentions of that, on several instruments examined, individual frets yielded noted flattened by a comma or more in relation to their nominal pitch; for example b, e, f♯, or c♯ may be a comma flat (Picken, 1975, p.289).

Based on this information that Picken provides about the fret system that he encountered in Sarısözen's compilations, it is understood that some frets of *saz*s with an incompletely chromatic system have an indeterminately lower pitch than the tempered system. Parlak (2000) also reports that in the Republican Era, such *saz*s with a different number of frets were usually tempered, however that the pitches of especially the B and F♯ frets were lower in a certain amount.

This fretting system is defined as "Traditional Fret (Tone/ Note/ Sound/ Voice) System" by Öztürk (2014; 2018). Öztürk (2018) states that a fretting system covering 2 octaves contains many makams:

> The traditional fret/note system is the fundamental starting point for a better understanding of makams and makam-based melodies. Although consisting of variable numbers of frets/notes are commonly accepted, a two-octave range is the optimum width (Feldman, 1996; Wright, 2000). This system seemed very common in the Ottoman music culture for centuries; it is also the same today. (Öztürk, 2018)

Frets on *Traditional Fret System* (TFS) are called as "*tam perde* (complete frets or notes)". Figure 2.7 shows all *tam perde*s in TFS.

Figure 2.7 : *Traditional fret system* (Öztürk, 2014, p. 38)[56].

Öztürk (2014) states the traditional fret system is an expandable and adjustable system. Accordingly, all these different fretting variations that have been collected from Anatolia can be seen as variations/adjustments/expansions of TFS.

These different fretting applications demonstrate that the *saz* culture was shaped in different ways in different areas in Anatolia in terms of TFS. Based on this data, it is possible to state that the number of frets and the use of microtonal intervals increase

---

[56] In this figure, the symbol " ‡" means small amount of sharpness, and the symbol " d" means small amount of flatness.

particularly in areas that are under the influence of urban culture. Parlak quotes from Orhan Dağlı that the attachment of an additional *koma fret* (an extra microtonal fret more flatter than *Segâh or Buselik*)" to *saz*s happened after the public reacted to the performance of a *türkü* that Muzaffer Sarısözen, chief of Yurttan Sesler at the time, collected from Gaziantep with tempered equivalents instead of *koma*s. According to this, various *koma fret*s were introduced during Muzaffer Sarısözen's time, and with his efforts in order to achieve a standard for pieces that were collected from various regions. Historical eyewitness accounts of Adnan Ataman, Kenan Şavklı, Ali Ekber Çiçek and Neriman Altındağ Tüfekçi confirm this suggestion, and that after this, the *saz* that is played in cities began to be called "radio *saz*" by rural artists (Parlak, 2000, p. 218).

Folk music researchers who wanted to annotate these modifications in performance, and who believed that it should be possible to represent microtonal intervals in notation began to investigate the recently applied and frequently debated Turkish classical Music theories. Sarısözen, who led the Yurttan Sesler choir, and who annotated the *türkü*s that he compiled adopted the system that followed the Arel-Ezgi-Uzdilek system (which is heavily criticized due to the differences in theory and practice) based on 53 equal divisions, where 1 whole tone (*tanini*) is divided into 9 *koma*s, however he adopted the approach which the *koma* is specified with a number over the flat and sharp signs, such as $B\flat^2$, $B\flat^3$, and $F\sharp^3$, instead of the modifiers suggested in the AEU system. Even today, *koma*s for *saz*s in the folk music community are represented with this notation. However, the amount of *koma*s used by Sarısözen in his compilations was criticized by some researchers, especially by Halil Bedii Yönetken, as "arbitrary," and "intuitive" (Markoff 1986, p.74, Parlak, 2000, p.105).

Another element adopted by Sarısözen in his notation is the "La-based notation" that assumes the *karar* (root) tone as the A4 fret in the treble clef, and that began with the adoption of the *dugah* fret as the A note. This choice had important consequences, and caused the A tone to be considered movable, and not be fixed to any pitch. This vocalist-based approach that completely varies according to the *türkü* singer survived to this day. A consequence of this approach was the fact that frets of different *saz*s of various dimensions and tuning systems came to be known with the same "western note" names. Thus, the *saz* undertook the character of a *transposing instrument*.

After these *koma fret*s were added, the necessity of transposing melodies to different frets caused different *koma* frets to be added to the fretboard, and the *saz*'s number of frets increased to thirty, forty, and even fifty in time. Consequently, *saz* became a "*tanbur*-like" instrument with many frets. As these sounds were used in the radio, local artists, âşıks and wedding players also adopted this practice (Parlak, 2000, p.219).

Especially the well-known artist Neşet Ertaş's many-fretted *saz* that contained many microtonal intervals that "better expressed his feelings" was very influential in the adoption of the use of these frets by the public. However, this practice was later abandoned except by Neşet Ertaş's followers (Parlak, 2000, p. 106).

Today, the fretting system that contains "17 non-equal intervals in an octave" became standardized in *saz*s and is widely adopted. This fretting system contains all chromatic frets and it has some microtonal frets.

When the *saz*'s frets are adjusted, the microtonal frets are indispensable in *saz*s where the chromatic frets are chromatically tuned by tuning devices that carry out precise measurements based on the "equal temperament" system in the studios and orchestras in order to accompany *piano*, *guitar* and similar instruments based on modern music's necessities (Öztürk, 2007). The "17 non-equal intervals" system contains 18 frets in an octave, and 13 of these frets are adjusted according to the equal temperament system in the contemporary *saz*. Consequently, the contemporary *saz*'s fretboard consists of divided (D) or undivided (U) chromatic columns[57] (Fig. 2.8)

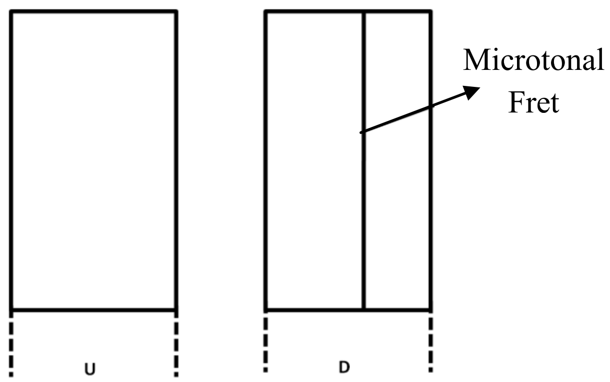


Figure 2.8 : Chromatic column types in contemporary *saz* (U: Undivided, D : Divided).

Chromatic columns on the fretboard become narrower as they approach the bridge where the fretboard and the body join. Mottola (2006) states that the distance between

[57] Chromatic columns are the area between two chromatic frets in one string.

chromatic sections can be calculated based on the following formula (as cited in Costalonga, 2009) (Equation 2.1).

$$d = s - \left(\frac{s}{2^{\left(\frac{n}{12}\right)}}\right) \tag{2.1}$$

Where; d= distance from nut; s= scale length; n= fret number (Mottola, 2006)

Öztürk (2007) provided the fret structures of contemporary *saz*s from A to high A (from *Dügâh* to *Muhayyer*) as follows (Fig. 2.9). Divided and undivided chromatic columns are clearly seen in Figure 2.9.

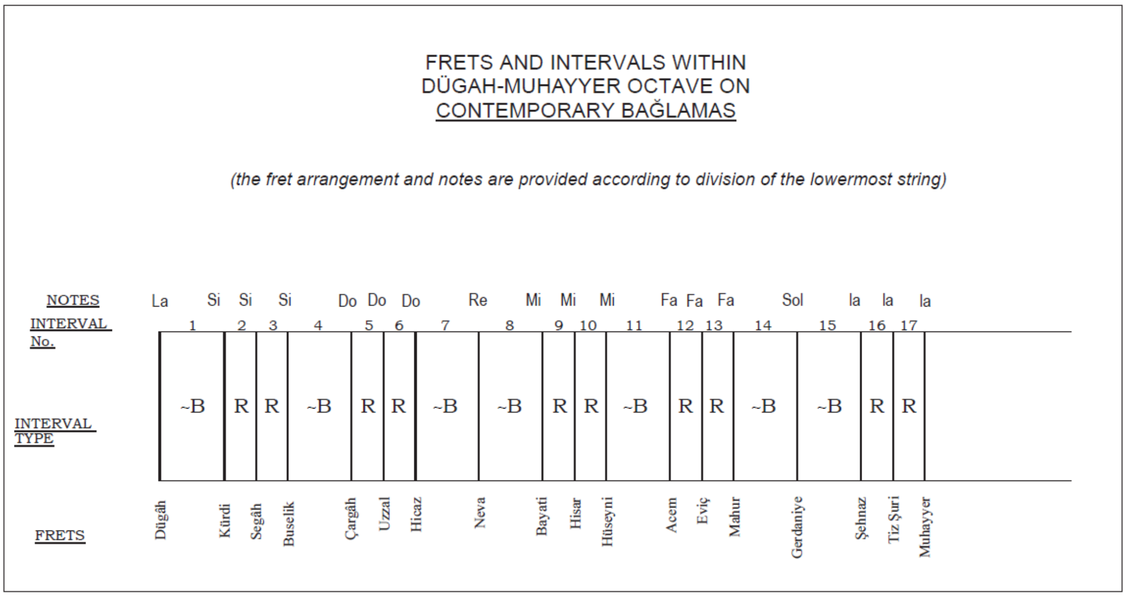


Figure 2.9 : Frets and intervals within Dügâh-Muhayyer octave on contemporary *bağlama*s (Öztürk, 2007).

Another very important aspect of *saz* that differs from many other fretted instruments is that the frets are movable. This allows performers to adjust the frets according to their personal preferences, or the characteristics of the pieces that will be played (especially the *mictrotonal* frets).

The adjustment of microtonal frets in the contemporary *saz* is another matter of debate. Öztürk (2007), stated value of *mücenneb*[58] intervals are variable, assumed that these frets were 50 cents lower than the next chromatic fret in his study on fret systems in *saz*, where he also showed contemporary *saz* frets. Karaosmanoğlu and Gürenç (2017) examined 63 pieces played by Âşık Veysel, and determined that the *koma fret*

[58] *Mücenneb* is an variable interval that is bigger than a semi-tone and smaller than a whole-tone.

is at the -20/-25 cents interval in most of these pieces. While this fret varies according to personal preferences among performers, it is generally at the -20/-45 cents, and mostly around the -35 cents interval. This information is supported by many performers (Personal communications with Adem Tosunoğlu, Ali Kâzım Akdağ, Güven Türkmen, Evrim Yener, Ahmet Gökhan Coşkun, 2018) and our experiences. Gürenç (2007, p.47) who had studied with a selection of audio samples of *saz* masters in ascending and descending "uşşak / yahyalı kerem category scales" in his graduation project reported avarage value for interval between first and second degree is 165.5 cent as microtonal fret is -34.5 cent than one tuned on temperament.

While the location of the microtonal fret in the divided chromatic column is standardized as the 2 *koma* flat, this value approximately corresponds to 44 cents. While it is not consistent with real data in this regard, it is used as an approximate value in line with the approach to "indicating the amount of *koma* with numbers above the accidentals" in the notation. Microtonal frets apart from $B\flat^2$ and $F\sharp^3$ are rarely used in notation.

In PVT performance on contemporary *saz*s, performers usually refrain from using the fret that is considered to correspond to $A\flat^2$ between the 16th and 17th intervals in Fig. 2.9. Instead, they use this fret in a manner that will produce the $G\sharp^3$ sound between the G and A frets (Personal communication with Adem Tosunoğlu, Evrim Yener, 2018). The main reason for this is that the empty middle string corresponds to G in the *bağlama düzeni*, and that this fret corresponds to the $F\sharp^3$ sound on the middle string, that is widely used in türkü performances.

The figure shows the frets, chromatic column numbers and types of the contemporary *saz* based on the "17 non-equal intervals in an octave" used by the PVT performers (Fig. 2.10)

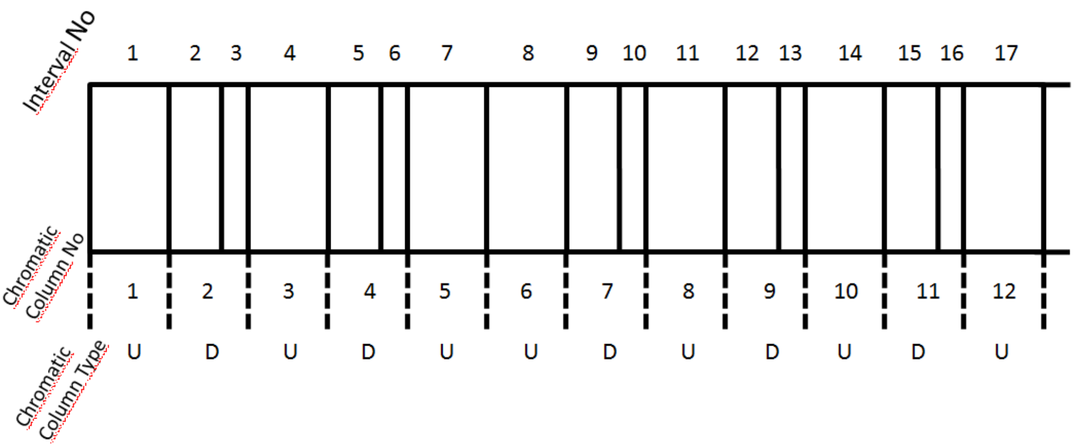


Figure 2.10 : Common replacement of frets in one octave in contemporary *saz* of PVT performers.

2.1.6 Tuning systems

Previous research identified many tuning systems for the *saz* in Anatolia. Factors that affect the selection of a tuning system are suitability to the type of melody that is played, the required root (dem) sound, and sometimes, the voice range of the vocalist, if vocals are accompanying the *saz*. Since Anatolian music is modal/makam-based, one of the *saz*'s strings usually undertake the function of providing the *dem (drone)* sound.

In Anatolia, the term *düzen*, which means "order," or "arrangement", is generally used to represent a tuning system. The root of the word, "*düz-*" means "to arrange" (Markoff, 1986, p. 88).

Some of the *düzen*s take their name from a location (Edirne Düzeni, Kayseri Düzeni, Kütahya Düzeni), while others come from a melody played in that *düzen* (Fidayda Düzeni, Misket Düzeni, Karanfil Düzeni), some from the *saz*s they are applied to (*Ruzba Düzeni, Bağlama Düzeni, Bozuk Düzen, Kaval Düzeni, Kemençe Düzeni, Çöğür Düzeni, Zurna Düzeni*), or a player of that *düzen* (*Veysel Düzeni*), an ethnic group (*Alevi Düzeni, Avşar Düzeni, Abdal Düzeni*), a makam name (*Segâh Düzeni, Hüseyni Düzeni; Acemaşiran Düzeni, Rast Düzeni*), or sometimes from an additional string (*Cinteli Düzeni*) (Çoğulu, 2010, p. 11).

The two most popular *saz düzen*s today are *bağlama düzeni* and *bozuk düzen*. As previously specified, the radio tradition and folk artists who were influenced by this tradition were responsible for spreading *bozuk düzen* in the country.

Bağlama düzeni, is the most popular *düzen* in Anatolia (Parlak, 2000, p.79), and incorporates the two widespread tuning systems of Central Asian two-stringed *saz*s (fourth and fifth) (Markoff, 1985, p.93). Taking the bottom string as "A," the middle string is tuned to the lower fifth "D," and the top string is tuned to the lower fourth "E." However, the approach that takes "A" as the root sound causes the bottom string to be tuned and annotated to "D," the middle string to "G" and the top string to "A" in short-necked *saz*s on which the *bağlama düzeni* is frequently played. While this tuning system was termed *Âşık Düzeni, Alevi Düzeni,* or *Veysel Düzeni* (because of Âşık Veysel) in the Republican Era since *saz* was particularly played with these tuning systems by Alevi communities and *Âşık*s, these terms are now obsolete and the oldest term, *bağlama düzeni* is frequently used. Parlak states that *bağlama düzeni* has been used for centuries in South-eastern Oğuzeli Türkmen region, by Central and Western Taurus and Aegean region Yörük Türkmens, in Central Anatolia and many non-Alevi communities, and that associating this tuning system with Türkmen roots (as a tribe) instead of the Alevi communities (Parlak, 2000, p.79). The traditional tuning system for PVT is also the *bağlama* tuning system.

Another popular tuning system of *saz* is the *bozuk düzen*. Various tuning systems are called *bozuk düzen* in various regions in Anatolia (Parlak, 2000, p. 82). However the term *bozuk düzen*, also called *kara düzen, düz düzeni*, *sazdüzeni* and *radyo düzeni*, is frequently used to specify the tuning system where the bottom string is tuned to "A," the middle string is tuned to A's lower fifth "D," and the top string is tuned to the lower augmented second "G."

Traditionally, *bozuk düzen* is usually performed by frequently changing positions in a while playing the melody. Contributing to the melody with the thumb on the top string without changing positions is also a defining characteristic. There are three *karar* frets that are frequently used in *bozuk düzen*. While a *dem* sound can be obtained from the top string in pieces that are played in the G tonic note, the middle string provides the *dem* sound in pieces with a D tonic note, which became known with Bayram Aracı and widely used by Neşet Ertaş. The approach of playing songs with A tonic note (open bottom string), that became popular in radio-style playing causes problems in the timbre consistency of the performance due to the difficulty of obtaining the *dem* sound.

Accordingly, based on the *dem* string, tuning the bottom string to "A," provides a root of "F♯" in *Misket Düzeni*, "F" in *Müstezat Düzeni*, "D" in *Fidayda Düzeni*, "C" in *Do Müstezat Düzeni*, and "B" in *Segâh Düzeni*. Frequently used *düzen*s, *karar* sounds and their alternative names are provided in Table 2.2

Table 2.3 : Tuning systems of *saz*[59].

Tuning Name	Common *Karar* Notes	Open Strings (top-3rd to bottom 1-st)
Bozuk (Karadüzen, Düz, Radyo , *Saz*)	**A,G,C,D**	**G-D-A**
***Bağlama* (Aşık, Alevi, Avşar, Hüseyni, Veysel)**	**E,G,A**	**E-D-A**
Misket (Karanfil, Hüzzam)	**F♯**	**F♯-D-A**
Bozlak (Abdal, Çöğür)	**A**	**G-A-A**
Fidayda (Zeybek, Hüdayda)	**D**	**D-D-A**
Segâh	**B**	**G-B-A**
Do Müstezat	**C**	**G-C-A**
Fa Müstezat (Müstezat, Kervan, Acem)	**F**	**F-D-A**

2.2 *Parmak Vurma* Technique (PVT)

2.2.1 The origin and tradition of PVT

According to research that examines *saz* types in terms of traditional performance, PVT is only used in the performance of *üçtelli bağlama* of South-western Anatolian Yörük Türkmens.

Parlak (2000) states that it is difficult to obtain sound on gut and silk strings using this technique, and adds that PVT is non-existent technique on *saz* types that uses non-metallic strings, and that this technique only emerged after the adaptation of metallic

[59] In Table 2.2., highest pitch is represented with red coloured note name and lowest pitch is represented with green coloured not name. Notes with green and red don't have intervals more than one octave.

strings on *saz*. Thus, an optimistic guess places the first use of PVT, which doesn't have as old a history as other pickless techniques (PT, TÇT), with the adaptation of metallic strings for *saz* (Parlak, 2000, p. 175). The fact that PVT is only known in the Teke region while other pickless playing techniques are widespread also supports this argument. However, considering the fact that the technique is adopted, spread and transferred between generations among Yörük Türkmens, it is also not possible to place the emergence of this technique to a very recent date. Another reason for not the widespread adoption of the technique in Anatolia may be the closed and nomadic lifestyle of Yörüks.

Various definitions of, and opinions about the term Yörük exist. The name is thought to originate from the root *yürü-* (to walk) and is assumed to mean "one that walks, runs to battle, tent folk, nomad that constantly changes location" (Gülten, 2009, p.2). Historical research concerning Yörüks of the area indicate that these communities are Türkmen groups that migrated to Anatolia from Central Asia, that they bear the signs of their previous livestock-based nomadic lifestyle, that these freedom-loving communities prefer higher altitudes for their settlements, and that this is one of the reasons for their selection of the Teke region (Tızlak, 2008; Ergun, 2004).

Yörüks were forced to settle in the Ottoman Era due to reasons such as easier control and tax collection, or the Turkification of a newly annexed region (Tızlak, 2008). Changing social conditions following the declaration of the republic forced almost all Yörüks to settle. Although they transitioned to a settled life, Yörüks kept their nomadic musical culture alive. Even today, a few Yörük communities that maintain their nomadic lifestyles can be found (Çelik, 2009, p. 32). Yörüks seasonally migrate between high altitude (and cooler) summer areas that are suitable pastures to feed their livestock, and lower altitude summer areas that contain structures such as barns, etc. that protect their livestock from cold (Armağan, 1997, p.1)

Thus, the most important factors that shape Teke Yörük Türkmen musical culture are migration, livestock and the relationship between humans and the nature.

The variety of instruments that are used in Yörük Türkmen music of the Teke region is astounding. Most of these are unique to Teke Region's Yörük Türkmen music. These are *ikitelli bağlama, üçtelli bağlama, kabak kemane, ıklığ, kemane, çam düdüğü, sipsi, çoban düdüğü, uyguncaklı düdük* and *hegit* (Ayyıldız, 2013). The common feature of these instruments is the fact that they are small and easily portable, in line with the nomadic lifestyle. Instruments such as *zurna, davul, kaval, çığırtma* and *delbek* that are played by Türkmens from other regions are also used in the region. Large *bağlama*s and instruments called *incesaz* are instruments that were only later introduced in the Teke region's Yörük Türkmen musical culture (Ayyıldız, 2013).

Parlak states that the small, and pickless played *ikitelli bağlama* and *üçtelli bağlama* were the original instruments of the region:

> The instruments of this region, which were shaped based on the nomadic lifestyle, are two and three-stringed *saz*s, and they are usually small in dimensions. These small *saz*s that are constructed based on the practicalities of a mobile lifestyle incorporate all the subtleties of the rich Yörük culture and the imagination of the Yörük people, despite their small sizes. These *saz*s are hand-played, and are the original and ancient instruments of the region's Yörüks. Large *saz*s, and the concept of plectrum were only recently introduced in the Yörük lifestyle. (Parlak, 2000, p. 114)

According to Parlak (2000), *ikitelli* and *üçtelli saz*s are named after the number of rows of strings they have, according to the Asian-Anatolian common naming tradition. The playing style, melodic structure and originality of *üçtelli bağlama* made it the most important instrument, and virtually the symbol of the region. *Üçtelli bağlama* is only played using pickless playing techniques, and its repertoire contains many genres unique to the region. The most important ones are: *boğaz havası*s, *gurbet havası*s, *teke zortlatması*s, *teke zeybeği*s, etc.

The PVT technique is also called *döğme* (beating), *damak* (palate), *parmak koyma* (finger placing) in the region, and its use in Yörük Türkmen musical tradition is unique to the *üçtelli bağlama* performance. It is not used with *ikitelli bağlama*s (Parlak, 2000, p. 176).

Parlak states the following about *boğaz havası*s:

> *Boğaz havası*s are among the most interesting tunes of the region's repertoire, and is a feature of livestock-based lifestyle. They can be performed using instruments or human voice. The first emergence of *boğaz havası*s is not clear. It is believed to have originated in ancient times in relation with the Yörük lifestyle, and survived until today. *Boğaz havası*s that are performed using human voice are almost extinct, due to the fact that yörüks adopted the settled lifestyle. *Boğaz havası*s survive today mainly due to their transference from human voice to primarily the *bağlama*, in addition to instruments such as *sipsi, kemane* and *kaval* (Parlak, 2000, p. 143).

The term *boğaz çalma* (throat playing) is used rather than *boğaz söyleme* (throat singing) is used in the region for the performance of all *boğaz havası*s, including the ones that are performed using human voice (Ergun, 2004). It is widely thought that the emergence of *boğaz havası*s performed on *üçtelli* and other instruments was based on the imitation of their vocal performance (Parlak, 2000, p.143). Another view is that the *boğaz havası*s emerged based on the imitation of the cuckoo bird[60]. (Parlak, 2000, p. 143)

Ergun (2004) states the following about the vocal performance of throat playing (See Fig. 2.11):

> The act of throat playing is based on a special vocal technique in *türkü* singing. The throat is pressed on the front or sides of the throat. The finger is moved up and down on the throat during the song. Some of the performers place their index and middle fingers on the opposite side of the throat, and similarly move them up and down during the song. (Ergun, 2004, p. 33)

There are no pitch jumps over an octave in *boğaz havası*s. The pitch jumps are usually to fifth, fourth, third and second intervals. The vocal performance of *boğaz havası*s undertake various roles in social life. Throat playing is usually not a part of musical events that are attended by everyone. They are usually performed by two persons who stand at a distance.

Ergun (2004, pp. 37-38) studied *boğaz havası*s in Yörüks, and stated that *boğaz havası*s are used as a symbol of the tribe, and that there is a single *boğaz havası* that identifies each tribe. Thus, the tune that constitutes the *boğaz havası* of the community is also the identity of that community. Another function of *boğaz havası*s is to provide a means of communication between shepherd girls, and kaval-playing shepherd boys (Fig. 2.11.a). Thus, music is used as a means of courting between genders. The fact that it is considered "shameful" for married women to play *boğaz havası*s support this argument. Additionally, boğaz havası has various functions such as reprimand, obloquy, competition, argument and game in different communities (Ergun, 2004). Yılmaz (2013) recently studied *boğaz havası*s and stated that the vocal performance of *boğaz havası*s is almost extinct, and that she encountered no *boğaz havası* playing women under 55 in his field studies (Fig. 2.10.b).

---

[57]There are many *boğaz havası*s in the region that concern the cuckoo bird, also known as *dugguk* or *duguk* in the region.

(a) **(b)**

Figure 2.11 : Vocal performance of *boğaz havası* : (a) Yörük girl playing *boğaz havası* (Parlak, 2000 p. 142). (b) Old Yörük woman playing *boğaz havası* (Yılmaz, 2013, p. 32).

In addition to their vocal performance, *boğaz*s are part of all of the region's *saz* performers' repertoires. *Boğaz*s that are adapted to instruments exactly preserve the pitch jumps in the vocal variety.

One of the instruments that are most frequently used for *boğaz*s is *üçtelli bağlama*. Parlak states the following about *boğaz havası*s that are played on *üçtelli bağlama*: "*Boğaz havası*s generally consist of two different structures in succession: a free-rhythm structure (with or without lyrics) and a patterned-rhythm structure (with or without lyrics)" (Parlak, 2000, p. 140). Parlak studied the "scales" in *boğaz havası*s and concluded that the following scale is used in almost all *boğaz havası*s[61] (Fig. 2.12).

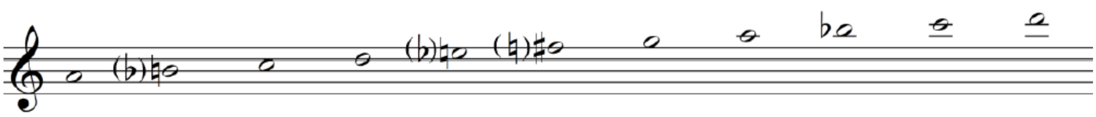


Figure 2.12 : Typical "scale" of *boğaz havası* (Parlak, 2000, p.145).

Parlak specifies the exceptions as follows:

> It is usually not possible to find a *boğaz havası* in a scale apart from the one above. However, from time to time, a *garip* transition towards the fourth grade D sound is made in this scale when descending from high pitches to lower pitches in the free sections of the tune. Although rare, the third degree C natural sound is sometimes converted to C sharp. (Parlak, 2000, p. 145)

[61]This scale is drawn by assuming A as the tonic note.

PVT used in the region shows similarities among performers (Fig. 2.13). Ramazan Güngör from Fethiye (1931-2004), one of the most important *üçtelli* players of the region spent most of his life in the region, and absorbed the Yörük-Türkmen culture (Fig. 2.14). He made his living by making and selling *ikitelli* and *üçtelli bağlama*s, and his real profession is carpentry. Güngör learned to play *bağlama (ikitelli, üçtelli)* from the elders in the region, and states that he first benefited from the knowledge of Mehmet Fırtına and İbrahim Emici (Parlak, 2000, p. 183).

Figure 2.13 : Traditional PVT performers (Parlak, 2000, p. 175).

Parlak (2000) notes the following about Ramazan Güngör's performance:

> As a performer, Ramazan Güngör is a master among masters not only in his region, but in all of Anatolia because of his advanced technique and fluent playing style. His unique, concise, feeling-laden, enthusiastic expressions always make his strong style felt. He addressed almost all of his region's tunes and almost reconstructed them. Another important characteristic of Güngör, who imparted a brand new soul and interpretation to these pieces is the fact that he preserved ancient melodies and expression styles in all their purities. Although Ramazan Güngör played the üçtelli, his performance incorporated striking elements of Asian-style ikitelli at all times. Characters of his melodies, his playing technique and forms of expressions make him a very important element in the transition between Asia and Anatolia. His exceptional feeling and unique polyphonic interpretation make him the most important example of Yörük Türkmen music that includes a wide spectrum of melodic cultures (from *zeybek*s to *gelin ağlatması*s, from *peşrev*s to *boğaz havası*s) played in various tuning systems. (Parlak, 2000, p. 183)

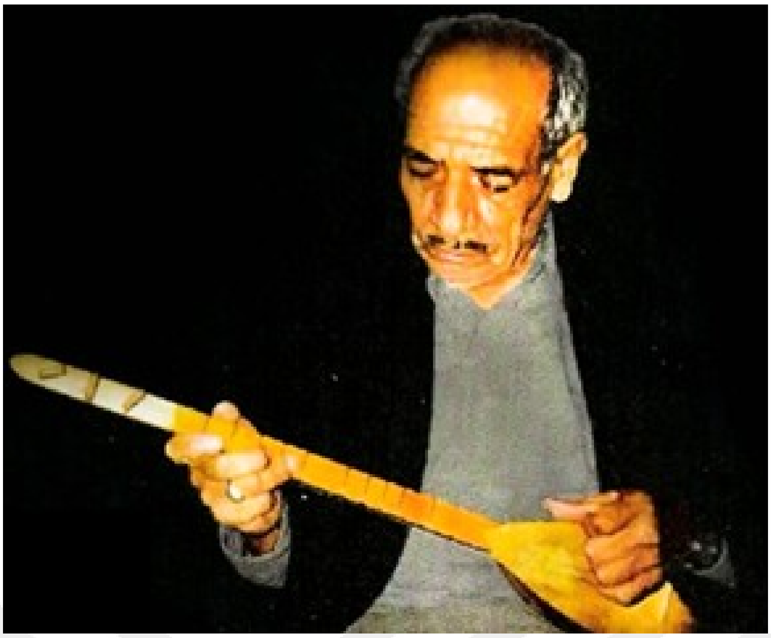


Figure 2.14 : Ramazan Güngör (Photo by: Unknown Photographer, Güngör, 1997).

A region where the pickless playing tradition of Teke region is kept alive, and that produced many masters is Dirmil. Parlak states that particularly Hüseyin Karakaya from Dirmil has a more advanced performance style, even compared to Ramazan Güngör, especially in the performance of *boğaz havası*s. Hüseyin Karakaya was an apprentice of Koca Şakir from Çörten, and he himself raised many apprentices during his lifetime (Parlak, 2000, p. 185).

Some of the *üçtelli* performers who use PVT in the region, in addition to Ramazan Güngör and Hüseyin Karakaya include: Ali Osman Aslan, Ömer Kanyılmaz, Ali Ulutaş, Osman Kırca.

In all examples that are compiled from Ramazan Güngör who used many tuning systems on the *üçtelli*, PVT is performed in the *bağlama düzeni*. Other performers who play *boğaz havası*s using PVT also used the *bağlama düzeni*. The fretting system of *üçtelli bağlama* is incompletely chromatic. Frets in this fretting system, which is also used in Central Asian dutars, are the characteristic frets of Yörük music. The frets that are used by the RH and LH for PVT in *üçtelli bağlama*'s fretting system and *bağlama düzeni* are presented in the figure (Fig. 2.15.).

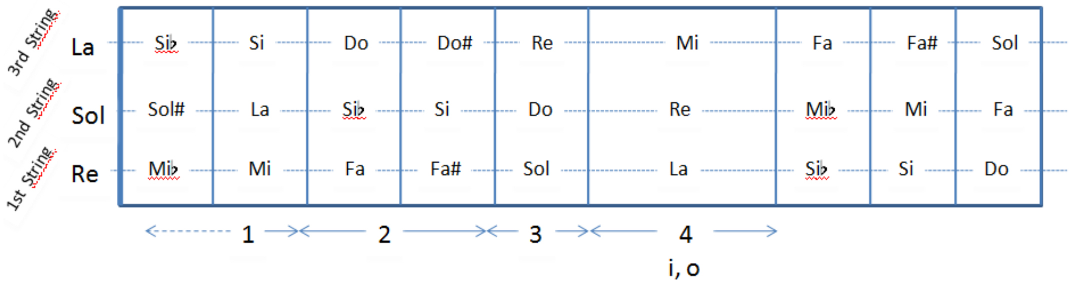


Figure 2.15 : *Üçtelli* fretting and typical replacement of fingers (Ayyıldız and Parlak, 2018)[62].

Boğaz havası is played only using *parmak vurma* technique and *tel çekme* technique on *üçtelli bağlamas*. A typical *boğaz havası* notation can be seen in Figure 2.16.

Figure 2.16 : Example of *boğaz havası* (Performed by Ramazan Güngör, Notated by Erol Parlak) (Parlak, 2000).

The fret that corresponds to the fifth of the open string of *saz* is played using the little finger of the LH in *boğaz*s that are played using the TÇT (See Fig. 2.14). This practice is very difficult, even for small *üçtelli saz*s, since it requires the LH to be stretched open. This fret is characteristically important for *boğaz havası*s, and it is easier to play it using the RH in PVT. In *boğaz havası* performance, the RH's position is always constant in PVT, and it is not used to play other frets. While the pulled string can be

[62]This figure is drawn by assuming A as the open string note of third (top) string. Some performers adds more frets than showed in figure 2.14 (Parlak, 2000; Öztürk, 2007) . In figure 2.14, numbers and letters under the fretboard shows finger replacement on characteristic posture of hand during *boğaz havası* performance on *üçtelli* bağlama . These symbols represents : 1 : Left hand index finger, 2: Left hand middle finger, 3 : Left hand ring finger, 4 : Left hand little finger, i : Right hand index finger, o : Right hand middle finger. In the sixth fret, feft hand little finger (4) is used only in *tel çekme* technique and index (i) and middle (o) fingers of right hand is used only in *parmak vurma* technique

open, it can also be pulled to any frets pressed by any LH finger. Thus emerge the "pitch jumps" that are a characteristic feature of *boğaz havası*s.

We think that PVT emerged when RH fingers were used to hammer-on/pull-off the fifth fret used in the performance of *boğaz havası*s instead of the more difficult LH little finger of the TÇT. The facts that PVT is only used in *boğaz havası*s and that the RH fingers are used only on a single fret support this argument.

In conclusion, the traditional musical characteristics of PVT can be listed as follows:

- It is performed on *üçtelli bağlama*, which is a small sized three stringed Yörük Türkmen *saz*.
- The main tuning system is the *bağlama düzeni*.
- PVT's repertoire consists of *boğaz havası* songs.
- Traditional use of PVT is limited to only one fret for RH hammer-on. This fret is the fifth degree pitch of the open string. Usually the index finger, and sometimes the middle finger of the RH are used for this fret. Other fingers of the RH are not used.

2.2.2 Adaptation of PVT in urban music life and contemporary use of PVT

Pickless playing techniques were adapted in urban musical culture only after a long process. It is interesting that compilers who travelled to many villages during their compilation studies for conservatories, radios and TRT never got interested in these techniques. Urban *saz* players who were part of official institutions or the "market music," and who "couldn't abandon the plectrum" also ignored pickless playing styles for a long time.

While Ramazan Güngör was sometimes called in for recordings at TRT (Parlak, 2000, p. 184), his *saz* performance was not examined in depth with an institutional approach. The first steps in the adaptation of pickless *saz* playing techniques in the urban musical culture were taken by artists who kept PVT alive in their regions. Turkey learned about *boğaz havası*s as the music of the famous grandmother-grandchild stories[63] presented by Özay Gönlüm from Denizli in a theatric style (Parlak, 2000, p. 177).

[63] Grandmother - grandchild stories: These are stories that present the dialogue between a grandmother and her grandchild, with an imitation of the Teke region's vernacular. *Boğaz havası*s are played on the *üçtelli bağlama* in the interlude between the dialogues of the grandmother and the grandchild.

Another important name from the region is Talip Özkan from Acıpayam. Özkan touched on almost all the tunes from his region, and reinterpreted the *zeybek* music. Özkan played tanbur in addition to *saz*, and his *saz* repertoire incorporates tunes from Azerbaijan to all regions in Anatolia. Talip Özkan is a versatile artist in this regard, and another of his important features is his *üçtelli* performance, and interest in PVT.

> One of the primary sources and inspirations of Talip Özkan, maybe the most important, was Ramazan Güngör. Özkan found the opportunity to examine *boğaz havası*s because of his friendship with Ramazan Güngör, and strived to improve himself on the subject. The artist focused on *boğaz havası*s using the *üçtelli bağlama*, and he tried to adapt these tunes to *large bağlama*s. (Parlak, 2000, p. 187)

Parlak thinks that Talip Özkan and Özay Gönlüm failed to capture the technical depth of PVT, and that they believed that this playing style was more a specific practice for *üçtelli bağlama* and *boğaz havası*s, rather than a unique technique. Thus, the idea that this style that was introduced to masses by Özay Gönlüm and Talip Özkan, was only a *boğaz* style played with a lyrical expression on the fret that has fifth of open strings of the *saz* took root in musical circles (Parlak, 2000, p. 188).

Hamit Çine from Burdur, one of the Teke region's artists carried out compilation studies in his region, and was interested in PVT. Çine has an album consisting of the tunes he compiled, and an "*üçtelli* method" that was more a "general guidelines" on the matter. Parlak states the following about Çine's performance of *boğaz havası*s: "Çine met with many üçtelli masters of the region, captured the logic of the hand-playing technique in his performance, but could not surpass a certain level as a performer" (Parlak, 2000, p. 189).

After this period, although this style was considered to have "limited opportunities and repertoire" was imitated by some artists, and was used in various albums and movie soundtracks due to its unique character. However, these performances are also similar (in terms of level-mentality) to *boğaz havası*s.

PVT reached the masses around the country and was lovingly adopted only after masters from the East Anatolian tradition got interested in this technique. Music functioned as the medium that allowed the poetry, which carried the main message, to propagate in space (from region to region) and time (from previous generation to new one) in the lyric-heavy East Anatolian tradition that was shaped around the Alevi-Bektaşi and Âşık musical traditions, and was secondary to lyrics in terms of importance. Pickless playing techniques are still used in the rural areas of these regions. However, almost all artists who migrated to cities from their regions abandoned the pickless *saz* playing techniques, and tried to adopt pick-playing techniques.

The fact that some masters left the holistic approach of folk music in the beginning of 1980s, caused some changes such as the emphasis on *bağlama düzeni* in this period (also called "*deyiş* rush"), the "reinvention" and rapid adoption of the short-necked *saz* form, the adoption of some pick-playing techniques that were used particularly in Central Anatolia by the Alevi-Bektaşi music, etc. By the end of the 80s, *saz* performance techniques stagnated and caused a search for novelties. Parlak states that the new search caused a tendency towards pickless playing: "Tendencies towards this technique that was previously ignored by the radio-based approach, and that was kept alive by masters such as Nesimi Çimen in the Alevi-Bektaşi tradition, and Ramazan Güngör in the Aegean and South-western Anatolian Yörük Türkmen tradition" (Parlak, 2016, p. 218).

Another artist who was interested in *boğaz havası*s that he learned about due to his meetings with Talip Özkan, is Hasret Gültekin, whose region had a tradition of hand-playing. The artist attracted attention when he developed a tune that he learned from Talip Özkan under the name "Avşar Havası," and presented in the East Anatolian style. Gültekin incorporated *guitar* playing styles in addition to traditional styles in the tune, and this interpretation was adopted especially by *saz* players of the Alevi-Bektaşi community (Parlak, 2016, p. 228).

Arif Sağ further developed Hasret Gültekin's tune, and his popularity at the time contributed to the recognition of pickless playing techniques among *saz* players and folk music listeners (Parlak, 2016, p. 228).

Figure 2.17 presents the *parmak vurma* parts of this tune, and while the tune's performance contains novelties in terms of TÇT and PT, in terms of PVT it offers no musical advances apart from the performance of the local style on a large *saz*. While *boğaz havası*s or compositions similar to *boğaz havası*s were played in this period, the dimensions of the technique were not discovered yet. We think that the most important development in this period is the combination of short-necked *saz* shaped large *saz*s and PVT. Even today, the short-necked *saz* form is the form that is most frequently used with PVT in the urban musical culture.

Figure 2.17 : PVT parts of *Avşar Havası* (Performed by Hasret Gültekin, Transcribed by Sinan Ayyıldız, Url-2 [between 2:26-2:47]).

PVT left its traditional dimensions and began to be presented in a new approach thanks to Erol Parlak's and Erdal Erzincan's contributions. These artists can be considered the "first generation" in the development of pickless playing techniques in the urban culture, and they carried PVT to a new level. Parlak talks about this process:

> Erol Parlak got interested in the finger technique near the end of the 80s, and carried out long archive reviews and field studies on traditional masters. He met with Erdal Erzincan, who was the same age with Hasret Gültekin and who met with him. They decided to combine their studies upon encouragement by Arif Sağ and started working together. A difficult process of experimental studies began and lasted for almost two years, and in the end, a novel style emerged based on traditional structures. This novel style called "şelpe" (one of the terms used in Anatolia), which brought *bağlama* to its essence rapidly became popular, and influenced large masses. Especially the new generation began learning about this style that they wholeheartedly adopted, while some of the performers realized the style's value but never played it, and others ignored the style by stating that this is a passing fashion invented by some people. (Parlak, 2016, p. 228).

Erol Parlak and Erdal Erzincan, who came together upon Arif Sağ's suggestion recorded a work called "Concerto for *Bağlama*," which relied heavily on pickless *saz* playing techniques along with the symphony orchestra in 1998, and played many concerts with this project (Sağ et al. 1998). One of these concerts were in Germany, along with the Cologne Philarmony Orchestra.

One of the most striking features of this period is the change in the PVT repertoire. In addition to *boğaz havası*s and similar tunes, *zeybek*s, *halay havası*s, *oyun havası*s, Azeri tunes, and tunes from the Alevi-Bektaşi repertoire were adapted to pickless techniques, and PVT was frequently used in these pieces. Furthermore, new solo compositions specifically composed for pickless techniques also began to be produced in this period. Erol Parlak's "Göç Yolları (Nomad Ways)," and Erdal Erzincan's "*Bağlama* Üvertürü (*Bağlama* Overture)" are some examples of these compositions.

Thus, the pickless playing technique was wholly incorporated in the urban musical life, and continued to be developed in musical environments such as studios and stages in the cities. Parlak and Erzincan, who shaped the process worked together for a while, then went their own separate ways.

Erol Parlak was engaged in compilations, a doctoral thesis, academic studies, stage projects and album projects involving pickless playing techniques since the end of the 80s. In his doctoral thesis, Parlak travelled around Anatolia, listened live to most of the pickless playing masters, and compiled many tunes from these artists. Furthermore, he visited Kirghizstan and Kazakhstan, which only recently opened their doors to the outside world, and found the opportunity to examine the *saz*-like instruments and pickless playing techniques in Central Asia. His album "Göç Yolları," in which he combined the compilations he included in his previous albums with new compositions based on pickless-playing technique was published in 1998 (Parlak, 1998).

Parlak created a method for the whole scope of the *şelpe* technique, published his method Şelpe 1 in 2001, and trained many students in his own musical training center. Parlak developed the concept of *saz* family music to include pickless techniques, and created the "Erol Parlak *Bağlama* Quintet" with four of his students. The *saz*s in this group were: 2 *şelpe saz* (soprano *saz*), 1 *bam saz* (tenor *saz*), 1 picked *saz* (7 stringed), and 1 bass *saz*.

The band presented various pieces using *saz*s in various resists with a polyphonic approach, gave many concerts in and out of the country, and compiled the tunes they played in these concerts in the 2003 album "Eşik"[64] (Parlak et al., 2003). The album introduces many novel techniques, such as producing harmonics using PVT, and the repertoire that was arranged using unique intros and bridge compositions included North-eastern Anatolian, Azerbaijani, Anatolian Alevi-Bektaşi music and Istanbul songs. Another striking feature of the album is that it included a PVT-based performance of W. A. Mozart's "Rondo Alla Turca."

---

[64] The album was republished in Germany in 2007 under the name "Erol Parlak Bağlama Quintett Schwelle Zum Licht."

The idea that pickless *saz* techniques could be used not only in albums, but also on stage became understood thanks to this band, and the work was especially influential in this regard on the second generation.

Parlak has two şelpe methods, one for beginners and one for advanced players[65]. Parlak was awarded the "Presidency Culture and Arts Grand Prize" in 2016 for his academic studies on pickless playing techniques of *saz* and important folk music phenomenon Neşet Ertaş.

Another important figure who contributed to and developed the pickless *saz* playing technique is Erdal Erzincan. Beginning in his first album, the artist used the technique in all his albums and produced an instrumental *saz* album titled "Anadolu (Anatolia)" in 2000, which was heavily based on pickless techniques. This album was also influential on the young generation. Erzincan also included many PVT-heavy compositions in his later albums.

Part of his "*Bağlama* Method" work with Arif Sağ concerned pickless *saz* playing techniques, and offered training on this subject in his own private music school, and trained many students. The 25-person "Erdal Erzincan *Bağlama* Orchestra" he established with his students divided *saz*s according to their sizes and the techniques that are used. One of these groups consist of performers who were responsible for PVT. The studio recordings of this orchestra project were published in 2013 in the album "Erdal Erzincan *Bağlama* Orkestrası."

The process that began with the album "Concerto for *Bağlama*," in which Arif Sağ, Erol Parlak and Erdal Erzincan were the soloists, and continued with the separate works of Erol Parlak and Erdal Erzincan saw many important modifications in the pickless playing technique. These techniques were later transferred to large *saz*s, and caused some problems in performance that were never before encountered by performers. The development of the technique was accelerated as these problems were resolved through the adoption of different string preferences, and the modification of some morphological[66] properties of the *saz*.

---

[65]The beginner level method Şelpe 1 was developed, and was published in Germany in 2010 in 3 languages (Turkish, English and German under the name "Bağlama (*Saz*) Okulu Schule Method."
[66] See 2.2.5 for detailed information.

The first development in PVT in this period was the transition from the *boğaz havası* approach in which the RH was used on only one fret on the fretboard, to an approach in which the RH could be used on all the frets on the fretboard. This is a development that was triggered by the adaptation of tunes that consisted of a different "scale" and melodic structure than *boğaz havası*. As a result, a new melody arrangement approach that combined different approaches in the adaptation to PVT emerged.

Another development in the period was the transition from the approach that only used the index and middle fingers, to the approach that used the index, middle, ring and little fingers of the RH. Furthermore, the simultaneous use of two fingers of the RH or the simultaneous use of the fingers of RH and LH on the fretboard were the first steps toward polyphonic playing.

These novel practices that developed in the urban music, combined with the "folk music that can produce its own polyphony on its own instruments" approach and the development of the "channel-based recording" technology (and its applications in album productions) caused a revolutionary step in folk music production. *Guitar* or *piano/keyboard* accompaniments were gradually replaced by pickless playing techniques in album recordings. The fact that PVT can effectively produce harmonic lines through arpeggios allowed it to play an important role in the process. As a result, simple accompaniments evolved to serious compositions, and almost all the colours of *saz* were used with a different logic in composition. Intros, hooks and bridges specific to *türkü*s were created, and vertical and horizontal harmonies began to be used in türkü arrangements. PVT was used for harmonic lines, in addition to melodic lines in this process. As a result of its compositional use allowed the development of new timbres that were non-existent in the traditional use of *saz*, and the instrument reached a new level. The approach of rendering tunes polyphonic through PVT that was developed by the first generation was also adopted by the next generations (Fig. 2.18).

Again, the search for new timbres in the first generation led to experimentation with different *saz*s and strings, and caused some changes in the *saz*s's structure. *Saz*s with levels adjusted for pickless techniques were constructed, and different strings were used for these *saz*s. While *saz*s without *bam* strings were preferred due to the fact that these strings were not traditionally used, *saz*s with only *bam* strings on all three strings were also used as a new musical colour in harmonic lines since they countered the tenor partition. In addition to these *saz*s, *saz*s such as the *üçtelli, ikitelli, ruzba* and *dede sazı* that lived on in the pickless *saz* playing traditions of various regions began to be used in the urban culture.

Figure 2.18 : Example of PVT arpeggio : Sinan Ayyıldız and Merih Çeliktopuz's arrangement of Aftandil İsrafilov's *Basgali*, measure 25-28.

Kızıler (2007) evaluates all these changes in the process, and strikingly notes:

> Especially the frequent use of octave pitches on the melody line, double sounds, three-pitched chord structures and arpeggios in conjunction allowed a new sound, richer technique and striking visual effect to emerge. The use of octave pitches broadened the sound surface of songs, and rendered more function to *bağlama*'s traditionally rarely used sound regions. Despite this new approach in playing style, the facts that the new hand-playing practices were wholly based on tradition, that this new playing style emerged through the broadening of the existing hand-playing styles of Anatolia in terms of playing style and song genres, and that the songs played in the new style kept the essence of the tradition are very important (p. 118)... The use of process-gate sounds is frequent in the sounding of the songs' melodic lines. These usages were arranged in a very rapid progression in places and caused difficulties in pick-playing, while they were easily performed using hand-playing techniques. The melody is sometimes played using dual sound during the performance using an accompanying pitch. This dual pitch is usually the higher and lower fourth and the higher and lower fifth of the melody. The dual pitch formed using the lower-higher fourth and fifth in this practice actually constitutes the chord pitches that lack a fourth or fifth degree. (Kızıler, 2007, p. 122-123)

These developments were apparent to everyone in the period, were carried out without leaving the essential core of traditional music, and were shaped around this core.

At this point, we should keep "Rondo Alla Turca"[67] arranged by Erol Parlak and performed using pickless *saz* playing techniques by "Erol Parlak *Bağlama* Quintet" apart from this general statement. This work was created with the intention of "demonstrating the *saz*'s capabilities," and contains many hints for the second generation. Parlak summarizes his philosophy in this work as follows:

> Alla Turca is one of the most well-known pieces in the western musical repertoire. The idea of adapting this piece to *saz*, and especially to the *parmak vurma* technique occurred to me when I listened to the piece from a Kazakh *dombra* player in an arrangement that reminisced of galloping horses. I tried to start from the timbre, rhythmic structure, and melodic progression of the *saz* by being faithful to its essential character, but also respecting the originality, melodic, harmonic and rhythmic structure of the march while arranging it. I first arranged the piece for a single *saz*, and then adapted it to my "bağlama quintet" project while preserving its harmonic structure. (Erol Parlak, Personal Communication)

By the end of this process, the fact that pickless playing techniques could allow the *saz* to become a "world instrument" was recognized, and many pieces outside the traditional repertoire were adapted to pickless playing techniques by the second generation, of which we are a part. Baysal states the following about the process:

> Most of the repertoires mostly consist of Western Classical Music. At the same time, some *bağlama* performers in the new generation focus on popular forms of world music such as flamenco and jazz repertoires for adaptation studies of pickless *bağlama* playing techniques. Further, some of the important ethnic music repertoires from the Middle East, Caucasia and Balkan region and the Central Asian Turkic music can also be used in this field. Another musical genre and form that is used in pickless *bağlama* playing technique adaptations derives from instrumental musical forms of Classic Turkish music such as *longa*, *sirto*, and *saz semaisi.* (Baysal, 2013, p. 137)

This tendency in the second generation's repertoire selection allowed the Western classical Music, Jazz music, World music and personal free compositions to be added in the pickless playing repertoire.

These new adaptations are exemplified by Baysal:

> Some important examples of the musical performance adaptation studies of pickless *bağlama* playing techniques to various world music repertoires and their re-arrangers include: İstanbul Türküsü by Erol Parlak, Nihavend Longa by Erkan Çanakçı, Kürdilihicazkar Longa by Güven

---

[67] Mozart, W.A., (2003). Rondo Alla Turca in *Eşik* [CD]. İstanbul : Akkiraz Müzik

> Türkmen, Ludwig Van Beethoven: Fur Elise by Sinan Ayyıldız, Wolfgang Amadeus Mozart: Marda Alla Turca by Erol Parlak, Kartuli Popuri (Georgian Folk Song) by Sinan Ayyıldız, Omorfi Thesselanoki (Greek Folk Song) by Sinan Ayyıldız, Patuvanje (Macedonian Folk Song) by Sinan Ayyıldız, Gankino Horo (Bulgarian Folk Song) by Sinan Ayyıldız, Johannes Brahms: Hungarian Dances No: 5 by Sinan Ayyıldız, Johann Sebastian Bach: Prelude in C minor BWV 999 by Evrim Yener, Nikolay Rimsky-Korsakov: Flight of the Bumblebee by Evrim Yener, Asturias by Evrim Yener, Take Five by Evrim Yener (composed by Paul Desmond) etc.. (Baysal, 2013, p. 138)

Baysal's 2013 list of adaptations can be further developed by including the following: Aziza Mustafa Zadeh : Holiday Blessings by Sinan Ayyıldız, Aziza Mustafa Zadeh : Boomerang by Sinan Ayyıldız, J.S. Bach : Badinerie by Sinan Ayyıldız, Santuri Ethem Efendi : Şehnaz Longa by Sinan Ayyıldız, Grodovsko Horo (Bulgarian Folk Song) by Sinan Ayyıldız, Jamil Bashir : Rast *Saz* Semaisi by Sinan Ayyıldız, L.V.Beethoven : Moonlight Sonata Presto Agitato by Sinan Ayyıldız, Paganini : Caprice No. 5 by Gökhan Kimverdi, Onbirli (Macedonian Folk Song) by A. Ozan Baysal. "Seleigner de moi" (Andalusian Folk Song) by A. Ozan Baysal, J.S.Bach : Minuet BWV Anh. 132 by Hakan Eren, J.S.Bach : Bourée BWV 996 by Hakan Eren.

We started our perfomance studies in PVT as we started training in Erol Parlak's music school with him and his assistants. We continuously produced new adaptations and products during this process, and evaluated the technique in all its dimensions.

The information we obtained during our trials in adapting from the Western classical Music repertoire in the beginning were applied to the adaptations of Anatolian music, and tunes from different musical cultures. These adaptations constitute the main repertoire of the 2009 album "Pangea" that we produced with the band "Etni-ka" that we established with *kaval* performer Serdar Deli. Our later studies on the use of harmonies in the melodic performance of the technique, and the use of pickless *saz* playing techniques with the instruments in the orchestration continued in and out of the country with projects in various musical genres such as "Erol Parlak & Sinan Ayyıldız *Bağlama* Duo," "Stereognosis," and "Mesel," in addition to our solo concerts in various platforms such as "Berlin Mandolin and Guitar Festival," "Ronda Guitar Festival," "Gent *Bağlama* Days" and "ITU *Bağlama* Days."

Zeki Çağlar Namlı, an alumnus of İzmir 9 Eylül Conservatory, got interested in pickless techniques during his training. The artist preferred the 3-bam stringed *saz* and developed the form in time, applied it to different *saz*s. Namlı tended towards his own compositions in his repertoire and performed them with the utmost virtuosity to build a non-traditional style more akin to *jazz-guitar* styles. Namlı produced two albums, one of them a duo with Dominic de Piazza (Namlı, 2006 and 2011), and published a book "*Bağlama* Kitabı" on twelve-tone *saz* playing in 2016 (Namlı, 2016).

Another important figure who shaped the development of PVT in the new generation is Adem Tosunoğlu, a multi-instrumentalist who can play many instruments in an advanced level. Tosunoğlu applied PVT to different tuning systems, and masterfully used novel techniques such as percussive techniques, harmonic sound production techniques, etc. in conjunction with PVT in his compositions and adaptations.

Erdem Şimşek, one of the member of "second generation" and academician, has produced some notable compositions with PVT. He used some contemporary techniques in this composition like harmonic sound production in multi-part melodic lines, sound producing on sound table part of *saz*,"dirty sound" production with nails and percussive effects. He has also some works with PVT techniques on 4 stringed *saz*.

Ali Kazım Akdağ, who was an member "Erol Parlak *Bağlama* Quintet" and *saz* instructor in ITU TMSC masterly has used PVT in his works. He arranged many arrangements for *bağlama* ensembles and he used PVT in some of these arrangements with other playing techniques of *saz* (Akdağ and Derin 2013a). He published his compositions and adaptations in a solo album "Derûn". (Akdağ and Yamalak, 2013).

Another name who contributed to the development of the harmonic aspects of PVT's melodic performance is Ahmet Ozan Baysal. Baysal produced many adaptations and compositions with this approach. Baysal's ongoing doctoral thesis is also about the harmonic use of pickless playing techniques.

Evrim Yener, a multi-instrumentalist musician, used PVT to create harmonic texture and multipart melodic lines in his some works. He also has some works with PVT techniques on 7-stringed-*saz*.

Additionally, PVT was used by many *saz* performers in various compositions, adaptations, albums, music videos or for melodic and harmonic purposes in orchestras. Some of these performers can be listed as Ahmet Gökhan Coşkun, Alexander Pewlo, Baran Özer, Barış Güney, Bilal Demir, Burak Aykaç, Cem Çelebi, Cem Doğan, Cem Tarım, Cihan Türkoğlu, Devrim Canen, Dursun Can Çakın, Efrén López Sanz, Emre

Dayıoğlu, Emre Gültekin, Erdal Akkaya, Erdal Beyazgül, Erkan Akalın, Erkan Çanakçı, Ersin Perçin, Faruk Çalışkan, Ferhat Durmuş, Gökhan Karakaya, Gökhan Kimverdi, Güven Türkmen, Hakan Eren, Haydar Kutluer, İsmail Çakır, Kemal Alaçayır, Kenan Tülek, Koray Berat Sarı, M. Evren Hacıoğlu, Mehmet Günay Eser, Merih Çeliktopuz, Mustafa Kılçık, Mücahit Kol, Musa Kurt, Ufuk Elik, Taylan Ergen, Ruşen Ozan Filiztek, Orhan Bilge, Özlem Özdil, Rıza Kılıç[68], Salih Gündoğdu, Sedat Akdağ, Sercan Baş, Uğur Küçük and Volkan Kaplan.

Another change that was brought about by second generation artists in PVT was the use of non-traditional *karar* sounds. This "transposed playing" style first led to the discovery of scales and positions that were not frequently used in *saz* performances, and the development of new timbre opportunities, leading to a novel dimension in *saz* performances. Transposed playing is used in songs that were adapted from pick-playing *saz* techniques, in addition to adaptations from instruments such as the *piano*, *accordeon*, etc.

Some adaptation works designed by the second generation for transposed playing are as follows[69]: Aman Avcı by Sinan Ayyıldız (G), Grodovsko Horo by Sinan Ayyıldız (D), Aziza Mustafa Zadeh's Boomerang by Sinan Ayyıldız (D), Ludwig Van Beethoven's Moonlight Sonata Presto Agitato by Sinan Ayyıldız (G), Aftandil İsrafilov's Basgali by Sinan Ayyıldız and Merih Çeliktopuz (C), Kalenin Bedenleri (Bb) by Adem Tosunoğlu, Kalenin Dibinde Taş ben Olaydım (Bb) by Adem Tosunoğlu

Some artists preferred tuning systems other than *bağlama düzeni* in their work. Some of these works are only adaptations of the original playing style of the work to the pickless playing technique. However, most works in different tuning systems are based on timbre preferences of artists (Adem Tosunoğlu, Güven Türkmen, personal communications, 2018). The following are some examples of the use of different tuning systems: Kalenin bedenleri (Traditional Song) (*Müstezat Düzeni*) by Adem Tosunoğlu, Kalenin dibinde bir taş olaydım (Traditional Song) (*Müstezat Düzeni*) by Adem Tosunoğlu, Adem Tosunoğlu's Stranger (*Müstezat Düzeni*) by Adem Tosunoğlu, Musa Eroğlu's Ceviz Arası (*Misket Düzeni*) by Güven Türkmen, Ela Ela

[68] Deceased in 2010.
[69] Notes in pharanteses represent the *karar* note/fret/sound of the piece, assuming that the bottom string of the *saz* is tuned to D in the *bağlama düzeni*.

Leose (a unique tuning system[70]) by Sinan Ayyıldız, Kervan (Traditional Song) (*Müstezat Düzeni*) by A. Ozan Baysal.

An important development in this period concerns the texture used in the arrangements. First generation artists, who can be considered to use a monophonic texture, later leaned towards samples that can feel like a homophonic texture. Erol Parlak's "Naz Barı" and "İstanbul Türküsü" adaptations are examples of this phenomenon. The homophonic texture is felt more and more in the second generation, who based their repertoire selection to a wider spectrum. In other words, melody came to be designed in conjunction with harmony in the melodic performance of PVT. Harmonic use varies from triad chords to more dissonance chords. J.S.Bach: Badinerie by Sinan Ayyıldız, Ay Laçin (Traditional Azerbaijan Song) by Sinan Ayyıldız, Adem Tosunoğlu's Stranger by Adem Tosunoğlu, Barış Güney's Tohum by Barış Güney, Onbirli (Macedonian Folk Song) by A. Ozan Baysal are among the examples of this approach.

The second generation contributed to the techniques developed by the first generation. Some of the developments of PVT in this period are the simultaneous use of LH and RH to produce harmonics, RH bending, combination of percussive techniques with PVT, simultaneously hammering/pulling with different hands for the performance of finger tapping on two-partition melodies. Especially adaptations from instruments apart from pick-played *saz* such as *piano, tanbur, harp, accordeon, dutar, dombra* and *guitar* led to the use of different techniques.

Innovative *saz*s for pickless *saz* playing were also developed in this period. Sinan Ayyıldız's "double-necked *saz*" that combines *şelpe sazı* and *bam saz*, and Zeki Çağlar Namlı's "double-resonance-box *bağlama*" are among examples.

Another development in the second generation consists of works on any-tone playing based on improvisation on the *saz*. Zeki Çağlar Namlı produced notable works in this subject, adopted this approach as his style and developed an "exercise book" mostly based on the TÇT. Sinan Ayyıldız focused on improvization studies in PVT, and used this approach that requires long scale, arpeggio, melodic pattern, etc. practices on the instrument for many concerts, albums and movie soundtrack works. His live music

[70] The tuning system in this piece is A-E-C# from bottom to top, assuming that the bottom string is tuned to A. The *karar* note/fret/sound of the adaptation is A.

video titled "Yüce Dağ Başında" with the group Mesel that he founded is an example of this subject (See Url-3 [between 1:03-3:30])).

In conclusion, the current state of PVT was developed by various performers in parallel with other techniques.

2.2.3 Education

As pickless playing techniques penetrated the urban culture, these techniques began to be a part of education efforts. ITU TMSC instructor Nida Tüfekçi who knew Ramazan Güngör from his old tape recordings in TRT invited him to Istanbul, and obtained new recordings of the artist in this process. Tüfekçi tried to teach these to students in the conservatory, but failed to achieve significant success (Parlak, 2000, p.189).

Hamit Çine frequently met with local üçtelli artists and developed a method in the subject, establishing signs for various strikes. The study was a first in the field, but was inadequate in many respects and thus could not become part of general education.

PVT training was first attempted under the title "üçtelli training," and is generally part of "pickless *saz* playing techniques training" on large short-necked *saz*s. These studies are generally carried out in private musical training centres rather than conservatories.

The most comprehensive pickless playing technique training in Turkey was provided by Erol Parlak Musical Center[71] and Erdal Erzincan Musical Center that were established in the 2000s, and later in musical centres established by the students of these institutions. Erol Parlak Musical Center was one of the institutions in which we studied, and taught pick- and pickless-playing techniques together. Pickless-playing training generally focused on the proper execution of the techniques, and their first priority has been to produce clean, rhythmic sound. The fact that the students were grouped and encouraged to arrange folk music pieces in line with their ideas greatly contributed to creativity. PVT was used in these arrangements with both its melodic and harmonic aspects.

"Second generation" artist and music teacher Ali Kazım Akdağ and his colleague Uğur Yalçın Derin created textbooks[72] for 9th, 10th, 11th and 12th grades of Fine Arts and

---

[71] This institution carried on its works under the name Ekin Musical Center and Evrensel Musical Center.
[72] For detailed information, see references.

Sports High Schools, which were important due to the fact that they included both picked and pickless playing techniques. The training of picked and pickless playing techniques began almost simultaneously according to the program, and are carried out from the 9th grade to the end of the 12th grade in 8 terms, allowing the students to absorb the technique.

ITU TMSC include PVT training in their curriculum recently, and now offer it as part of the first term curriculum of the fourth year in the instrument department (Url-4). Compressing the training that takes a long time to practice and understand in a single term causes the students who lack a background in the subject to fail to properly apply the technique, and in general fails to provide a true training (Ali Kazım Akdağ, personal communication, 2018).

First Erol Parlak, then Erdal Erzincan and Devrim Canen offered PVT training in Yıldız Technical University's Art-Design Faculty. Today, PVT training is offered by Mehmet Evren Hacıoğlu as part of the "*Bağlama*" class. PVT training in YTU focuses on the use of techniques and their applications on songs (Mehmet Evren Hacıoğlu, personal communication, 2017).

The *saz* training we offer in Istanbul Medipol University offers a "şelpe class" for pickless techniques, in addition to one-on-one classes teaching pick-playing techniques, and the lessons in this class provided techniques including PVT, and taught about pieces arranged in the 90s and 2000s to students.

Apart from these, the frequently used pickless playing techniques didn't become part of conservatory curricula. The main reason for this is the *saz* education approach that was shaped based on the equation "pick pattern = regional musical character" that was adopted by artists who founded the conservatories who were part of the "radio approach" and worked in official institutions. Another important reason is the fact that conservatory instructors who couldn't catch up with the rapidly evolving process, and failed to improve themselves on this technique.

The first method that systematically introduced PVT, along with all its development on large *saz*s was Erol Parlak's "Şelpe Metodu 1 (Şelpe Method 1)" first published in 2001, and then in 2002. This work introduces PVT's history, explains sub-techniques in detail, introduces a symbolization system to annotate the techniques, and asked students to practice the systematic exercises. The method was designed in three parts, and each part addressed a separate sub-technique of pickless *saz* playing techniques (PT, TÇT, and PVT). This method offers the exercises necessary to teach PVT in three stages using a pedagogic approach.

Parlak published a 3-language version of this method in Turkish, English and German after further developing the subjects, changing the figures and adding a VCD containing the video and sound recordings of the exercises in 2010. This remake method (*Bağlama* (*Saz*) Okulu *Saz* Schule) arose as a more refined method distilled from the experience of the developments in years. The novelties in this method in comparison to the first method are more detailed and enlightening explanations of the subjects, detailed presentation and explanation of the notations of each technique, detailed explanation of techniques such as bending and vibrato that were not part of the first method, the addition of new symbols for these techniques, and the addition of exercises in different scales before the songs (Parlak, 2010).

Erol Parlak also published "Şelpe Metodu 2 (Şelpe Method 2)" in 2005 for students who completed the first method, and aimed at the more advanced applications of the technique. This method focused on the application of the techniques in musical language, rather than teaching new techniques. The chapter on the song arrangement approach in pickless playing techniques explains how to benefit from all şelpe techniques, using the piece "Efsaneyim" arranged by Parlak as an example. Moreover, Parlak (2005) offered explanations on polyphony in pickless-playing technique, and introduced arpeggios with TÇT and PVT, and playing chords using PT using basic examples.

Another method teaching PVT on large *saz*s is "*Bağlama* Metodu (*Bağlama* Method)" by Arif Sağ and Erdal Erzincan published in 2009. The first volume of the two volume method is "*bağlama düzeni* method," and the second volume is "a systematic guide to playing scales in different positions in *bağlama düzeni*." The book uses original symbols for notation. The second chapter of the first volume of this work concerns pickless *saz* playing techniques. The method is designed in three parts, and the first part of pickless *saz* playing techniques introduces the sub-techniques PT, TÇT and PVT, but concludes with a few examples that don't explain the application of the techniques. The second part also does not provide any explanations, and offers mixed exercises on the three sub-techniques, without identifying them. The third part is a song repertoire (Sağ & Erzincan, 2009).

Our personal experiences and views lean towards using Erol Parlak's "*Bağlama* (*Saz*) Okulu *Saz* Schule" method that addresses the subject more systematically as a basis for the modern education of pickless *saz* playing techniques. Other methods should be used as song repertoires. Additionally, in addition to the songs published in the methods, all works arranged by the first and second generations have to be examined, and the student has to be provided with an up-to-date education. In terms of a holistic repertoire, in addition to adaptations developed in the urban musical culture, Yörük Türkmen music, Eastern Anatolian Alevi-Bektaşi music, and other techniques and works identified in other Anatolian regions should also be part of the curriculum. The repertoires of the Central Asian and Iranian members of the *saz* family such as the *dutar, dombra, tenbur* and *komus* can also be included in the curriculum. The education of pickless *saz* playing techniques that are increasingly developed each year by stretching its capabilities, and the capacity of which is better understood with each passing day should also be updated based on these new conditions. The pickless *saz* playing techniques instructors should continuously update their knowledge, and base their education-training on this updated knowledge.

Indeed, we established a continuously updated, original curriculum beginning in 2006 including methods of pickless *saz* playing techniques, and extra-methodical songs and techniques (See Appendix B) (Ayyıldız, 2018). The curriculum includes many new elements that we developed, in addition to those addressed in methods. The elements concerning PVT are the following: Finger technique in Teke region songs, harmonic structures in PVT, finger arpeggio techniques, expression of chords using finger arpeggios and finger arpeggio exercises, accompaniment playing styles, applications of 9th, 11th, 13th chords on the fretboard, accompaniment practices in different rhythmic patterns, the use of pickless *saz* playing technique in a group: the role of pickless *saz* playing technique in works arranged for multiple instruments, the concept of adaptation and its application on the pickless *saz* playing technique, transposition, modulation, use of pickless *saz* playing technique in tuning systems other than *bağlama düzeni* and improvisation in PVT.

We provided training to hundreds of students using this continuously updated curriculum during our career as an instructor since 2006.

2.2.4 Notation

Currently, the notation of most folk songs use the approach of notating and teaching the A (La) sound on the treble clef that began with the adoption of the A pitch for the *Dügâh* sound by Dârulelhan, practiced by researchers who carried out compilation studies, and later adopted by TRT, Turkish Music Conservatories, etc. Microtonal intervals on the *bağlama* are notated using the approach of identifying the approximate *koma* amount using a number above the accidental sign that was adopted by Muzaffer Sarısözen (Altınay, pp.114-117).

Examination of *bağlama* methods that are previously prepared for pick-playing techniques reveal that many methods are methodologically inadequate, and are produced mainly based on commercial concerns (Ergen, 2012, p. 198). Ergen (2012) examined *bağlama* methods produced between 1959[73] and 2012 in his graduation thesis, and his data indicates that many works are inadequate in terms of notation and transcription signs, although sharing a common approach concerning major signs. Accordingly, pick strikes are generally indicated using an arrow sign (↓↑) indicating the strike's direction. When the picking patterns like *serpme, sıyırtma, çırpma, çiftleme, tarama* need to be expressed in pick-playing notation, different methods use different types of arrows based on the arrow notation (Ergen, 2012).

LH hammer-ons/pull-offs are not indicated in many methods. Hammer-on/pull-off signs began to be used only after the 1990s, and the sign ∨ was frequently used for hammer-on, and the sign ∧ for pull-off. LH fingers are usually indicated in Arabic numerals. LH fingers are usually numbered as 1 (index finger), 2 (middle finger), 3 (ring finger), and 4 (little finger). The signage used for LH thumb varies. The most important ones are "5," "+," "x," "B," and "b". Recently, the use of "5" for LH thumb became widely adopted. The general approach in string numbering is to use the numbers 1, 2 and 3 for string courses, and to encircle them as a symbol. While these signs and their usage differ among methods, it is possible to say that there is a general unity.

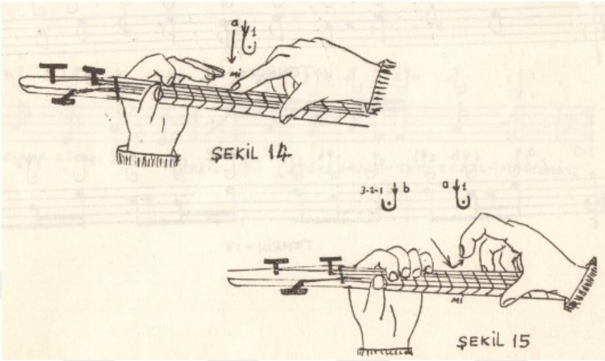
The number of methods that include PVT training are relatively few. The first notes that were written for PVT belong to *boğaz havası*s in *üçtelli* repertoires.

---

[73] The first bağlama method was published by Şemsi Yastıman in 1959 (Ergen, 2012).

The "üçtelli method" guidebook published by Hamit Çine in 1981 is the first publication for the training of pickless playing techniques including PVT. Çine (1981) uses the monophonic notation in this publication, and used original transcription signs to express the technique. This publication uses the term *döğme* (beating, one of the regional names of PVT) for PVT. Çine uses "a" for RH and "b" for LH, and tries to annotate PVT using the symbols in Fig 2.19.

(a)



(b)

Figure 2.19 : Hamit Çine's "Üçtelli Metodu" : (a) PVT symbols and representation of postures. (b) PVT Notation (Çine, 1981).

The work "Ramazan Güngör ve Üç Telli Kopuzu"[74], is a non-educational research book, published by Savaş Ekici states that it uses a simple and guiding signing system for Ramazan Güngör's technique. However, no signs were indicated for PVT, and the hammer-ons and pull-offs in PVT were indicated using slurs (Fig.2.20).

Figure 2.20 : PVT notation of Savaş Ekici (Ekici, 1993).

After such attempts, more comprehensive thoughts on PVT notation arose, as the technique penetrated urban culture.

[74] "Ramazan Güngör and His Three-Stringed Kopuz". Ekici uses the term *kopuz* in his title due to the fact that Ramazan Güngör identifies his *saz* with this term. Parlak (2000) states that Ramazan Güngör used the terms he used from urban musicians with urban researchers, and that kopuz is not a term used in the region.

Erol Parlak's Şelpe methods (2001, 2005, 2010) use a PVT notation that cover the elongated sounds of three strings (Fig. 2.21). While this approach is not applied to the simple, beginner-level exercises in the first chapters of the method, are used in later exercises and the notation of the songs in the method.

Figure 2.21 : Polyphonic notation of Erol Parlak (Parlak, 2010).

Parlak explains this approach as follows:

> The conventional notation system, following only the main lines of a piece, tends to neglect various other aspects of the music. For this reason, this course introduces a new compound and polyphonic approach to notation which, using arrows to indicate the RH technique, notates the pieces rhythmic, melodic, harmonic structure in full detail. Displaying the pieces' rich structure, this also promotes effective development of the solfege skills and the sense of polyphony. (Parlak, 2010)

According to this approach, the length of a note on the stave is as long as its actual sound. Thus, the notation almost completely reflects the actual performance. This notation approach not only expresses when to hammer/pull the note, but when the fingers will be lifted from the fretboard if the sound is not an open string, and how long the note will be sustained if it is an open string.

This notation preference provides explicit information on performance, and according to our experiences, while it is quite complicated for the student at first, can be rapidly read after it is understood.

Parlak's "Şelpe Metodu 1" (2001) expresses RH and LH techniques and the timbre expressions using detailed transcription signs. Parlak examined various *dutar, dombra, oud, piano, guitar* and *violin* methods before deciding on the signage, and developed a notation system that is suitable to the *saz*'s structure. All of Parlak's şelpe methods use these transcription signs that reflect the timbre richness of the şelpe technique. Dr. Martin Greve states the following on this notation:

> "…This concentration on timbre pushes European notation to its limits: Western notation can illustrate melodies and rhythm completely, but not timbre. In reality, it is impossible to notate

modern *bağlama* music. For this reason, the *bağlama* is up against difficulties similar to those which modern Western composers had to overcome. Composers of western music also compose with timbre and for this reason, must develop new notation methods or at the very least, fill out the existing notation with a host of added symbols. Much modern sheet music reflects a clear need for a more detailed notation. Here, Erol Parlak uses a language to explain how these new and non-transcribable timbres are obtained – an unbelievably clear language. The student must read this book with *bağlama* in hand, frequently pausing to imitate and so internalize each of complex motions explained here. But in time, the reader will find reach extra ordinary experiences in timbre…Though notation odd at first glance, after a short period of adjustment it will become surprisingly easy to read. (Parlak, 2010, p.14-15)

"Transcription signs" used by Parlak in his methods are presented in Appendix C. We see that the signs used for PVT are ⋁ and ⋀ in these transcription signs. Arabic numerals were used gain for LH fingers, as in pick-playing methods, and these numbers are used below the stave. For RH fingers, the initial letters of the fingers' names in Turkish were used, i: [işaret parmağı (TR) = index finger (EN)], o: [orta parmak (TR) = middle finger (EN)], y: [yüzük parmağı (TR) = ring finger (EN)] and s: [serçe parmak (TR) = little finger (EN)] enclosed within ⋁ and ⋀ signs. Parlak specified the string numbers and *vibrative impact source*[75] signs above the stave, and the signs indicating LH finger numbers below the stave (Fig. 2.22).

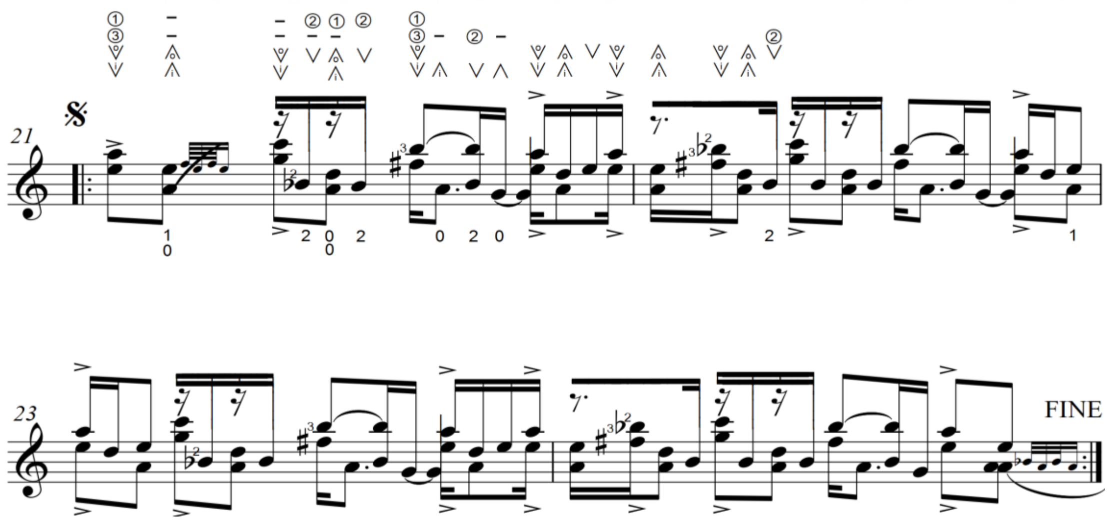


Figure 2.22 : "Transcription sign" use in PVT notation of Erol Parlak (Göç Yolları) (Parlak, 2010).

Arif Sağ and Erdal Erzincan's (2009) "Bağlama Metodu" that include teaching PVT used different signs (See Appendix D). In contrast with Parlak's usage, all finger

---

[75] The source that vibrating strings to generate a pitch

numbers are placed below the stave in PVT, and above the stave in TÇT. Different signs are used to indicate different hands' hammer-ons and pull-offs by LH and RH. Arabic numerals were used in line with the general approach for LH fingers, and the "pimac" system used in *guitar* methods were adapted to "pimas" for RH fingers. String numbers are identified using encircled numbers as in Parlak's notation. To emphasize the difference between two hands, blue signs were used for RH and red signs were used for LH (Fig. 2.23).

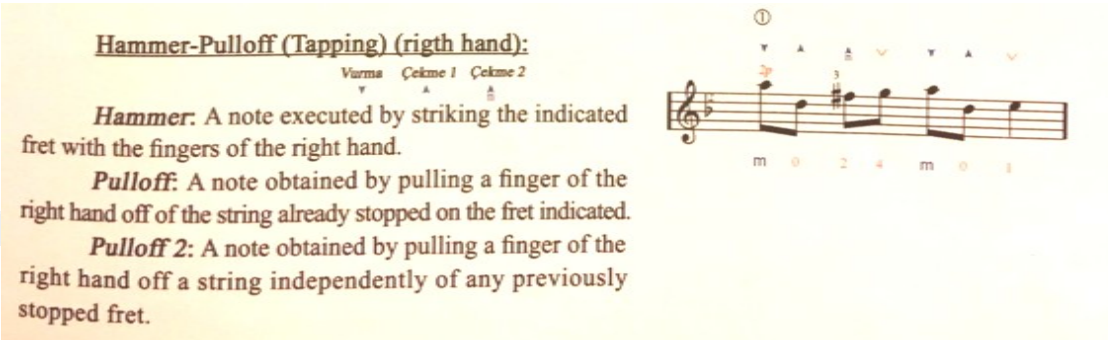


Figure 2.23 : PVT symbols in "Bağlama Metodu" by Arif Sağ & Erdal Erzincan (Sağ and Erzincan, 2009).

Moreover, the notation of the exercises and songs in this method were made in line with classical notation, and elongated sounds were not used. The " " sign was that indicates that fingers are kept waiting to sustain the sound for a duration were used (Figure 2.24, Measure 3).

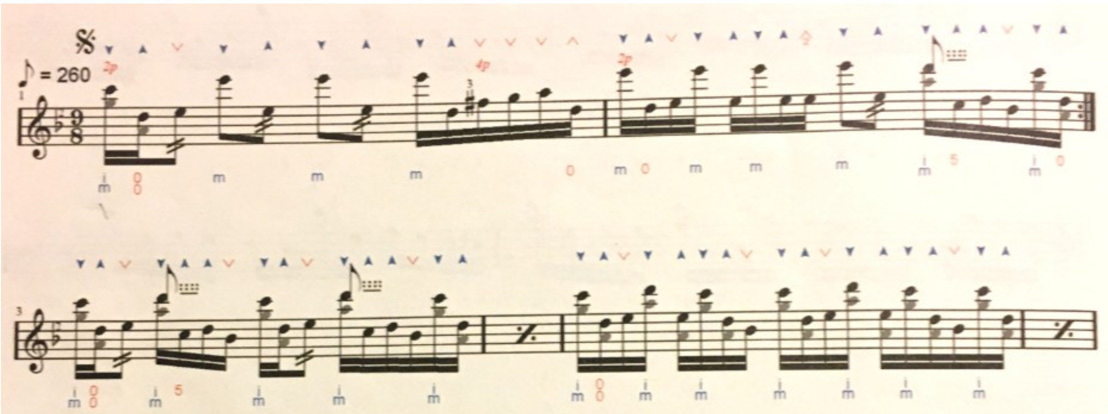
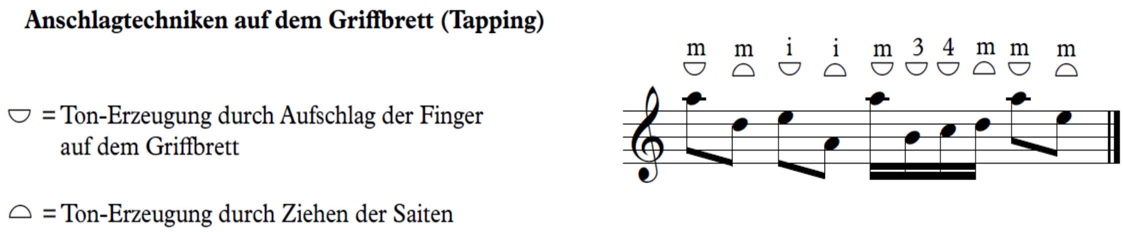
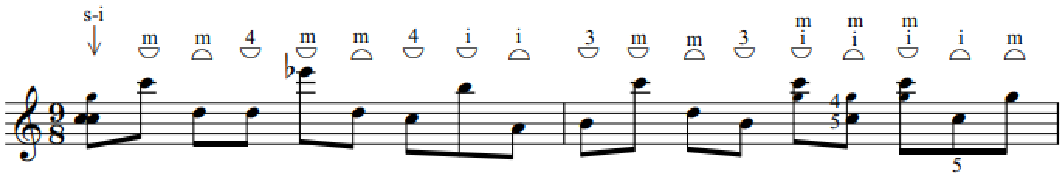


Figure 2.24 : "Transcription sign" use in PVT notation in "Bağlama Metodu" by Arif Sağ & Erdal Erzincan (Sağ and Erzincan, 2009).

PVT notation of Kenan Tülek also used Arabic numerals and "pimas" system as in Erzincan & Sağ for LH and RH fingers, respectively. Tülek adopted the approach of indicating string numbers using encircled Arabic numerals, but adopted another approach for hammer-on/pull-off signs and used ◡ and ◠ signs instead of V and Λ signs (Fig. 2.25).



(a)



(b)

Figure 2.25 : Kenan Tülek's studies on PVT notation : (a) PVT Symbols (Tülek, 2015, p.38). (b) "Transcription sign" use in PVT notation (Tülek, 2018).

Koray Berat Sarı's PVT notations are interesting in terms of their simplification for polyphonic notation. He adopted a simplifying approach for polyphonic notation in his hand technique notations. Accordingly, if a finger is kept waiting for the pull-off movement to produce another sound after a sound is produced by hammering the finger on the fretboard; a slur can be used between those two notes. If the finger is only kept for sustain, one end of the slur is left open (Fig. 2.26).

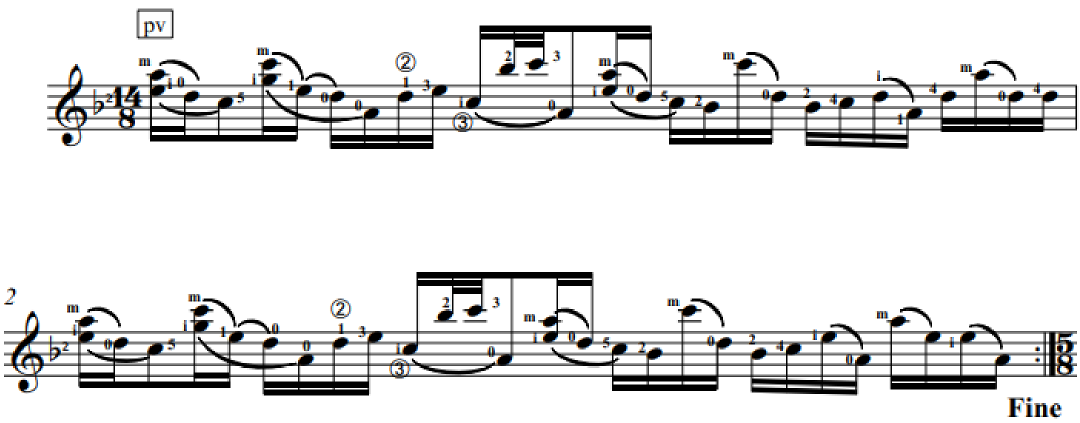


Figure 2.26 : PVT notation and symbols in Koray Berat Sarı (Koray Berat Sarı's arrangement of Armenian Folk Song *Abaran* measures 1-2) (Sarı, 2016).

We will use Parlak's transcription system in our thesis when detailed notation is necessary because it is the school in which we studied, and it is more suitable for our purposes. Additionally, a new position symbolization system that we developed, that includes finger position and fingering, and that allows performance comparisons when examining relations between melodic patterns will be used, especially for the notation of melodic patterns on the *saz*[76]

2.2.5 Morphology of *saz*s that are played using PVT

Koruk (2009) provided some technical information about the structure of *üçtelli*, on which Teke region's Yörük Türkmen communities, where PVT is traditionally used (Fig. 2.27).

> "Üçtelli" varies between 60 and 90 cm in the region...The body is generally made from mulberry wood and is pear, ellipse or axe shaped. The neck and body of the üçtelli is sometimes also made from a single piece of wood. In usual, the neck and the soundboard is concave. When the neck is separately constructed, pine, oak and other woods in the area are used, and the body is constructed with pine. Two or three holes are drilled on the body of some üçtellis in order to increase the sound volume.
>
> The number of fret usually varies between seven and twelve. Frets are tied using nylon or metallic threads, and a special knot is used to prevent the knot to cause a nuisance during performance.
>
> Holes or notches are cut on the side of the neck in order to tighten the metal frets. String gauges vary between 0.15 mm and 0.30 mm. (Koruk, 2009, p. 53)

Figure 2.27 : *Üçtelli bağlama* (from Erol Parlak *saz* collection, photo by Sinan Ayyıldız).

While names such as "üçtelli cura" due to its small dimensions, or "parmak curası" due to the playing technique are used in the region, it is widely believed that these are

[76] See Chapter 3.3 for detailed information.

misused names that emerged after the larger *saz*s came to be used in the region's music (Parlak, 2000, p. 117). Ramazan Güngör, one of the most important performers in the region (1924-2004) used the name "üçtelli kopuz" for his *saz*. However, the fact that other performers and luthiers of the region are unfamiliar with the term, it is generally thought that Ramazan Güngör, who frequently met with urban musicians, personally used this term that he heard from them (Parlak, 2000). In contrast with *ikitelli*s[77], a single string is used in each string course on üçtelli *bağlama*s. According to Parlak, this is due to the playing technique of *the üçtelli bağlama* (Parlak, 2000, p. 117).

When PVT was transferred to larger *saz*s, the first attempts were made on short necked (14) and seven stringed *saz*s that are used in pick-playing technique. Later, the idea that these were not suitable for the rapidly evolving pickless playing techniques and some modifications were made on the *saz*.

The first of these modifications was the lowering of the *eşik* (bridge) (Erol Parlak, personal communication). The height of the bridge is such that will not affect the performance in traditional hand-played *saz*s. The bridge height of seven-stringed urban *saz*s is adjusted for pick-playing, and is higher than *saz*s that are traditionally played by pickless playing style. The main reason for the increased bridge height is to be able to strike more easily with the pick, and the requirement of a higher sound volume. However, while the pickless playing technique was being transferred to larger *saz*s, and especially due to the fact that the PT could not be easily implemented on these *saz*s, the height of the bridge was decreased. This led to a reduction in the amount of force necessary to obtain sound from the strings, and the controlled dynamics and agility allowed an easier implementation of PVT on large *saz*s[78].

In order to obtain a clear sound from all frets in these low-bridge *saz*s, the levelling operation for *saz*s gained more importance, and indeed this precise levelling began to be called "*şelpe tesviyesi* (şelpe levelling)," and the *saz*s made for pickless playing techniques came to be known as "*şelpe sazı* (şelpe *saz*)" (Fig. 2.28).

Another "return to basics" in şelpe *saz* is the change in string preferences. *Şelpe saz* was initially stringed by removing the *bam* string of the 7-stringed pick-played *saz* and

---

[77] Today, ikitelli bağlamas of Teke Region have 2 strings in the lower course, and 1 string on the upper course, resulting in 2 courses and 3 strings.
[78] It is known that instruments with bottom strings, nearer to the fretboard that are called "low action" are preferred for the tapping technique, which corresponds to PVT on the guitar (Jordan, S., 1984).

replacing it with a steel string, with three courses and six strings (2+2+2) (Erzincan, 1998, p. 20), but today, it is generally used in line with the tradition with three courses and three strings (1+1+1) as *üçtelli* has .

Figure 2.28 : *Şelpe saz* (from Sinan Ayyıldız *saz* collection).

Pickless playing techniques can be applied to almost any *saz*, but for some reasons, performers don't prefer to use *bam* strings in addition to steel strings[79]. These reasons may be listed as:

- Not using bam strings on *saz*s such as *üçtelli, ruzba, dede sazı* that are traditionally played by bare hands.
- The fact that clean sounds cannot be obtained when *bam* strings are used in conjunction with steel strings, especially in PVT.
- The fact that old *bam* and steel strings produce different pitches, especially on higher frets on which PVT is usually applied.
- The fact that finger presses have to be stronger when playing a *saz* that has a bam string in addition to steel strings[80].

[79] In the seven stringed pick-played *saz*, PVT is sometimes used in concerts (for reasons such as not carrying an additional *saz* to the concert venue, not having to carry out a second sound check for the second *saz*, et(c).

[80] Tappings that are made to obtain a clean sound in PVT require a quite high finger pressure.

- In case there are more than one strings attached to each course, some vibrato methods such as bending become difficult.

The bam string is preferred in the *saz* with 3 bam strings (one in each course) called "sırma telli *saz* (gilded stringed *saz*)," "tenor *saz*," "bam *saz*," "bam-*saz*" by performers, when using pickless *saz* playing techniques. This *saz* is especially used in *bağlama* ensembles and folk music orchestras, and in albums containing compositions with different sized *saz*s, and is preferred because it corresponds to the sound spectrum between the şelpe *saz* and bass *saz*. Different sizes of *saz*s can have different sound ranges. The following figure presents the approximate ranges of pickless-played *saz*s (Fig. 2.29).

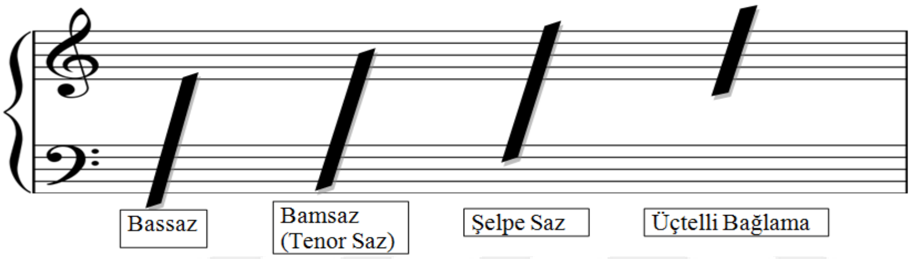


Figure 2.29 : Comparison of approximate ranges of pickless-played *saz*s.

The idea of combining "pickless playing techniques" of Anatolia and Asia in a single instrument led Erol Parlak to carry out some üçtelli *saz* experiments. The dimensions of these *saz*s was not very different than üçtelli *bağlama*, but it was large enough to be able to play songs made for existing Central Asian *saz*s, and it was used by Parlak for many years (Parlak, 2000).

One of the major problems encountered by performers after PVT was applied to larger *saz*s is the "*saz* holding problem." The body of the *saz* in pick-playing is fixed between the inside of the right forearm and the belly of the performer. Thus, the LH doesn't have to hold the neck during position changes and remains comfortable. However in PVT, the RH doesn't hold the *saz*, and the fretboard is carried completely by the LH. While this is not a problem in the traditional performance of *boğaz havası*s performed on the small-sized üçtelli *bağlama* where RH fingers only tap on one fret, it is a serious problem for performers who use larger *saz*s and need a more advanced level of performance.

We experimented with some designs that fix the *saz*'s body on the performer's leg as a solution to this problem, but the carved construction of the traditional *saz* prevented this solution from working as expected.

A definitive solution to this issue was reached in the double-necked şelpe *saz* project that we designed with luthier Aslan Türkmen in 2005. We started from the idea that we could combine the three-steel-stringed şelpe *saz* and the "tenor" 3-stringed *bam saz* in a double necked *saz*, and designed the back of the body similar to a *guitar* body. This allowed playing the *saz* while standing up, and the neck-strap removed the problem of holding the *saz* for PVT, especially for stage performers.

Later, we experimented on this *saz* with different luthiers. One of these is the *saz* that combine different *saz*s (4 *saz*s) on two sides of a thin and full body; a silent *saz* with two face, two necks and that doesn't have an acoustic sound made by luthier Hacı Akpınar. We used this instrument with two *saz*s in front and two *saz*s in back, with the three stringed *şelpe sazı* (1+1+1), 7 stringed pick-played *saz* (3+2+2), 2 nylon stringed *dutar* (1+1) and 4 nylon stringed *fretless saz*.

Later, in order to obtain a *saz* with greater acoustic features, we employed luthier Süleyman Aslan to construct a two-necked acoustic *saz* for the "Erol Parlak & Sinan Ayyıldız *Bağlama* Duo" project we had with Erol Parlak. This *saz* experiment was constructed based on the acoustic calculations of a *guitar* body, and as a result a form of *saz* that has a much louder volume than the traditional *saz* form, that preserves the timbre characteristics of the hand-playing technique, and that is especially effective for PVT playing (Fig. 2.30). Today, this is the *saz* form we prefer for our PVT studies.

Figure 2.30 : Double necked acoustic *saz* for pickless playing technique.

While the idea that playing while standing up is not suitable for the traditional performance posture is prevalent among *saz* performers and listeners, this is far from the truth. Parlak's statement in this regard is important:

> We know that the *saz* was carried hanging on the neck while riding on a horse. *Saz* was played with this strap while standing up, or while sitting cross-legged in the nomadic lifestyle. Today, the extensions of the tradition of standing up during performance can be observed in the âşık tradition of North-eastern Anatolia and the âşık tradition of Azerbaijan. (Erol Parlak Personal Communication)

3. THEORETICAL FRAMEWORK FOR DEFINITION OF MELODIC PATTERN CREATION THROUGH PVT

3.1 Need for a New Terminology and Updated Notation

In order to establish a proper system for performance in our study on melodic pattern creation through PVT, we have to develop some existing concepts to work with PVT, and also to invent some new concepts. Moreover, we preferred to make some modifications on the notation that is used in the study.

We previously mentioned that the *saz* family has members of varying dimensions and timbre capacities. We have to identify the characteristics of the "*saz model*" used in the study, in order to obtain standardized data as a result. All patterns and notations that are used in the study are created by taking the standard characteristics of this *saz* into consideration. We believe that some terms in the "*saz* terminology" that will be used when defining these characteristics also have to be examined, and modified if necessary, in order to ensure scientific precision. We will examine these terms and suggest new terms in this study. "Short-necked *saz*" and "long-necked *saz*" are among the most well-known terms in this field.

Performers have been using terms such as "Re Kesik (D cut)," "Do Kesik (C cut)," or "Si Kesik (B cut)" to define the number of chromatic columns on the fretboard of a short-necked *saz* based on the long-necked *saz*. Contrary to popular belief, the terms such as short-neck, long-neck, D cut, C cut, and B cut do not define the length of the neck[81], but the pitch range that a single string course can produce on the fretboard. We believe that a new concept that identifies the number of chromatic columns, and thus the number of positions on the fretboard is necessary instead of these terms that are not scientific and that are indeed understood differently by different people. Based on this approach, we will use the term "14 *saz* ("14'lük *saz*" in Turkish)," short for "with 14 chromatic columns" instead of the term "short-necked *saz*," based on the

[81] The neck length of a "short-necked *saz*" with a large body, may be longer than the neck of a "long-necked *saz*" with a smaller body.

position definition in Chapter 3.1.2.2. Accordingly, the terms "14-*saz*," "12-*saz*," and "15-*saz*" will be used to refer to short-necked *saz* variations "C-cut *saz*," "D-cut *saz*," and "B-cut *saz*," respectively. Thus, the *saz* type known as "long-necked *saz*" has to be identified with "17-*saz*." Since these terms are used to refer to the neck length, the names of the members of the *saz* family and their body dimensions can be used in conjunction. For example, terms such as "40 body 15-tanbura," "45 body 17-divan *saz*," "30 body 14-cura" can be generated using this terminology.

We have to define some technical properties of the "*saz model*" that we will use to achieve standard results in our study. The "*saz model*" used in our study:

- has a body length of 40 cm.
- is stringed with 3 strings (1+1+1), one on each course.
- is a 14-*saz*.
- has the strings that are tuned to the *bağlama düzeni*, with the bottom string at D4, the middle string at G3, and the top string at A4, based on a 440 Hz tuner.
- is a strapped şelpe *saz* that is leveled according to the pickless technique. This means that it is a *saz* that does not pose technical difficulties between notes due to its bridge height and leveling, and that does not have the "*saz* holding problem."

This allows the range of the strings, and of the *saz model*, to be between G3 and E5. Figure 3.1 shows the melodic range of the strings and the entirety of the *saz model*.

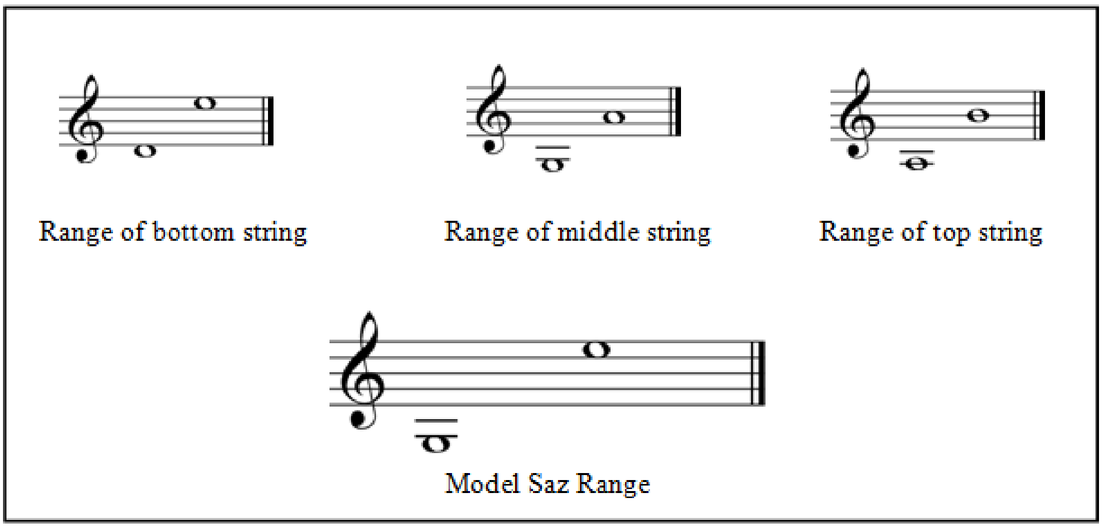


Figure 3.1 : Melodic range of *saz model* and its strings.

Additionally, the fretting system

- of the *saz model* is the contemporary *saz* fretting that is commonly used by PVT performers, as described in Chapter 2.1.5, Figure 2.10.
- has microtonal frets that are configured to be 35 cents lower than the chromatically configured frets[82].

The appendix section presents the performance of scales and melodic patterns in a suitable key on the stave as an example. Our study will use the Parlak transcription signs that were suggested by Parlak (2000), and that are adequate for describing many performance situations in PVT (see appendix C). The treble clef (G-clef) was used as the clef for the notation of the *saz model*, and sub-octave treble clef was also used as necessary.

An important modification to the notation system in this study concerns the expression of microtonal frets on the *saz*. Microtonal frets are described, especially in the notation of pieces that are performed on the *saz*, with the approach of "indicating the amount of *koma* with numbers above the accidentals". As stated in the previous chapters, this usage is not compatible with the real microtonal values on the *saz model* that we defined. The reason for the widespread use of this method is more of a habit in the community, rather than scientific basis. We think that another approach is necessary to describe microtonal frets on the *saz*.

Stone (1980) states the quarter sharp (𝄲) and three quarter sharp (𝄰) symbols suggested by Tartini in 1756. After that some flat adaptations are made and one of them, a regular flat written backward sign (𝄳) are commonly used especially in atonal woodwind music (Stone, 1980, p.69). Quarter sharp and quarter flat symbols adopted in the AEU system and they are used together with some invented signs for microtonal notation by Arel and Ezgi.

Whereas in Western music, musicians such as Arnold Schoenberg, Harry Partch, Charles Ives, Karel Husa, Brian Ferneyhough, Easley Blackwood, Ben Johnston, Krzysztof Penderecki, who make "contemporary music," developed many symbols

---

[82] Based on common practice of PVT performers, -35 cent value is selected for *saz model*. See Chapter 2.1.5. for more information

for the notation of their works by using various methods (Garett and Hopkins, 2013). However no standard international approach is developed yet.

One of the most frequently used methods to describe quarter tones is the arrowed accidental signs (Stone, 1980, p.67). The usage of these signs differs among composers, and the same symbol can be used to describe a different degree of lower/higher pitch compared to a certain tempered note (Tolgahan Çoğulu, personal communication, 2017).

We already stated that the microtonal frets on the *saz model* were adjusted to 35 cents lower than chromatic frets. Since all divided chromatic columns are separated with a fret of equally lower pitch, these frets can be more simply described by arrowed accidentals. Based on this approach, we use the natural sign with a downward arrow (♮↓) instead of the symbol $\flat^{2}$ for the fret that is 35 cents lower than the natural note, and the sharp symbol with a downward arrow (♯↓) for the fret that is 35 cents lower than the sharp pitch instead of the $\sharp^{3}$ symbol in this study (See Table 3.1). These two symbols can describe all microtonal frets on the *saz model*. The main reason for adopting this notation in this study is to easily show the relationship between microtonal frets and tempered frets to the performer. We believe that describing a microtonal fret that is closer to a natural fret with a flat sign causes unnecessary complications, especially for transposition. Thus, we chose the downward arrow natural symbol to describe these frets in the notation. Similarly, the frets that are described with the downward arrow sharp fret are closer to the sharp sound than the natural sound. This is why these frets are shown with a downward arrow sharp symbol. When a transposition is made on the notation for any reason, a downward arrow flat symbol can be used for the fret that is approximately 35 cents lower than the sound that is described with the flat sign (See Table 3.1). Thus, the accidental signs that will be used in our study are presented in Table 3.1.

Table 3.1 : Microtonal notation in this study.

Microtonal Accidentals	Explanation
♮↓	Used to describe the fret that is 35 cents lower than the natural fret.
♯↓	Used to describe the fret that is 35 cents lower than the sharp fret.
♭↓	Used to describe the fret that is 35 cents lower than the flat fret.

A notation system can be designed for *saz*s that contain more frets than the contemporary *saz* fretting system that is based on "17 frets with non-equal intervals," or the cent amounts that correspond to the accidental signs can be defined at the beginning of each musical piece in order to resolve these issues. The exact solution of this issue is the subject of another study, and not included in the scope of this study.

The performance of melodic patterns on the *saz* varies according to the patterning method that is applied, and the directional properties of the melodic patterns. This is why these patterning methods and pattern types are assigned some nomenclature. A coding system is also developed to express the melodic pattern exactly to this purpose.[83]

The performance of melodic patterns with PVT causes the emergence of three different structures.[84]

1- *Position difference class* (PDC)

2- *Pitch generation technique order pattern* (PGTOP)

3- *String order pattern* (SOP)

Position difference class is an expression that is used to describe the position groups that emerge due to the positional differences of the two hands. In order to examine this concept in detail, the new terminology that we will establish needs to develop the concept of position with regard to PVT, and to classify the fingering types that are produced by the upper extremity movements of the body during PVT performance.

As it is well-known, having a good knowledge of the usage opportunities of different positions and fingering types in *saz* performance is considered an indication of mastery. However, the currently used concept of position is inadequate with regard to PVT. The concept of "fingering types" is not known to, or is ignored by *saz* performers and *saz* method authors. The LH and RH positions, LH and RH fingering types, and the PDC structures that emerge due to the positional differences of the hands will be significant tools for our study when defining the performance of melodic patterns.

---

[83] See Chapter 3.2 for detailed information.
[84] See Chapter 3.5 for detailed information.

The meaning of the word "position" is location, place. The concept of position in the performance of string instruments is also used to describe the position of the LH, which is the hand that defines the pitch, on the neck[85]. However, since RH is also used on the fretboard in PVT, we will need a concept of "RH position." This concept does not exist in previous literature, and will be defined in our thesis study.

Pitch generation technique order pattern (PGTOP) is the pattern that is generated by the order of pitch generation techniques that are sequenced in the melodic pattern. A new method of expressing pitch generation techniques was necessary in order to describe this type of pattern. The codes of pitch generation techniques (PGTs) are defined according to the *vibrative impact source*, and the *pitch determination source*.

Finally, the string order on which the melodic pattern is played with PVT also creates another pattern. These structures are called *string order pattern* (SOP) in our study, and they are important in order to define the melodic pattern in PVT.

3.2 Melodic Pattern Coding

There are 3 different melodic movement types between two successive pitches: 1-) Move up a step or leap (Ascending Movement) 2-) move down a step or leap (Descending Movement) 3-) Stay on same note (Prolonging pitch) (Öztürk, 2014, p.141)

Melodic patterns consist of at least two successive pitches. In this study, the melodic patterns will be shown with the following coding that describes the order of melodic movements in the pattern (Equation 3.1.).

$$Melodic\ Pattern\ =\ [a, b, c, etc \ldots (r)] - [z] \tag{3.1}$$

In this coding system, the bracketed letter a=first melodic movement, b=second melodic movement, and c=third melodic movement (if any). Thus, the coding may continue for the number of melodic movements in the melodic pattern. The melodic movement that describes the relation between the last pitch of the pattern and the first pitch of the repeat copy of the pattern is shown with a bracketed letter r in the coding system. This melodic movement is called *connector movement* in this study.

[85] Additionally, the term "posture" can also be interpreted as referring to the position. While this may hold true in English, it is not true in Turkish. Bağlama performers interpret "the hand's posture" as posture, and "position," as position as defined here.

In addition to the bracket that describes the pattern, the letter z in another bracket describes the melodic movement between the first pitches of two patterns, and thus the melodic movement of the whole melodic pattern. This melodic movement is called *pattern movement* in this study.

3.2.1 Melodic patterning methods

Melodic patterns are repeated on another pitch through two different methods: chromatic transposition, and modal transposition. The melodic pattern coding system specified in the previous section varies according to patterning methods.

3.2.1.1 *Tonally unconnected melodic patterning*[86] (TUMP)

Tonally unconnected melodic patterning (TUMP) is the type of patterning that is carried out by preserving the interval relations of a melodic pattern. In this regard, TUMP causes a chromatic transposition of the melody.

The a, b, c, r and z values in TUMP describe the interval of melodic movement. In this study, we will use numbers that describe the interval adjacent to the ↑ and ↓ symbols in semitone interval units when coding this patterning type. For example, ↑ 1 indicates a semitone ascending movement. Assuming this movement is a 100 cents ascending movement, melodic movements that also include the microtonal frets in fretting of *saz model* can be described with values such as ↑1.65, ↓ 2.35, etc.

When coding the pattern: The "0" as *z* value means that TUMP makes it repeat the same pattern. The number (*n*) with upward arrow "↑ n" as *z* value means TUMP causes an pattern moves in ascending way with amount of *n* semitones, and The number with upward arrow "↓ n" as *z* value means TUMP causes an pattern moves in descending way with amount of *n* semitones.

---

86 Marius Scheneider (1934-1935) categorizes types of parallelism in two categories: Tonally unconnected parallelism and tonally linked parallelism. Jordania (1998) explains tonally unconnected parallelism in vocal music as follows: "Tonally unconnected parallelism, or when two or more parts are singing the same melody in parallel movement, keeping all the time the same interval. In most cases this means that parts are singing without the unifying tonal system. Vocal parts singing without the shared tonality may indicate that this is a case of “thick unison”, or when singers intend to sing in unison, and sometimes they believe they are singing in unison, but in reality they start from different pitches and proceed as they started – maintaining the initial interval throughout". As explained in this definition, one of these two parts that move in parallel at the same time, is a copy of the other that is produced with the TUMP method. This term is used for this type of patterning based on this similarity, and Scheneider's definition.

For example, a pattern that is assigned the TUMP coding $[\uparrow 1, \downarrow 4, \uparrow 1, (\uparrow 3)] - [\uparrow 1]$, beginning on the E pitch is presented as follows on the stave (Figure 3.2).

Figure 3.2 : $[\uparrow 1, \downarrow 4, \uparrow 1, (\uparrow 3)] - [\uparrow 1]$ on E.

The pattern advances with chromatic transpositions of half-pitch ascending intervals. The z value in the pattern's coding describes the direction and amount of the pattern's advance. The z value is the directional sum of all values in the first bracket.

3.2.1.2 *Tonally linked melodic patterning*[87] (TLMP)

TLMP is the type of patterning that causes the modal transposition of a melodic pattern that is related to the degrees of a certain scale. In this type of patterning, the degree relationship between pitches is preserved when the melodic pattern is transposed. The interval relationship between pitches varies frequently depending on the structure of the scale.

In this study, the formula for this type of patterning will be described with numbers that specify the degree step/skip/leaps adjacent to the $\Uparrow$ and $\Downarrow$ symbols. Values such as *a, b, c, r,* and *z* that are specified in the codings of previous sections describe the degree step/skip/leaps of the melodic movement in TLMP.

For example, a melodic pattern that is described with the formula $[\Uparrow 1, \Uparrow 2, \Uparrow 1, (\Downarrow 3)] - [\Uparrow 1]$ in the D Mixolydian scale is presented as follows on the stave (Figure 3.3.).

Figure 3.3 : $[\Uparrow 1, \Uparrow 2, \Uparrow 1, (\Downarrow 3)] - [\Uparrow 1]$ on D Mixolydian Scale.

---

[87] The definition of TLMP is also based on the concept of Tonally Linked Parallelism defined as one type of parallelism by Scheneider. Jordania (1998) explains this type of parallelism as follows: "Tonally linked parallelism, or when the parallel movement of different parts is united into one tonal system. As a result, intervals do change occasionally, for example, parallel fourths sometimes change into isolated thirds, or fifths (as this happens in some sub-Saharan African traditions), or, in other cases, minor and major thirds follow each other in a tonally specified succession (this kind of parallelism is very popular in most of European and some African traditions). As evident from this definition, one of these two parts that move in parallel at the same time, is a copy of the other that is produced with the TLMP method. This type of patterning is called TLMP, based on this similarity, and Scheneider's definition.

In conclusion, when exact information is necessary about the contents of a melodic pattern that is coded in TLMP, the scale and tonal center of the performance also have to be specified. Otherwise, the code for TLMP will be valid for all scales and tones. In this study, both are used when a TLMP coding is required.

The value that is presented separately in a bracket, at the end of the code specified by *z* in TLMP describes the degree difference between two successive patterns. In this regard, patterns can be ascending, descending or looped in TLMP too.

Although rare in musical practice, interval jumps specific to TUMP can be used in a TLMP. The pattern that is described with such a code may cause alteration on its scale (See Fig 3.4.).

Figure 3.4 : $[\downarrow 1, \uparrow 1, \Uparrow 1, \Uparrow 1, (\Downarrow 1)] - [\Uparrow 1]$ on A Aeolian Scale.

3.2.2 Melodic pattern types

The directional movement styles of melodic patterns are a subject that is very significant for the performance. This is why melodic patterns have to be named differently according to their directional behaviors inside and between patterns. In this study, we assigned some names to patterns based on their directional characteristics. These names are as follows:

- *Looped Melodic Pattern* (LMP)
- *Directional Melodic Pattern* (DMP)
- *Directional Repeating Melodic Patterns* (DRMP)

Each of these pattern types can be observed in TUMP and TLMP.

3.2.2.1 *Looped melodic pattern* (LMP)

LMPs are used in conjunction with terms such as ostinato, riff, groove, etc. in various musical styles and musical textures.

The z in the pattern coding actually identifies the direction of movement of the pattern. When the z value is 0, the pattern will loop through the same pitches both in TUMP and in TLMP. These patterns will be termed looped melodic patterns (LMP) in this study. For example, an LMP that begins in the A pitch described by the formula $[\uparrow 2, \downarrow 3, \uparrow 4, (\downarrow 3)] - [0]$ can be presented as follows on the stave (Figure 3.5).

Figure 3.5 : Representation on staff of $[\uparrow 2, \downarrow 3, \uparrow 4, (\downarrow 3)] - [0]$ on "A".

Looped melodic patterns can also be performed in TLMP. The main difference between TUMP and TLMP performance is that LMP performed in TLMP structurally varies according to scales. For example, the LMP that is described with the code

$[\Uparrow 2, \Downarrow 1, \Uparrow 2, (\Downarrow 3)] - [0]$ in Figure 3.6 has different structures in A Ionian, A Phrygian and A Lydian scales.

(a)

(b)

(c)

Figure 3.6 : Representation on Staff $[\Uparrow 2, \Downarrow 1, \Uparrow 2, (\Downarrow 3)] - [0]$: (a) on A Ionian. (b) on A Phrygian. (c) on A Aeolian.

3.2.2.2 *Directional melodic pattern* (DMP)

DMPs occur when the relation interval is in the same direction as the pitches in case all of the successive pitches of a melodic pattern are ascending or descending.

A performance of successive patterns of this type consists of a single type of melodic movement (ascending or descending). Thus, there are two types of DMP: Ascending DMP (a-DMP), and Descending DMP (d-DMP) (Figure 3.7).

In this regard, there is a relationship between scale playing and DMP playing in terms of performance. DMPs move in a single direction on scales. When melodic patterns that can be described with codes such as $(\Uparrow 1)$ *connector movement*, $[\Uparrow 1]$, $[\Uparrow 1, \Uparrow 1]$, $[\Uparrow 1, \Uparrow 1, \Uparrow 1]$ etc. are applied to any scale, the resulting performance will be ascending scale playing. Thus, scales can be considered a sub-group of DMPs in terms of performance.

(a)

(b)

Figure 3.7 : Representation on staff of DMP types : (a) a-DMP example (b) d-DMP example.

Indeed, Slonimsky (1973) provides the definition of a scale in a manner that also covers DMP in his book "Thesaurus of Scales and Melodic Pattern." "Scale: Progression of tones changing its direction only at terminal points" (Slonimsky, 1947). This is important because it calls attention to the similarity of these two concepts.

3.2.2.3 *Directional repeating melodic pattern* (DRMP)

One of the most frequently used types of melodic patterns is the *directional repeating melodic pattern* (DRMP). In contrast with LMPs, these occur when the same pattern is repeated in different degrees with TUMP. Applying the same *pattern movement* interval to every new pattern creates a directional situation for repeating melodic patterns. When the performance is completed from the first pitch of the first degree of a melodic pattern until the pitch at the end of the *pattern movement* interval, if the resulting pitch is higher than the first pitch, this pattern will be called an *ascending repeating melodic pattern* (a-RMP) in this study. In the opposite condition, if a lower frequency pitch is obtained as a result of the same operation, it will be called a *descending repeating melodic pattern* (d-RMP). In this case, it is actually the quality of the *pattern movement* interval that determines the direction of the pattern. Even if the first degree of a melodic pattern is the upper octave of its last degree, an ascending relation interval that crosses an octave may transform a melodic pattern to an *ascending repeating melodic pattern.*

The difference between DRMPs and DMPs is that DRMPs contain more than one melodic movement type. DRMP examples are presented in Figure 3.8.

(a)

(b)

Figure 3.8 : Representation on staff of DRMP types : (a) a-RMP example (b) d-RMP example.

3.3 Position & Fingering Symbolization System

The position & fingering symbolization system that will be brought in this study is a system that precisely defines the positions of LH and RH fingers on the fretboard. Due to the ergonomic differences of LH and RH in PVT performance, the fingering types also vary. This is why the position and fingering variations will be separately examined for both hands. Some necessary identifications, such as identifying the reference finger, and the natural fingering that will be considered the reference fingering for the position & fingering symbolization system will only be possible after the fundamentals of PVT's biomechanics are understood.

3.3.1 Biomechanics of PVT in *saz* performance

When PVT is performed on the *saz*, the movements of the upper extremity region that includes the fingers, wrist, forearm and shoulder actively affect the process in order to achieve comfortable positions. The movements are made possible when the impulses from the neural networks cause the bones of fingers, hand, forearm, arm and shoulder to move at the joints through muscles and tendons. The muscle groups that are controlled by various motor and sensory nerve pathways, and that affect a bone and joint system that offers perfect mechanical opportunities allow the hand to move in countless movements (Taylor and Schwarz, 1955, p. 22). The upper extremity movements that are used in this study and their terminological nomenclature are presented in Figure 3.9 and 3.10

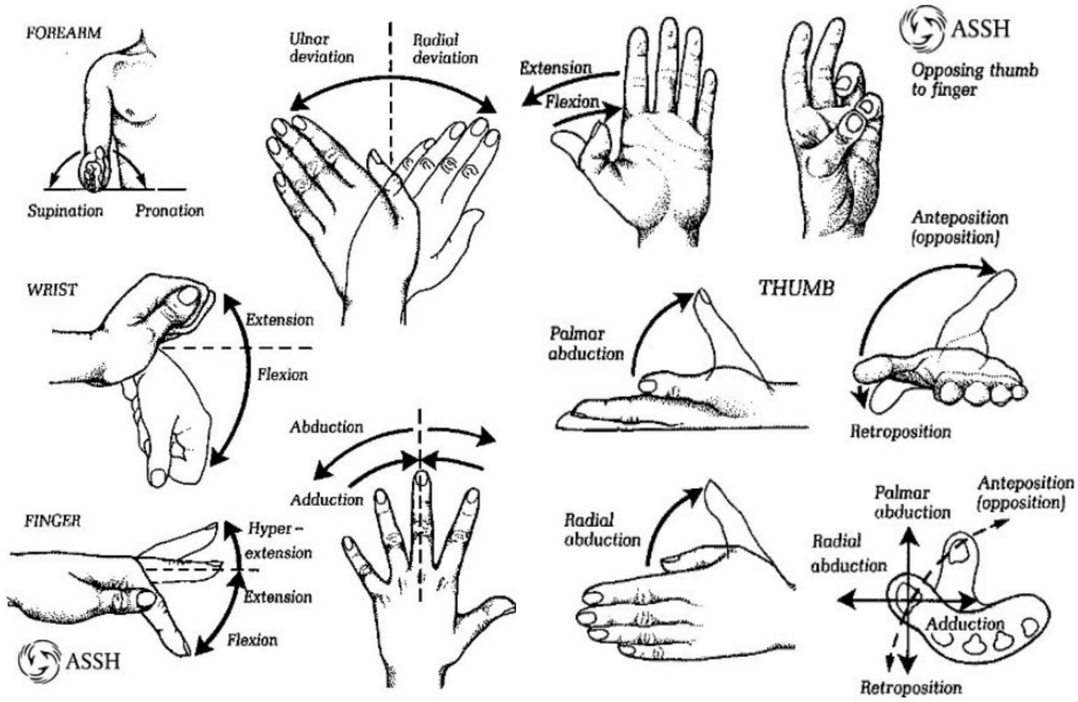


Figure 3.9 : Terminology for forearm, wrist and finger and thumb movements (ASSH,1990, p.10-11).

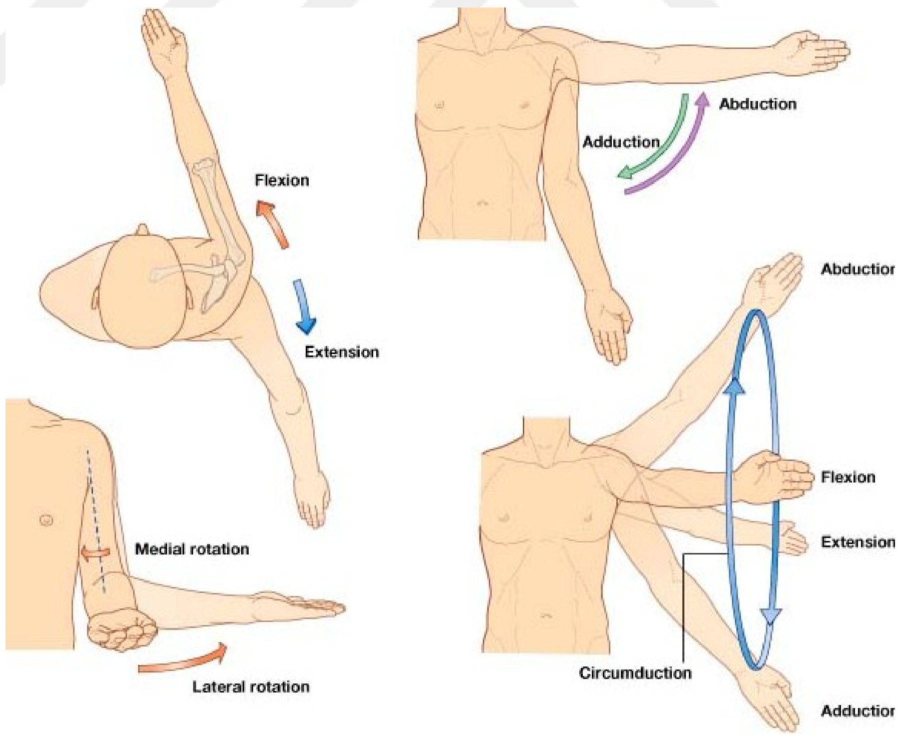


Figure 3.10 : Terminology for shoulder and elbow movements (Url-5).

In the body's natural posture, when the hands are at their characteristic rest position at the sides of the body, the wrists are bent at approximately 35 degrees (Figure 3.11).

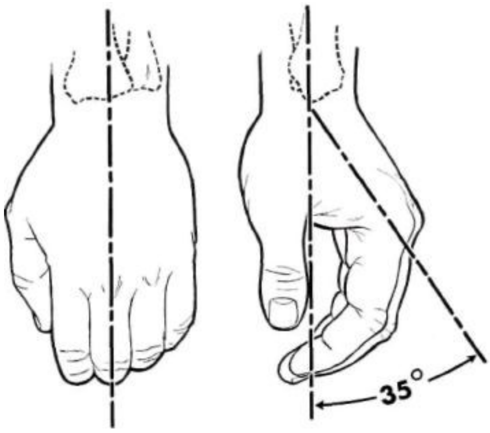


Figure 3.11 : Posture of resting left hand from top and from side (Taylor and Schwarz, 1955, p.31).

In *saz* performance, LH is at a supinated position of approximately 70 degrees. Biceps, the strong muscle group, that is located between the shoulder and the elbow, are the primary supinator muscle group (Drake R.L. et al., 2015, p. 754). The supinated hand position is the position in which the grip strength force is the highest (Terrell and Purswell, 1976; Richards et al., 1996). A high grip strength force is a very important factor in producing clear sounds for necked string instrument performers. The supination angle of the LH may vary between approximately 20 and 100 degrees in order to produce different fingerings when necessary during performance.

The *saz* has an important difference compared to many-stringed instruments such as the *guitar* and the *oud*, that have a wider fretboard, in terms of LH holding technique. In general, the thumb is held at the back of the fretboard on many-stringed instruments. Thus, the desired sound is generated by vibrating the string after squeezing the fretboard and the string(s) between the thumb and the other fingers. However, in *saz* performance, the fretboard is held using the palm region between the index finger and the thumb, and when pressure is applied to the *saz* with fingers, the *saz*'s fretboard and string(s) are squeezed between this region and the fingers. Thus, the thumb is in a free position, and it has the capacity to wrap the fretboard from above through flexion. The fact that there are less strings than instruments such as the *guitar* and the *oud*, and that the fretboard height is less allows the active use of the thumb.

When all fingers are at flexion, the hand is closed. If the LH thumb is bent with the combination of abduction, flexion and medial rotation, the hand becomes a fist

(Figure 3.12-a). In this position, the thumb's side is opposite to the middle finger. As seen in Figure 3.12-b, this feature allows it to effectively grip cylindrical objects over a certain size (Napier, J.R, 1956). As the diameter of the cylindrical object increases, the thumb balances the grasp by creating opposition in the grip position (Fig. 3.13)

(a) **(b)**

Figure 3.12 : (a) Fist Position. (b) Cylindirical grisp (Napier, J.R., 1956).

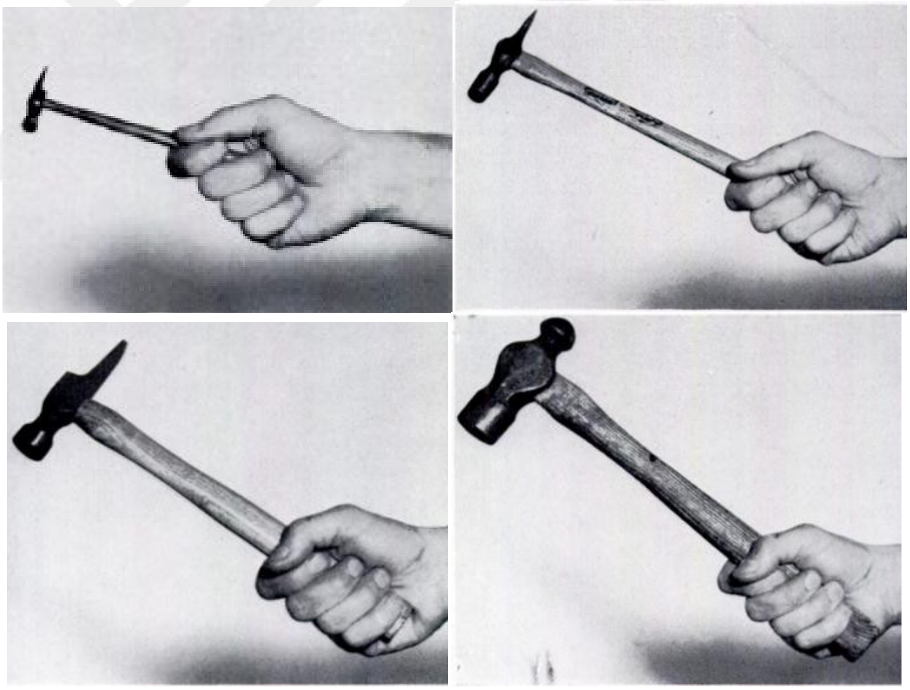


Figure 3.13 : Changing relationship of the thumb to the shaft of the hammer as the size of the tool increases (Napier, J.R., 1956).

Fingers have different contributions to the grasp in the cylindrical grasp hold that is defined as the pattern of holding cylindrical objects. The greatest contribution belongs to the middle finger. This is followed by index, ring and little fingers (Kong, 2001; Kong and Freivalds, 2003). According to Freivalds (2011), this can be explained by the mechanic characteristics of bones and muscles. The middle finger has a mechanical advantage since it is positioned in the middle of the hand. Index and ring fingers are at the same distance to the middle finger. The little finger is the farthest, and is at a mechanical disadvantage.

Another factor that affects the gripping strength is the muscle structures of the fingers. The fingers' muscle structures are proportional to their sizes (Brand, 1981). Accordingly, the strongest muscles are the flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP) of the middle finger. It is also reported that the FDS of the middle finger was strongest and the combined force of both the superficialis and the profundus tendons was also the strongest in the middle finger, followed by the index, ring, and little fingers by Ketchum et al., 1978. (As cited in Freivalds, 2011)

When the task of gripping the *saz*'s fretboard, which is similar to holding a cylindrical object, the thumb and middle fingers come in opposition in the natural posture of the hand. This holding position is the typical LH position for the *saz*. In traditional *saz* performance, the typical posture for LH fingers is as presented in Figure 3.14 below. Fingers slightly turn sideways and perform flexion, and the fingertips touch the fretboard during *saz* performance.

(a) **(b)**

Figure 3.14 : Characteristic posture of LH on *saz* performance : (a) Close view. (b) Far view.

In the PVT technique, the RH does not perform any forearm rotation in terms of supination or pronation. The hand is at the mid-range position. The forearm is usually maintained at 90 degrees flexion at the elbow. This allows the hand to remain opposite the fretboard in a perpendicular manner. The RH thumb that is on the fretboard supports the hand's position (Figure 3.15-a). When the RH changes position on the fretboard, the thumb that slightly pressures the neck maintains its position and moves along the line over the fretboard. In the characteristic posture of the RH in this position, the right wrist is approximately 10 degrees ulnarly deviated. The hand is slightly cupped, and the fingers are perpendicular to the fretboard (Figure 3.15-b).

(a) **(b)**

Figure 3.15 : Characteristic posture of RH in PVT. (a) Top view (b) Front view.

In conclusion, the LH fingers are positioned horizontally on the fretboard, while RH fingers are positioned vertically in PVT performance. This situation allows both hands to have different performance characteristics, and different capacities for different conditions during the performance.

Many joints move and establish various angles in order to place the fingers on the appropriate frets during the performance. Table 3.2 presents the angular changes of left and right upper extremity regions, and the typical holding angles in PVT performance.

Table 3.2 : Upper extremity angular movements in PVT[88].

Upper extremity movements	Left Side		Right Side	
	Typical Angle	(Min/Max Angles)	Typical Angle	(Min/Max Angles)
Supination (+), Pronation (-) of Forearm	+70	+20/+100	0	-15/0
Flexion (+) - Extension (-) of Wrist	+15	-20 / +50	+25	+15/+45
Ulnar Deviation (+) - Radial Deviation (-) of Wrist	0	-25/+60	10	-25/+60
Flexion (+) of Elbow	+100	+80 /+120	+90	+70/+120
Abduction (+) of Shoulder	+30	+45/0	+75	+65/+85

[88] All data are measured via a norma and they show approximate angle values of PVT performance. These angles can slightly change according to performers. The reference posture for measured values in the table is the resting hand position beside legs.

As stated in previous sections, in traditional and contemporary PVT, the LH generally controls the left side of the fretboard, while the RH generally controls the right side (Figure 3.16-a). Although sometimes the LH fingers press the same frets as the RH fingers, the basic position is maintained.

The abilities of LH and RH on performance are different because of their natural positions. This is why a cross-hands posture, in which the LH and RH substitute places in PVT performance, is sometimes seen in some performances (Figure 3.16-b). In cross-hands posture, LH is responsible for upper notes of strings.

(a) **(b)**

Figure 3.16 : Postures of PVT : (a) Common posture of PVT. (b) Cross-hands posture of PVT.

3.3.2 LH positions and fingerings on *saz* performance

3.3.2.1 LH position

The concept of position began to be used for the *saz* when the education of *saz* became institutionalized. Many methods were tried since the beginning of the institutionalization process, however only a small fraction of them mentioned the concept of position (See Table 3.3). Akdağ (2013, p.1) mentioned the importance of using positions in training in his master's thesis, and stated that many factors, particularly the variety of *saz* tuning systems, prevented instructors from using a common approach to positions, and that this caused a failure to standardize the training.

The practicability of the concept of position depends on considering a reference point on the LH. The position sign has to be determined based on the position of this point on the fretboard. In position studies, the reference point is commonly taken as the index finger, or the thumb is commonly assigned to be the "reference finger" (See Table 3.3)

Table 3.3 : Various *bağlama* methods that mention the concept of position, and the reference finger preference in these methods.

Author	**Bağlama Methods**	**Reference Finger Preference**
İrfan Kurt	*Bağlamada Düzen ve Pozisyon* (1989)	Thumb
Yaşar Kemal Alim - Mustafa Aydın Atalay	*Pozisyonlarla Bağlama Metodu* (2004)	Index Finger
Arif Sağ - Erdal Erzincan	*Bağlama Metodu* (2009)	Unknown
Erol Parlak	*Saz Schule* (2010)	Index Finger
Ali Kazım Akdağ	*Bağlamada Düzenler ve Tezene Tavırları* (2012)	Index Finger

Kurt (1989) evaluated positions in terms of tuning systems in his work titled "*Bağlama*da Düzen ve Pozisyon (Tuning System and Position in *Bağlama*)." This work specifies *Bozuk Düzen, Bağlama Düzeni, Misket Düzeni* and *Müstezat Düzeni* as the basic tuning systems, and explains positions based on these four systems. The most common positions for each tuning system were specified and a classification was made. However, the finger placements for a specific tuning system cannot be applied to other systems with this approach.

The work titled "Pozisyonlarla *Bağlama* Metodu" written by Yaşar Kemal Alim and Mustafa Aydın (2004) is based on *bozuk düzen*. This work also designed its training based on the most common positions. The index finger was selected as the reference finger in this work.

Both of these works ignore some positions on the *saz*, and in that regard, are not suitable for our study in terms of scope.

Other works in Table 3.3 ("*Bağlama* Metodu" by Sağ and Erzincan (2009), "*Bağlama* Schule" by Parlak (2010) and *Bağlama*da Düzenler ve Tezene Tavırları by Akdağ (2012)) define the positions based on chromatic columns. This offers the student with a higher-resolution concept of position. Akdağ termed this approach the "Chromatic Position System," and explained its advantages: "The chromatic position system is a system that covers all tuning systems and playing styles. In the chromatic ordering system, each fret was named as a position, and the left hand was placed on the instrument based on the index finger" (Akdağ, 2013).

All the works, apart from Kurt's (1989) book don't consider the thumb as the reference finger. As stated in previous sections, the thumb has much more mobility than other fingers. We think that taking a finger with such a high mobility as the reference finger is not a correct approach in terms of the stability of the concept of position. Moreover, the LH thumb is used less than the other LH fingers during melodic performance.

Kınık (2011) states that the most important finger that controls the LH's dominance on *saz* is the index finger, and it is usually called the reference (guide) finger because of this. Kınık states that the horizontal movement on a single string is controlled by this finger in tunes, and adds that the index finger is the most frequently used finger in *saz* performance, just like in many other instruments (Kınık M., 2010, p.56).

The index finger is anatomically different than other fingers. The index finger and the little finger have an extra extensor muscle group that is not present in other fingers (Drake R.L. et al., p. 788-790). This allows them to perform independent extension. Moreover, the flexor tendon to the index finger has an extra muscle belly (Platzer, W., 2004, p.162). This imparts an advantage to the index finger when it performs flexions. In addition to these features, the fact that the index finger is the finger that is at the back in the characteristic LH grip in *saz* performance is a detail that supports the argument that the index finger has to be the reference finger. The index finger is also used as the reference finger in studies of instruments such as *guitar* (Leawitt W., 1986, p. 56), *violin group* (Sevsay, p. 7), and *oud* (Torun, p. 78). In light of this information, we also think that the index finger has to be the finger that defines the position.

The contemporary position approach has to be able to cover the novel performance approach, and all the capabilities of the *saz*. Thus, the position approach that will be established must not be formed based on the traditional performance approach, or finger habits, or on any tuning system. The position approach has to include the pitches in a chromatic scale, and the microtonal intervals that the *saz* contains.

The 2nd volume of the "bağlama metodu" published by Arif Sağ and Erdal Erzincan in 2009 contains tables and examples concerning the scales used in folk music, and the playing of these scales in different positions. The positions are chromatically ordered according to the hand's position on the fretboard, and presented over the stave using the combination of Arabic numeral with "p", under the transcription symbols, as 1p, 2p, 3p, etc. (Sağ and Erzincan, 2009).

This work does not specify whether the position system is based on the thumb or the index finger. This causes some problems in the interpretation of the position. For example, this problem is evident in the notes of the musical piece called "Anadolu" in the book (Figure 3.17).

Assuming that the LH index finger is the reference finger in Figure 3.17, the notes that are not consistent with the left hand finger number under the stave are encircled in red. The notes that are encircled in blue are the notes that are not consistent with the left hand finger number, when the LH thumb is assumed to be the reference finger.

Figure 3.17 : Positions in Erdal Erzincan's *Anadolu* (Sağ and Erzincan, 2009).

Akdağ thinks that the main reason for this is the fact that the concept of position in this method is shaped based on scales, and explains the situation in the following words:

> The system devised by Arif Sağ and Erdal Erzincan is structured based on scales. It is designed by selecting the scales that are presumed to be used on the *bağlama*. However, when a different makam or tonal scale is played, the hand's position on the instrument will change and the system will become invalid. Considering the large number of makams and tonal scales that can be used, we are faced with hundreds of scales. Considering the number of scales, memorizing a system that is separately designed for each one is very hard and complicated. The instrument is a tool. What types of pieces will be played, and which scales will be used are decisions made by the performer. Thus, the position approach that is offered has to be of a quality that will reflect the mechanical performance, that will not limit the instrument, and that will be inclusive. (Akdağ, 2013, p. 160)

We think that another reason for such problems in this work is the fact that the fingering concept was not evaluated within the position concept, and the fingering types that emerged were not bound within rules. This caused disregarding the fingerings that are performed based on playing habits.

Another work that uses the chromatic position system is the "*Bağlama* (*Saz*) Okulu *Saz* Schule" (Parlak, 2010) method written by Erol Parlak. The LH positions were shown using encircled Roman numerals under the stave (Figure 3.18).

The method of determining the position is explained in the method as follows:

> The left hand position sign (the position is determined by the placement of first/index finger of the left hand). Starting from the lowest/first fret of the *bağlama*, each chromatically ascending fret is a separate position, excluding the quarter tone frets. For example, if the index finger is on the first fret, the left hand is in the 1st position, If the index finger is on third fret, then the left hand is not on the 3rd but rather the 2nd position, because the second fret is a quarter tone. The positions are thus laid out only on the chromatic tones (half tones), skipping quarter notes. (Parlak, 2010, p. 25)

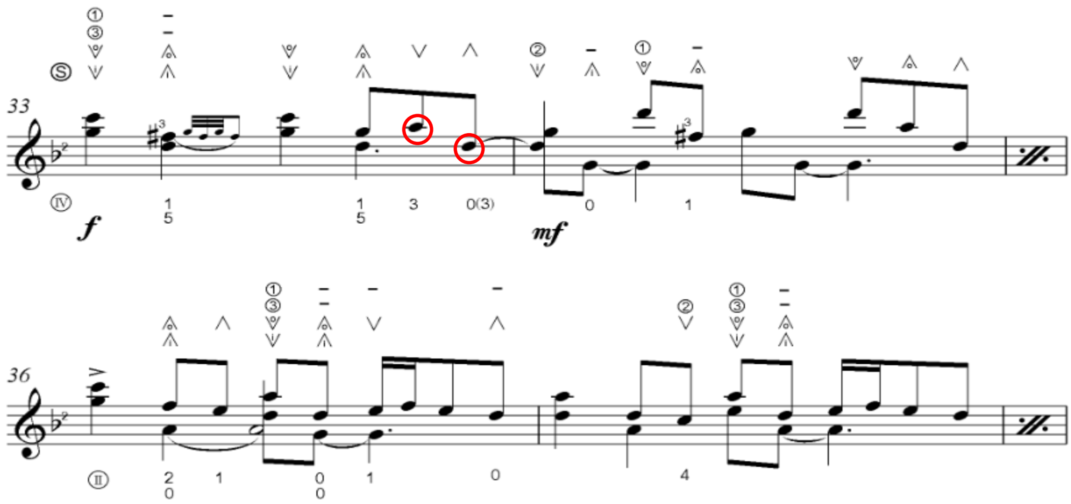


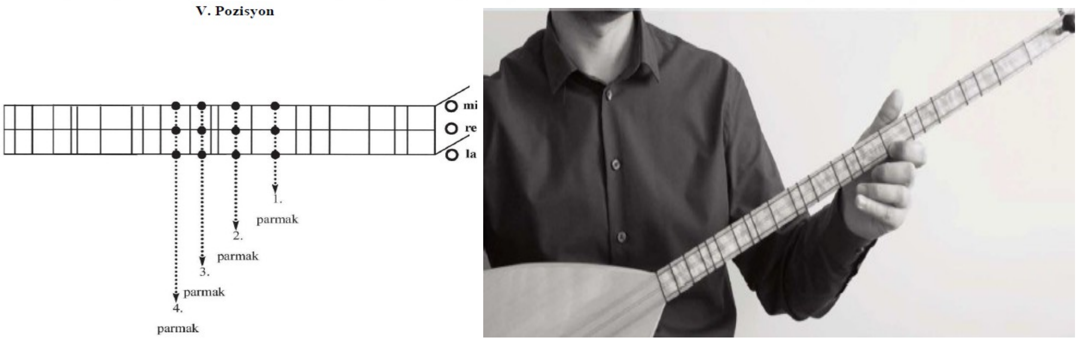
Figure 3.18 : Positions in Erol Parlak's *Yayla Yollarında Yürüyüp Gelir* arrangement (Parlak, 2010).

In this method work, the index finger was taken as the reference finger. However, since fingering types were not addressed, situations that deviated from the selected position approach could be observed. The notes encircled in red in Figure 3.18 show the notes where the index finger is not at the specified position.

Paying attention to Figure 3.17 and 3.18 also reveals that the positions that are confusing are positions where the thumb is fixed, and the index finger is in a different chromatic column. This is not addressed as a position change for performers. Apart from these situations, the positions in both Sağ & Erzincan (2009) and Parlak (2010) are consistent with the chromatic position system.

Akdağ (2013) examined the chromatic position system, and in his thesis study, he argued that the position approach that is designed based on the logic that builds upon the fingering type where the index finger is the reference finger, and the other fingers are placed chromatically in reference to this finger is suitable for all tuning systems. That study identifies the positions chromatically with Roman numerals. Akdağ explains the reason for this preference: "Left hand finger numbers are identified with Arabic numerals. To avoid confusion, positions are identified with Roman numerals. This allows the notation to be easily understandable, and functional. Notation for the *guitar* and other western musical instruments that are similar to *bağlama* in terms of performance characteristics is made in the same manner."(Akdağ, 2013, p. 161).

Akdağ acknowledges that in his work, each finger covers a chromatic column. According to this approach, the pitches on four chromatic columns are played by the four fingers of the LH, regardless of which string is being played (Fig. 3.19). This approach is similar to the concept of position in the *guitar*. In Akdağ's study, the position of the LH thumb, which is frequently used in *saz* performance, is undefined in relation to other fingers. All figures and diagrams in the thesis present the thumb in an inactive position (Figure 3.19).



(a) (b)

Figure 3.19 : V. position in the Akdağ's "chromatic position system" :
(a) Representation of left hand fingers' placement. (b) Posture (Akdağ, 2013, p.109).

Akdağ devised a system to describe positions in which the index finger is playing microtonal intervals by placing small Latin letters beside the Roman numerals that identify the position, to specify the *koma* order and sign.

> Koma pitches are not shown as a new position, but evaluated to be the continuation of the next position (pitch), and named as IIa, IIb, IIIa, IIIb, etc. Six intermediate positions are obtained on the 23-fret *bağlama*. The positions IIIV, VII, IX, XII and XIV have an additional position each. The additional positions are shown as IIa, IVa, VIIa, IXa, XIIa,

> XIVa. In many regions in our country, more than one additional fret may be used. Additional fret usage is most commonly seen in the Central Anatolia region. Artists who perform Central Anatolian music can use many intermediate frets according to their needs. Frets that are added according to regional playing styles are described by adding letters to the position in the positional approach, such as VIIa, VIIb, VIIc, and VIId. (Akdağ, 2013, p. 156)

Akdağ states that the newly developed positions can be used when the index finger is on a microtonal fret, and adds that the finger positioning is completely the same as the main positions. According to this approach, the same fret can be named with different position names depending on whether another fret is tied in front of it.

Akdağ addressed the chromatic position system in his 2012 work "*Bağlama*da Düzenler ve Tezene Tavırları[89]" and used them, albeit in a limited manner.

We think that Akdağ's work contains the logic of the matter, but has some deficiencies in terms of exact results. The fact that the position of the thumb is indefinite may cause some problems when practicing the theory. Additionally, since microtonal frets are within certain chromatic columns, pressing these frets with the index finger does not necessitate the generation of a new position sign. This problem is already solved using the chromatic position approach.

The chromatic position system divides the *saz*'s fretboard into chromatic columns, and specifies the chromatic column in which the index finger currently is, starting to count from the top. In this regard, the position sign exactly determines the position of the LH index finger; however it can only roughly determine the LH position. Positions in the chromatic position system will be specified using Roman numerals in this study for universality, as in Akdağ's (2013) work. Accordingly, the short-necked *saz* for which we provided the standards in chapter 3.1, has 14 chromatic columns (Fig 3.20).

The position does not depend on whether the LH index finger is pressed or not. In each case where the LH is over the fretboard, we can talk about LH position. The LH position is specified using the chromatic column number of the fret on which the index finger presses (when it is pressed), or the chromatic column number of the fret that the index finger faces (when it is not pressed).

---

[89] Tuning Systems and Picking Styles in Bağlama

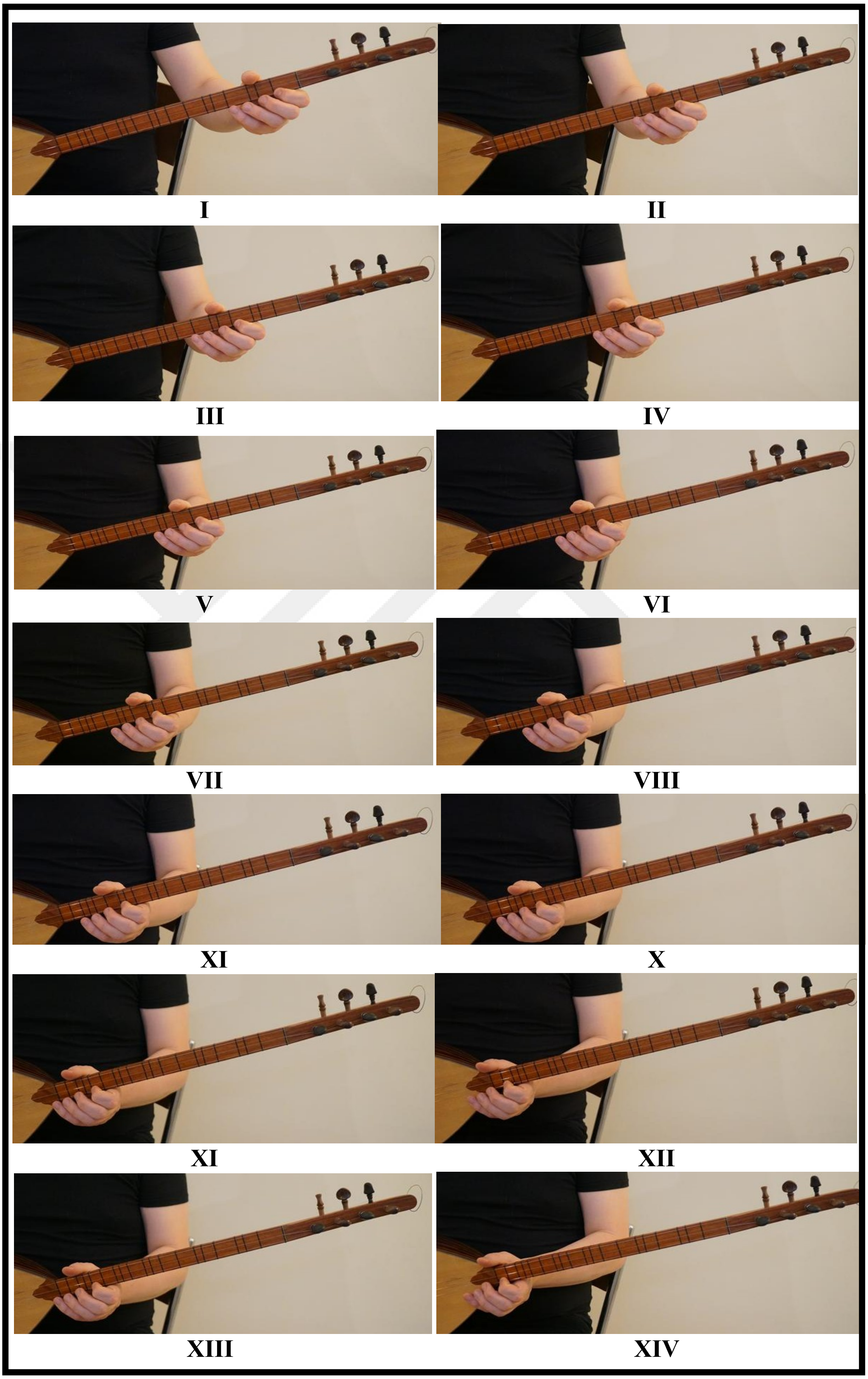


Figure 3.20 : Left Hand Positions

Accordingly, we can see that negative positions can also be used on the *saz*. In this approach, the upper bridge that generates the open string sound will be represented with "0" in terms of positions. When the index finger is positioned over the virtual frets beyond the bridge, negative positions occur. The position in which the middle finger corresponds to the first chromatic column on the *saz* is "-I," (Fig. 3.21-a), in which the ring finger corresponds to the first chromatic column is "-II," (Fig. 3.21-a), and in which the little finger corresponds to the first chromatic column is "-III," (Fig. 3.21-c) resulting in 3 different negative positions.

While the position "-I" is used in musical practice, "-II" and "-III," being positions with very restricted possibilities, only exist in theory and are not used in practice. Thus, we can state that there are 15 actively used positions on our *saz* with 14 chromatic frets. Additionally, sounds can also be produced on the fretless section over the body. However, this section of the *saz* is not suitable for sound generation through PVT.

(a) **(b)** **(c)**

Figure 3.21 : Negative Positions of LH : (a) Position (-I). (b) Position (-II). (c) Position (-III).

When the chromatic position approach is used in conjunction with different fingering types, it can describe all LH movements on the *saz*. Thus, in our study, the position concept will be described based on the positions of LH and RH index fingers (taken as reference) on the *saz*'s fretboard, and the fingering concepts will be described based on the change of the posture of the reference fingering hands in PVT through forearm rotation, finger abduction, finger adduction and finger extension. This will provide full positional information of the hand.

3.3.2.2 LH fingering

Fingering is the positioning of the hand's fingers over a position in order to perform a certain melodic structure. In this study, the fingering types are shown with the distribution of fingers on the chromatic columns and strings on the fretboard, and classified according to this distribution. This classification allowed us to develop a position system that can be used in notation (Figure 3.22). According to this approach, the fingering types defined for the LH will be specified with symbols in the lower left and/or upper left corner of the position symbol. The reason for placing the symbols "*a*" and "*t*" that represent the LH thumb and LH fingers as they perform LH moves on the left side of the position symbol is the fact that these symbols refer to left hand fingering types.

$${}^{a}_{t}\mathrm{P}$$

P : Position of Left Hand (reference finger : index finger)

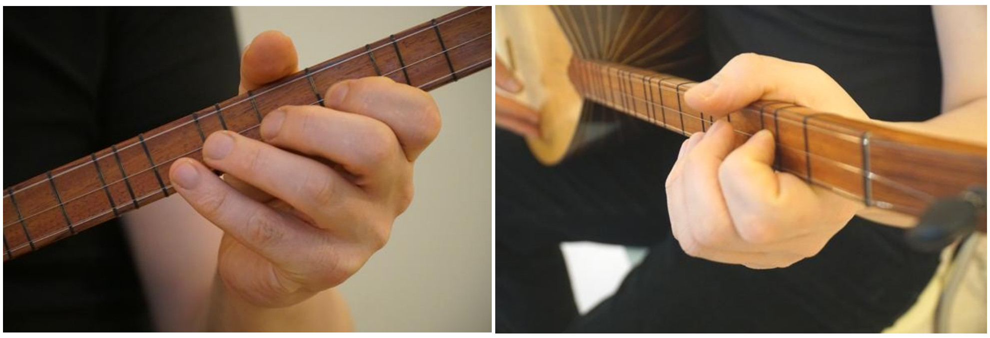
a : Representation of abduction and/or adduction movements of LH fingers

t : Representation of thumb position

Figure 3.22 : Representation of LH fingering types on LH position symbol.

LH characteristic posture-fingering type

When the fingers are in the LH characteristic posture as defined in previous sections, the LH fingers are placed on the fretboard in a manner that covers 4 chromatic columns. The LH thumb is placed in a manner that controls the top string of the same chromatic column with the middle finger. Since the LH fingers and the LH thumb are placed in their natural posture on the *saz*, we named this fingering type L(0) fingering type, and it is as shown in Figure 3.23.



(a) **(b)**

Figure 3.23 : Posture of L(0) fingering type : (a) Front view. (b) Side view.

The fingers that will press the chromatic columns in the L(0) fingering type are shown in Figure 3.24.

When the thumb is used on the top string, the 5th finger controls the fret(s) on the top string in the 2nd finger's column. The area behind the 5th finger that is set aside for the top string is not used in natural fingering.

	cc 1	cc 2	cc 3	cc 4
1st string	1	2	3	4
2nd string	1	2	3	4
3rd string		5	3	4

Figure 3.24 : Finger placement on L(0) fingering type[90].

When L(0) fingering is used for LH, this will be represented with a 0 ($_0$P) to the left of the position symbol below the stave. For example, the left hand finger numbers in Figure 3.25 can be represented with the fingering position symbol $_0$II.

Figure 3.25 : Notational representation of the L(0) fingering type.

The most used fingering is L(0) in *bağlama düzeni.* This position is frequently used in *bozuk düzen* and bozuk düzen derivatives, and is particularly preferred in traditional performance, when the melody is played on the bottom string and a semitone interval is required between the index finger and the thumb. Regardless of the tuning system, the LH is usually held at this fingering type when the thumb is not used. If another fingering is necessary, this should also be specified in the notation.

LH fingering types that indicate location of thumb

According to the definition of LH position & fingering symbolization, the fingering types that are created by changing the position of the LH thumb will be represented in the lower left corner of the position symbol. The "t" sub-symbol in the position

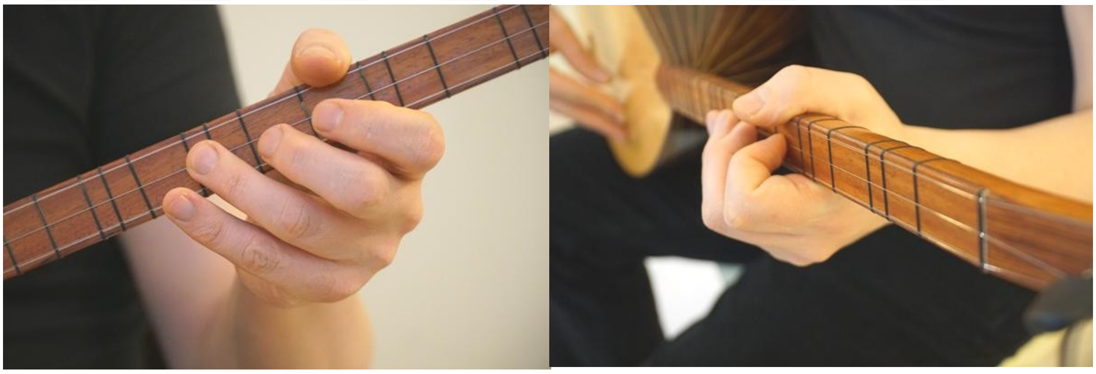
---

[90] cc1 is a chromatic column in *saz* fretboard. cc 2, cc3, cc4 represents successive chromatic columns.

symbol of Figure 3.22 defines the position of the thumb in the fingering. Basically, the LH characteristic posture-fingering type will be assumed to be the reference fingering. Other fingering types will be symbolized based on this basic holding position.

Some upper extremity moves may be used to control chromatic columns other than the chromatic column controlled in the L(0) fingering type. This change in the LH thumb is basically executed by changing the supination angle of the clockwise or counter-clockwise LH forearm rotation movement. Thumb adduction/abduction and ulnar/radial deviation of LH wrist are other movements that play a part in this change[91]. Thus the thumb's position relative to the other fingers changes and LH fingering positions other than L(0) are produced. Rotations in the supination direction will be represented by (+), and rotations in the pronation direction will be represented by (-) in this study. The LH fingering types produced by these rotations are called L(+), L(++) and L(-).

In the L(+) fingering type, the LH rotates for approximately 15-25 degrees in the supination (+) direction from the natural posture. LH thumb moves away from the palm through adduction, and moves toward the index finger (Fig. 3.26)



(a) **(b)**

Figure 3.26 : Posture of L(+) fingering type : (a) Front view. (b) Side view.

[91]As specified by Castalonga (2009), a movement may be produced by a single joint and muscle group, or by the coordinated movements of many joints and muscle groups. A hand movement is produced when the brain uses different muscle groups in different amounts. This means that while the movement is outwardly the same, different performers may achieve the same movement by directing their joints and muscles in different ways. These ratios may depend on how the performer developed the movement, and the position of the hand before the movement (Costalonga, 2009, p. 84). Thus, it may not be correct to define a holding position for every performer. This is why in this study, the fingering types are defined according to the distribution of the fingers on the chromatic columns and strings as a result of the movement.

Thus, LH thumb comes to the same line with the index finger, and controls the top string of the chromatic column that is controlled by the index finger. In the L(+) position, fingers are placed as follows in the chromatic columns (Fig. 3.27).

	cc 1	cc 2	cc 3	cc 4
1st string	1	2	3	4
2nd string	1	2	3	4
3rd string	5	2	3	4

Figure 3.27 : Finger placement on L(+) fingering type.

L(+) fingering type covers a 4-chromatic-column horizontal area, just like L(0). L(+) fingering type is most frequently used in traditional performance with tuning systems such as *bozuk düzen* and *bozuk düzen* derivatives that contain whole tone intervals between the top and bottom strings.

This fingering type is sometimes also used in *bağlama düzeni*, and is represented with the sub-symbol "+". The left hand finger numbers in the first measure of Figure 3.28 can be represented with the fingering position symbol $_{+}$V.

Figure 3.28 : Notational representation of the L(+) fingering type.

In some instances, the thumb can be placed at the chromatic column behind the index finger during performance. In this case, LH forearm executes a wider angle rotation in the supination direction compared to the L(+) fingering type. The combination of the ulnar deviation movement of the LH wrist, and the thumb's abduction movement, the thumb is horizontally positioned to the back of its position in L(+). This fingering type that we will call L(++) is shown in Figure 3.29.

(a) **(b)**

Figure 3.29 : Posture of L(++) fingering type : (a) Front view. (b) Side view.

While this fingering type theoretically covers 5 chromatic columns, it is very difficult to use the 4th finger and the thumb at the same time. Especially when this fingering type is used on parts of the fretboard near the head, where the chromatic column is wide, the 4th finger become completely inactive. In higher positions, where the physical length of chromatic columns decreased, the 4th finger may be used from time to time. The distribution of the fingers on chromatic columns is as follows in the L(++) fingering type (Fig. 3.30).

	cc 1	cc 2	cc 3	cc 4	cc5
1st string		1	2	3	(4)
2nd string		1	2	3	(4)
3rd string	5	1	2	3	(4)

Figure 3.30 : Finger Placement on L(++) fingering type.

L(++) fingering type is represented with the sub-symbol "‡" in notation (Figure 3.31).

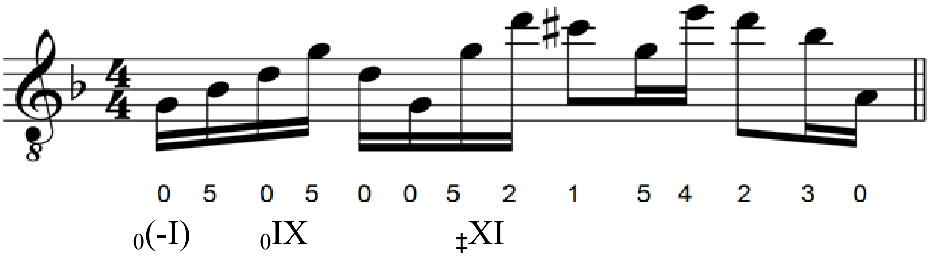


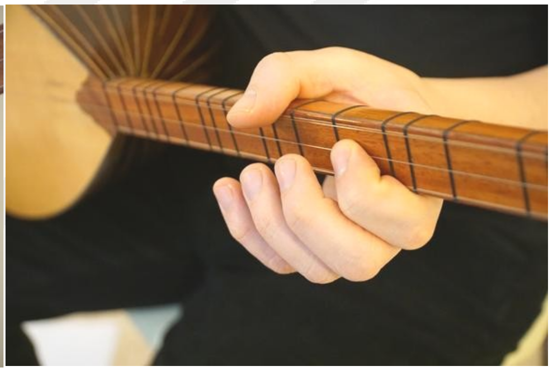
Figure 3.31 : Notational representation of the L(++) fingering type.

The left hand finger numbers in Figure 3.31 can be represented with the position & fingering symbols ${}_{0}$(-I), ${}_{0}$IX, ${}_{\ddagger}$XI respectively.

The L(++) fingering type emerges particularly when the notes on the fretless region over the body have to be played with fingers during pick-playing. In the traditional performance of *bozuk düzen*, when the melody is being played on the bottom string, and an augmented second interval is required between the top and bottom strings, the L(++) fingering type is also sometimes used. This fingering type is used in *bağlama düzeni* only rarely and temporarily.

In *saz* performance, the LH may also rotate in the pronation direction in order to reduce the angle of supination. This fingering type is especially used when playing in *bağlama düzeni*, and the 5th finger (thumb) comes in line with the chromatic column controlled by the 3rd finger. The thumb opposition is also effective in the emergence of this fingering type. This fingering type is called L(-), and is shown in the figure (Fig. 3.32).

(a)



(b)

Figure 3.32 : Posture of L(-) fingering type : (a) Front view. (b) Side view.

The distribution of the fingers on chromatic columns is as follows in the L(-) fingering type (Figure 3.33).

	cc 1	cc 2	cc 3	cc 4
1st string	1	2	3	4
2nd string	1	2	3	4
3rd string			5	4

Figure 3.33 : Finger placement on L(-) fingering type

The L(-) fingering type will be represented in notation as follows (Fig. 3.34):

.V

Figure 3.34 : Notational representation of the L(-) fingering type

The left hand finger numbers in Figure 3.34 can be represented with the fingering position symbol.V.

This fingering is rarely used in *bozuk düzen* and *bozuk düzen* derivatives since the thumb plays the same pitch with the index finger, but it is sometimes used in *bağlama düzeni*.

In traditional *saz* performance, the fret on the top string that is in line with the thumb is played with the thumb. When it is necessary to play the frets behind this one on the top string, usually the position or the fingering is modified. However, the pitches of the fret controlled by the thumb, and the frets behind the thumb on the top string in traditional *saz* performance, can also be played using fingers other than the thumb in contemporary *saz* performance, within the limits of the position. This is achieved through the extension of the fingers, and the flexion of the wrist. In this case, the thumb is melodically inactive (Figure 3.35)

(a) **(b)**

Figure 3.35 : Posture of L(i) fingering type : (a) Front view. (b) Side view.

We also observe some performers place their thumbs behind the fretboard (like a *guitar*) when playing melodies in this fingering type (Fig. 3.36).

(a) **(b)**

Figure 3.36 : The posture of the thumb behind the fretboard in the L(i) position : (a) Back view. (b) Top view.

We named this fingering type L(i) in order to specify that the thumb is 'inactive,' and the distribution of the fingers on the chromatic columns is shown in Figure 3.37.

	cc 1	cc 2	cc 3	cc 4
1st string	1	2	3	4
2nd string	1	2	3	4
3rd string	1	2	3	4

Figure 3.37 : Finger placement on L(i) fingering type

The L(i) fingering type begins when fingers other than the thumb are used to play the chromatic column on which the thumb is placed, or the frets behind it. In this case, the symbol "i" will be used on the lower left corner of the position sign that represents the position of the LH thumb. This symbol signifies that the thumb will be placed over or behind the fretboard, and that it will not be used to play the melody, in order to ensure a more active use of the fingers on the top string. No other fingering signs are used unless the thumb doesn't come back to its position on the top string in the same position. The representation of the L(i) fingering on notation is shown in Figure 3.38.

$_0$II $_i$II $_0$I

Figure 3.38 : Notational representation of the L(i) fingering type

A rarely observed LH thumb situation is the fingering type that emerges when the thumb is curled through flexion, combined with the wrist's extension to allow the LH thumb to reach strings other than the top string. This fingering type is also a part of the traditional performance style, and its typical application is observed on the *üçtelli saz* of the Teke Yörük Türkmen music. Parlak (2000, p.182) states that performers call this technique, which is exemplified in Ramazan Güngör's performances, *sarma* (wrapping), or *boğma* (choking) because the thumb tightly grips the fretboard from above (Figure 3.39).

Parlak (2000) suggests that Güngör places the middle string in the extra notches on the bridge when performing with this technique, and that this fingering type may be adapted to the *üçtelli* from its use on the typical *ikitelli* of the region. Güngör adjusts the *saz*'s tuning to "A, A, D" when using the *boğma* technique. It is observed that a double top string is used, and that one of these strings is tuned to A, and the other to D on the *ikitelli*s in the region (Parlak, 2000).

Figure 3.39 : Typical LH posture in the *boğma* technique on *üçtelli bağlama* (Performer is Yusuf İhsan Bodur -The frame is captured from Emre Dayıoğlu Video Archive) (Url-6).

We will name this fingering type the L(f) fingering type. "f" refers to "flexion" of LH thumb. It is used in contemporary *saz* performance, particularly in order to increase the control of other fingers on the bottom string, when the top and middle strings are held by the thumb. It is also used in situations when only the top and middle strings have to be played together (Figure 3.40).

(a) **(b)**

Figure 3.40 : Posture of L(f) fingering type : (a) Front view. (b) Side view.

The distribution of the fingers on the chromatic columns for L(f) is shown in Figure 3.41.

	cc 1	cc 2	cc 3	cc 4
1st string	1	2	3	4
2nd string		5	3	4
3rd string		5	3	4

Figure 3.41 : Finger placement on L(f) fingering type.

The L(f) fingering type will be represented with the symbol 'f' in the lower left corner of the position symbol (Figure 3.42)

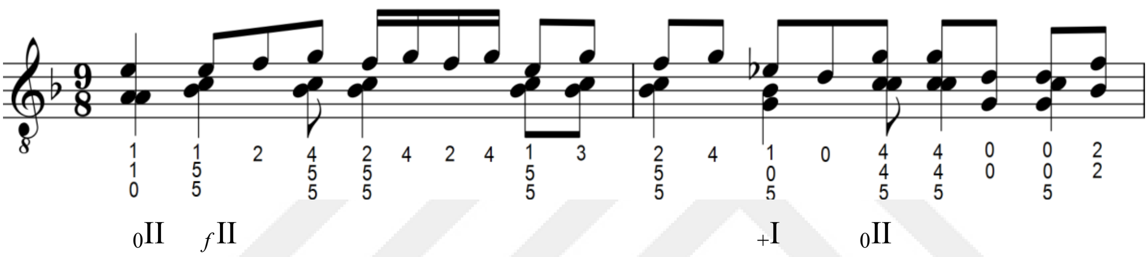


Figure 3.42 : Notational representation of the L(f) fingering type.

The left hand finger numbers in Figure 3.42 can be represented with the fingering position symbols $_0$II, $_f$II, $_+$I, $_0$II respectively. Fingering types such as L(+f) and L(-f) can also be observed when the thumb is placed on different columns.(See Appendix E)

LH fingering types that indicate location of fingers

The anatomical description of the abduction and adduction movements of hand fingers is made by using a virtual line that passes over the middle finger as reference (Drake R.L. et al., p. 792). Accordingly, the other fingers perform abduction by moving away from the middle finger and adduction by moving near it . Figure 3.43 represents the abducted and adducted hand postures.

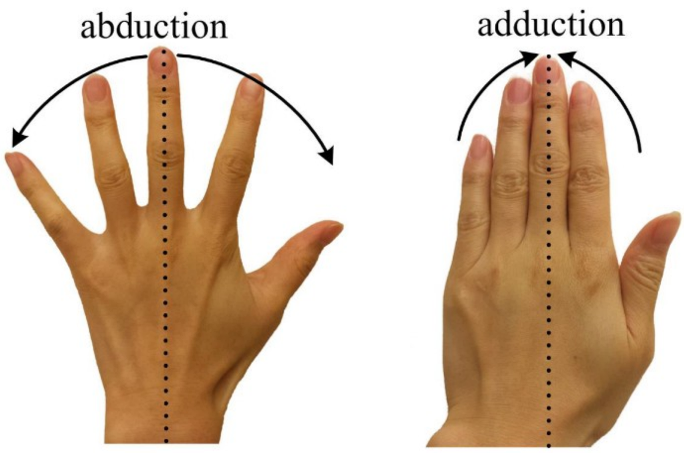


Figure 3.43 : Direction of abduction-adduction movements (Wang et al. 2017).

The middle finger can only perform abduction in relation to the virtual line. The middle finger's movement towards the index finger is called lateral abduction, and its movement towards the little finger is called medial abduction (Fig. 3.44).

Figure 3.44 : Lateral abduction and medial abduction of the middle finger (Url-7).

There are many fingering types that can be created through abduction and adduction in *saz* performance (Table 3.4). Performers sometimes narrow or widen the hand span through finger abduction and finger adduction during performance in order to control a wider or narrower area.

Symbols that are used to name the fingering types created through LH abduction and adduction are placed inside parentheses after the capital "L," just like in fingering type names that represent the position of the LH thumb. The finger that changes its chromatic column through abduction or adduction is represented with left hand

Table 3.4 : A comperatative representation of fingering types with abduction/adduction movements[92].

Fingering	Symbol	Chromatic Columns					
L(0) Reference Fingering	$_{0}P$		1	2	3	4	
L(+1)	^{1}P	1		2	3	4	
L(+3,+4)	$^{3,4}P$		1	2		3	4
L(+4)	^{4}P		1	2	3		4
L(+2l)	^{2}P		1,2		3	4	
L(-1)	^{-1}P			1,2	3	4	
L(-1,+4)	$^{4,-1}P$			1,2	3		4
L(-1,+3)	$^{3,-1}P$			1,2		3,4	
L(-1,-4)	^{-1-4}P			1,2	3,4		
L(-4)	^{-4}P		1	2	3,4		
L(+3)	^{3}P		1	2		3,4	
L(+2m,+ 3)	$^{m,3}P$		1		2	3,4	
L(+2m)	^{m}P		1		2,3	4	
L(-3)	^{-3}P		1	2,3		4	
L(+1,-3)	$^{1,-3}P$	1		2,3		4	
L(-1,-3,-4)	^{v4}P			1,2,3	4		
L(-1,-3)	^{v+4}P			1,2,3		4	
L(-1,+2m,-4)	^{1v}P			1	2,3,4		
L(+2m,-4)	^{+1v}P		1		2,3,4		
L(-1,-3,(-)- 4)	^{v}P			1,2,3,4			

: 1st chromatic column of reference fingering ; : 2nd chromatic column of reference fingering

: 3rd chromatic column of reference fingering ; : 4th chromatic column of reference fingering

[92] The table presents horizontal replacement of 4 fingers in one string (1[st] or 2[nd]) in different type of LH fingerings. The thick frame represents hand span of 4 fingers.

finger numbers. The symbol "+" before the left hand finger numbers represent the abduction movement and the "-" symbol represents the adduction movement. The lateral abduction movement of the middle finger that can perform abduction in two directions will be represented with +2l, and its medial abduction movement will be represented with +2m. When multiple fingers perform abduction/adduction, the fingers shown in parentheses will be separated with a comma. A fingering type that occurs when two fingers change chromatic columns through abduction/adduction can be represented in two different ways. For example, L(+2m,+3) and L(+1,-4) represent the same position. In such situations, we preferred to use the fingering type that lies within the hand span represented by the distribution in L(0), which is the reference fingering. If neither of the names define a fingering type that lies within the hand span, the fingering type will be named based on the assumption that the second finger is fixed.

As shown in Table 3.4, the fingering types obtained through finger abduction and finger adduction are represented as superscript on the upper left corner of the position symbol. Abduction movements are represented in the position symbols only through the number of the finger performing the abduction, and the adduction movement is represented with a (-) sign before the number of the finger performing the adduction. The lateral abduction of the middle finger is represented with the number "2," and its medial abduction is represented with the letter "m." as superscript on position symbol in notation

Moreover, the chromatic column controlled by three or four fingers that are aligned on a single chromatic column is represented with the symbol "v" (to refer to the vertical placement of the fingers). The finger combinations that control the chromatic column symbolized by "v" can be "123," "234," or "1234." The combination "1234" is reflected on *saz*s with 3 courses, such as the *saz model*, as "124" or "134." The finger that remains outside the "v" chromatic column is also named after its position in relation to the "v" chromatic column.

This allows the performer to adjust his/her fingers by thinking about the position of the finger that is not used in the vertical positioning of the fingers. These types of fingering that are created by fingers that are put on top of each other on the chromatic column are especially used in chord and arpeggio applications.

Saz performers prefer the fingering types that are created through abduction in order to achieve a larger hand span. The L(+1), L(+4), and L(+2,+3) etc. fingering types are sometimes used in this context. These fingering types offer the maximum hand span for the left hand during performance. In that regard, they have different qualities than the other fingering types that are created through abduction/adduction. In these fingering types, one or two of the fingers move outwards in order to widen the hand span. In this study, we used the abbreviation L(ocs) to represent all of these fingering types, in order to refer to "outside chromatic shifting."

L(ocs) fingering types allow stretching the hands during performance, and pressing frets that are located farther away. The following passage shows a notation in which three fingering types in the L(ocs) fingering types group are used (Figure 3.45).

Figure 3.45 : A melody performed by L(0) and L(ocs) fingering types.

In addition to L(ocs) fingering types, the other fingering types in Table 3.4 that are formed through abduction/adduction were named L(ics) to refer to "inside chromatic shifting."

The thumb can also be positioned in different ways during abduction and adduction movements. Table 3.5 shows the representations of all LH fingering types that are theoretically possible to form with different movements in the position & fingering symbolization system.

A point to consider when representing the fingering type that is formed through abduction and adduction, and that uses the thumb as a position symbol, is the positioning of the thumb in relation to the middle finger. If the thumb is on the same line with the middle finger, the sub-symbol is not shown in the abduction and adduction fingering types, and the position is only represented with the symbols that replace the "a" superscript. In abduction/adduction fingering types, the symbol "*i*" for

Table 3.5 : LH fingering types combination of two fingering types symbolization.

	L(0)	**L(i)**	**L(+)**	**L(++)**	**L(-)**
-	${}_{0}P$	${}_{i}P$	${}_{+}P$	${}_{\ddagger}P$	${}_{-}P$
L(f)	${}_{f}P$	-	${}_{+f}P$	${}_{\ddagger f}P$	${}_{-f}P$
L(+1)	${}^{1}P$	${}^{1}_{i}P$	${}^{1}_{+}P$	${}^{1}_{\ddagger}P$	-
L(+3,+4)	${}^{3,4}P$	${}^{3,4}_{i}P$	${}^{3,4}_{+}P$	-	${}^{3,4}_{-}P$
L(+4)	${}^{4}P$	${}^{4}_{i}P$	${}^{4}_{+}P$	-	${}^{4}_{-}P$
L(+2l)	${}^{2}P$	${}^{2}_{i}P$	${}^{2}_{+}P$	-	${}^{2}_{-}P$
L(-1)	${}^{-1}P$	${}^{-1}_{i}P$	${}^{-1}_{+}P$	-	${}^{-1}_{-}P$
L(-1,+4)	${}^{4,-1}P$	${}^{4,-1}_{i}P$	${}^{4,-1}_{+}P$	-	${}^{4,-1}_{-}P$
L(-1,+3)	${}^{3,-1}P$	${}^{3,-1}_{i}P$	${}^{3,-1}_{+}P$	-	${}^{3,-1}_{-}P$
L(-1,-4)	${}^{-1,-4}P$	${}^{-1,-4}_{i}P$	${}^{-1,-4}_{+}P$	-	${}^{-1,-4}_{-}P$
L(-4)	${}^{-4}P$	${}^{-4}_{i}P$	${}^{-4}_{+}P$	${}^{-4}_{\ddagger}P$	${}^{-4}_{-}P$
L(+3)	${}^{3}P$	${}^{3}_{i}P$	${}^{3}_{+}P$	-	${}^{3}_{-}P$
L(+2m,+ 3)	${}^{m,3}P$	${}^{m,3}_{i}P$	${}^{m,3}_{+}P$	${}^{m,3}_{\ddagger}P$	${}^{m,3}_{-}P$
L(+2m)	${}^{m}P$	${}^{m}_{i}P$	${}^{m}_{+}P$	${}^{m}_{\ddagger}P$	-
L(-3)	${}^{-3}P$	${}^{-3}_{i}P$	${}^{-3}_{+}P$	${}^{-3}_{\ddagger}P$	${}^{-3}_{-}P$
L(+1,-3)	${}^{1,-3}P$	${}^{1,-3}_{i}P$	${}^{1,-3}_{+}P$	-	-
L(-1,-3)	${}^{v+4}P$	${}^{v+4}_{i}P$	${}^{v+4}_{+}P$	-	-
L(-1,-3,-4)	${}^{v4}P$	${}^{v4}_{i}P$	${}^{v4}_{+}P$	${}^{v4}_{\ddagger}P$	-
L(+2m,-4)	${}^{+1v}P$	${}^{+1v}_{i}P$	${}^{+1v}_{+}P$	${}^{+1v}_{\ddagger}P$	-
L(-1,+2m,-4)	${}^{1v}P$	${}^{1v}_{i}P$	${}^{1v}_{+}P$	${}^{1v}_{\ddagger}P$	-
L(-1,-3,(-)- 4)	${}^{v}P$	${}^{v}_{i}P$	${}^{v}_{+}P$	${}^{v}_{\ddagger}P$	-

inactive thumb, "*f*" for thumb that controls both the top and middle strings, "+" if it is one column behind the middle finger, "‡" if it is two columns behind the middle finger, and "-" if it is one column in front of the middle finger are used in the lower left corner, in addition with the abduction/adduction superscript symbols (See Table 3.5).

The symbols for fingerings that are not anatomically possible in *saz* performance are left empty in Table 3.5. Additionally, the area covered by all the positions in Table 3.5 on the chromatic columns, examples of their representations in notation, and how they look on the *saz* are presented in Appendix E.

The all-inclusive position & symbolization system shown in Table 3.5 can be applied to all tuning systems and sizes of *bağlama*. Additionally, it can also be used for many stringed instruments such as *guitar, balalaika, violin, banjo, mandolin*, etc. The virtual chromatic columns approach grants it the potential to be adapted to many other instruments such as *oud, fretless guitar, microtonal guitar*, *cümbüş*, etc.

Despite the large number of variations that emerge, only a small part of the fingering types presented above are being actively used in contemporary *saz* performance. The fingering preferences vary depending on the tuning system, the scales that are used in the piece, the structure of the piece, and the performer's preferences.

In order to determine the fingering types that are actively used in PVT, we have examined the 8 scores with pickless *saz* playing styles that were previously published, in addition to our own 4 scores. These scores are labeled with position signs by us and they are given in Appendix F. The using rate of fingering types in these musical pieces are presented in Appendix G[93].

The results suggest the following conclusions:

- The average using rates of fingering types in PVT is similar with the average using rates of fingering types in all scores. PVT fingerings doesn't show tidy deviation.
- The left hand fingering types in PVT parts of 12 scores are L(0), L(i), L(+), L(-). Also some of L(ics) fingering types are seen in PVT performance. These

[93] The data in tables in Appendix G were obtained from position symbols in scores of the musical pieces in Appendix F. The fingering use of every beat in the pieces was recorded with Microsoft Excel Program and using rates as percentage were obtained with this program.

are L(i)&L(-4), L(+)&L(-4), L(-)&L(-1), L(+)&L(+2m), L(i)&L(+2m) L(+)&L(-1,-4). L(ics) fingering types with LH thumb are used with combination of different thumb variations. They are not used in their L(0) thumb variation. The passages played with L(ics) fingering types actually can be played by L(0), L(i), L(+) or L(-) fingering, however performers prefers L(ics) fingering types to obtain more comfortable performance.

- The examination of the existing PVT notes reveals that L(0) is the most frequently used fingering type (%59,11 in PVT, %55,34 in general), because it emerges from the natural position of the hand.

- One of the most commonly used fingering types among L(ics) fingering types in *saz* performance is combination of L(+2m) and L(+) (%10,30 in PVT, %14,64 in general). Particularly the fingering type that is created through the combination of the L(+2m) and L(+) fingering types is frequently used on the 2nd position in tunes where the 2nd degree in relation to the tonal note is played on a microtonal fret (Figure 3.46)

Figure 3.46 : An example for use of combined L(+) and L(+2m) fingering types.

So, while its rate is high in that tunes that has this microtonal fret (proportion in PVT parts : %65,82 in Sarı Zeybek by Erdal Erzincan, %43,52 in Kolhoz Barı by Sinan Ayyıldız, %26,84 in Topal by Erol Parlak, %22,13 in Anadolu by Erdal Erzincan, %16,94 in Göç Yolları by Erol Parlak) it is not seen in tunes in other scales or FTSs (See Appendix G)

- The proportion of the use of L(i) fingering type is %10,10 in PVT parts of scores and %7,96 in general. It is mostly used in musical adaptation of musical pieces from Western classical music repertoire (proportion in PVT parts : %46,63 in W.A. Mozart's Alla Turca by Erol Parlak, %31,00 in J.S. Bach's Badinerie by Sinan Ayyıldız, %18,12 in L.V.Beethoven's Fur Elise by Sinan Ayyıldız) .

- Although L(+) fingering type is sometimes seen (%8,25 in PVT parts, %8,82 in general), L(-) fingering type is rarely seen (%0,18 in PVT parts, %0,26 in general). It couldn't be found that a partition played with L(++) fingering type in these 12 scores.
- Other L(ics) fingering types are also used in PVT performance, albeit rarely. L(-)&L(-1) fingering type is sometimes used in PVT performance (See Figure 3.47). The proportion of the use of L(-)&L(-1) is %4,27 in PVT parts, % 3,52 in general. Most used piece of L(-)&L(-1) fingering is L.V.Beethoven's Fur Elise by Sinan Ayyıldız (%42,5 in PVT, %34,26 in general)

Figure 3.47 : An example for use of the combined L(-) and L(-1) fingering types (Sinan Ayyıldız's arrangement of LV.Beethoven's *Fur Elise,* measures 1-3. (Parlak, 2005)).

- The fingering type created by combining L(-4) and L(+) fingering types, which is another fingering type created through abduction/adduction is also sometimes observed in *saz* performances (Figure 3.48)

Figure 3.48 : An example for use of the combined L(+) and L(-4) fingering types (Sinan Ayyıldız's Arrangement of *Kolhoz Barı,* measure 1.)

The proportion of the use of L(+)&L(-4) in pieces in Appendix F is %4,38 in PVT parts, % 6,26 in general. Most used piece of L(+)&L(-4) fingering is Göç Yolları by Erol Parlak (%32,45 in PVT part, %41,18 in general)

- The proportion of the use of L(i)&L(-4) is %3,41 in PVT parts, % 2,89 in general. Most used piece of L(i)&L(-4) fingering is traditional Azerbaijan song "Ay Laçin" by Sinan Ayyıldız (%23,85 in PVT part and in general) (Figure 3.49)

Figure 3.49 : An example for use of the combined L(i) and L(-4) fingering types (Sinan Ayyıldız's Arrangement of *Ay Laçin,* measure 21-22.).

- One of the fingering types that is created through abduction/adduction that is sometimes used in is the fingering type that combines L(-1, -4) with L(+) (Figure 3.50). It is usually used on the 4th position.

Figure 3.50 : An example for use of the combined L(+) and L(-1, -4) fingering types.

The proportion of the use of L(+)&L(-1,-4) is %0 in PVT parts, % 0,20 in general. Most used piece of L(i)&L(-4) fingering is Anadolu by Erdal Erzincan (%2,41 in general, % 7,43 in PT). For PVT, it couldn't be detected on songs in Appendix F.

- Fingering types that are created through abduction only is not observed among the PVT pieces written for L(ocs) fingering that we examined. It is evident that these relatively difficult fingering types are not preferred by performers. We believe that this is mainly due to the diminished pressure force of the hand that is spread in L(ocs) fingering types, since the pressure force is especially important in PVT, which is based on generating sound by tapping and pulling the strings with fingers.

- Any fingering types couldn't be found other than mentioned above. So It proves although there are a lot of variety of fingering types, a small amount of variations are actively used in PVT and other pickless playing styles.

3.3.3 RH positions and fingerings in PVT performance

3.3.3.1 RH position

There is no symbol that clearly represents the RH position in previous publications in PVT. As presented in Appendix C, Parlak (2000, 2001, 2005, 2010) used the following symbols in order to represent the position of the RH on the *saz*.

Ⓖ : RH over the body
Ⓢ : RH over the fretboard
Ⓔ : RH over the bridge
(EA) : RH behind the bridge.

These symbols are rough guidelines about the position of the RH, and may be used for all *şelpe* techniques. For example, PT and TÇT can be applied over the body, as well as over the fretboard. However, the RH is always over the fretboard " Ⓢ " in PVT. A performer who follows Parlak's transcription has a general idea of where the RH is positioned over the *saz*. However the signs do not specifically state the position of the RH.

Sources other than Parlak's methods did not use a specific sign to represent the position of the RH. To achieve some results in terms of the performance of melodic patterns through PVT, we have to use the position concept for the RH, just like we did for the LH.

The RH index finger is one of the most frequently used fingers in PVT. The RH thumb, the main purpose of which is to anchor the hand on the fretboard, is passive in terms of sound generation. In this study, we took the RH index finger as the reference finger that determines the RH position, as required for a symmetrical and consistent theoretical approach. When the RH index finger is not used, the fret that is in line with the index finger is assumed to be the fret that determines position.

In this regard, 14-*saz*s will have 14 different RH positions, just like in LH. While negative positions are theoretically possible for the RH, in practice, they are never used. The chromatic column upon which the RH index finger is pressing, or is hovering will be considered when determining the position.

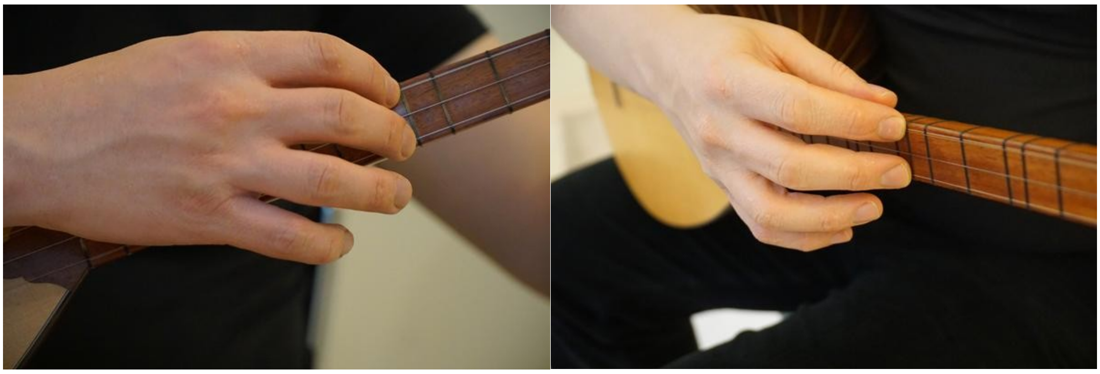
3.3.3.2 RH fingering

Since fingers are perpendicular to the fretboard in the characteristic posture of the RH, the fingering types in RH performance are not as varied as LH fingering types. The PVT performer frequently changes the RH position during the performance. The main reason for this is that the RH has limited fingering types. The RH fingering types emerge through the ulnar and radial deviations of the RH wrist. RH abduction and adduction is sometimes partially applied to allow the fingers to transit comfortably between strings, but these movements are not applied in an amount that will change the fingering type.

RH characteristic posture-fingering type

Since the natural posture of RH is perpendicular to the strings, we name the fingering type established by this posture R(0), similar to the naming of LH fingering types. The letter "R" indicates that the fingering type concerns the right hand. The R(0) fingering type is represented in position symbol notation as a sub-symbol in the lower right corner of the position sign (P_0) The reason for placing the number 0 to the right of the position symbol is because the fingering type concerns the right hand. This prevents confusing the RH position signs with LH position signs in position notations on the stave.

The RH index and middle fingers are perpendicular to the fretboard in the R(0) fingering type (Fig. 3.51).



(a) (b)

Figure 3.51 : Posture of R(0) fingering type: (a) Front view. (b) Side view.

The distribution of the fingers on chromatic columns is as follows in the R(0) fingering type (Fig 3.52).

	cc 1	cc 2	cc 3
1^{st} string	o (i)	y	s
2^{nd} string	o (i)	y	s
3^{rd} string	i (o)		
		b (inactive)	

Figure 3.52 : Finger placement in R(0) fingering type.

As shown in Figure 3.52, the index and middle fingers control the same chromatic column. Usually, due to their natural positions, the bottom string is controlled by the middle finger, and the top string is controlled by the index finger. The middle string is controlled by the suitable finger, depending on the situation. Due to the perpendicular position of the wrist, the passage of one finger to other strings, is relatively easier than the passage of the fingers of LH to other strings. Usually, in passages where the bottom and middle strings are heavily used by the RH, the middle string is played with the index finger; while in passages where the bottom and top strings are heavily used by the RH, the middle string is played with the middle finger. This is not a general rule, and from time to time, exceptions are observed depending on the performer's preferences. Ring and little fingers are used to control different chromatic columns in this fingering type. The "b" symbol in Figure 3.50 represents the position of the anchoring thumb on the fretboard. Accordingly, the RH thumb is positioned on the fretboard approximately 1 chromatic column to the right of the chromatic column controlled by the index and middle fingers.

RH ulnar and radial deviation fingering types

Different RH fingering types emerge through the ulnar and radial deviations of the RH wrist. When the wrist performs an ulnar deviation in the horizontal position, 4 RH fingers can be positioned over 4 adjacent chromatic columns. The resulting fingering will be called the R(+) fingering type (See Figure 3.53).

When the R(+) position is applied to different strings, in other words, when it is performed with the fingers in a diagonal position, the angle of ulnar deviation of RH has to be approximately 25-30 degrees. In this case, R(+) emerges as a comfortable fingering type, and is sometimes used during performances.

(a) **(b)**

Figure 3.53 : Posture of R (+) fingering type : (a) Front view. (b) Side view.

The figure below shows the placement of the fingers on the fretboard, and the position of the thumb in the R(+) fingering type (Figure 3.54).

	cc 1	cc 2	cc 3	cc 4
1st string		o	y	s
2nd string	i	o	y	s
3rd string	i	o	y	
		b (inactive)		

Figure 3.54 : Finger placement on R(+) fingering type.

Particularly, when the index finger and the other fingers play the same string, the angle of ulnar deviation increases to 50-60 degrees. This is why playing the same string poses great difficulties in terms of performance. This fingering type is named R(++) (Figure 3.55).

(a) **(b)**

Figure 3.55 : Posture of R (++) fingering type: (a) Front view. (b) Side view.

The figure below shows the placement of the fingers on the fretboard, and the position of the thumb in the R(++) fingering type. The R(++) fingering type is a transitional fingering type that occurs when the right hand plays on a single string (Figure 3.56).

	cc 1	cc 2	cc 3	cc 4
1st string	i	o	y	s
2nd string	i	o	y	s
3rd string	i	o	y	s
		b (inactive)		

Figure 3.56 : Finger placement on R(++) fingering type.

Another RH fingering type that is commonly used in contemporary performance emerges when the wrist is rotated through radial deviation. The radial deviation in this fingering type, which will be named R(-), allows the middle finger to control the chromatic column to the left of the index finger (Figure 3.57).

Thus, the index finger controls the same chromatic column as the ring finger. The little finger, while rarely used in this position, controls the chromatic column behind the index and ring fingers. It is impossible for fingers other than the index finger to play the top string. The thumb is placed on the chromatic column controlled by the little finger, which is at the rearmost position.

(a) **(b)**

Figure 3.57 : Posture of R(-) fingering type : (a) Front view. (b) Side view.

The figure below shows the placement of the fingers on the fretboard, and the position of the thumb in the R(-) fingering type (Figure 3.58)

	cc 1	cc 2	cc 3
1st string	o	y	s
2nd string	o	y(i)	s
3rd string		i	
			b (inactive)

Figure 3.58 : Finger placement on R(-) fingering type.

These are all the RH fingering types that are observed in performances. The RH abduction that is performed in the R(0) fingering type is functional in the transition between the strings, and does not create different fingering types. While it is theoretically possible to perform different fingerings through abduction in the R(+) position, this will not generate a healthy result since the tapping force will be decreased in practice.

The proportion of the use of RH fingering types of musical pieces in Appendix F are given in Appendix G.

The results suggest the following conclusions:

- The examination of the existing PVT notes reveals that characteristic RH fingering R(0) is the most frequently used fingering type (%80,39) in PVT, as expected.
- R(+) fingering type is seen secondary fingering type for RH (% 14,52).
- R(-) (%3,02) and R(++) (%2,21) fingering types are rarely seen. R(++) fingering types are generally used during applying hammer-on and pull-off in one string, respectively or vice versa.

3.3.4 Position and fingering symbol use in PVT notation

Table 3.6 provides instructions on how to use the position symbols in notation under different circumstances. In the beginning of notation, the RH and LH position-fingering symbols are used in parentheses, separated with a slash in order to specify the beginning position of the hands. Usually in PVT performance, one hand changes position or fingering, while the other maintains its position and fingering type. In this case, only the hand that changes position and ⁄ or fingering type is specified in the notation. In case both hands change position and ⁄ or fingering type, a position sign that represents the positions of both hands is used again.

Table 3.6 : LH and RH position symbols for different cases in notation[94].

Representation of Positions on Notation	Cases that are used
${}^{a}_{t}(\mathrm{P_L}/\mathrm{P_R})_{d}$	1-) In the beggining bar 2-) When the positions and/or fingerings of both of hands are changed
${}^{a}_{t}\mathrm{P_L}$	When the only position and/or fingering of LH is changed
$\mathrm{P_{R_d}}$	When the only position and/or fingering of RH is changed

For example, according to the position symbols in the notation in Figure 3.59, in the 7th bar, the performance begins with $_{+}(\mathbf{I/V})_{\mathbf{0}}$ position pair.

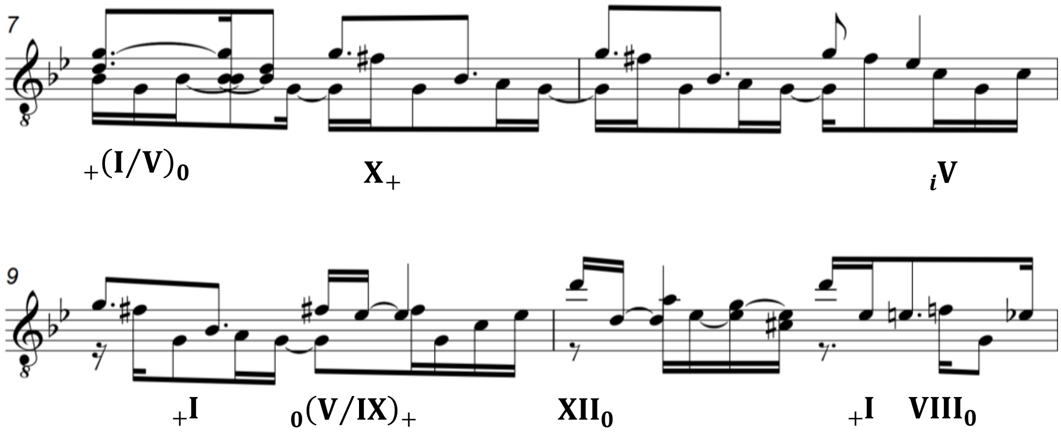


Figure 3.59 : Sinan Ayyıldız's arrangement of *Ay Laçin*, measures 7-10.

If one of the hands changes its fingering type or position during performance, the symbolization is not repeated for both hands, but only for the hand that changes its position and ⁄ or fingering type. For example, in bar 7, beat 2, the right hand changes position and transitions to the position $\mathbf{X}_{+}$ (Figure 3.60). With the right hand at this position, in bar 8, beat 2, the left hand transitions to the position $_{i}\mathbf{V}$. In bar 9, the left

94 The explanation of symbols in the Table 3.6 are as follows : $\mathrm{P_L}$: LH position, $\mathrm{P_R}$: RH position, t : LH thumb position in fingering type, a : LH fingers' position in fingering type, d : RH fingering type.

hand transits to the beginning position, $_{+}\mathbf{I}$. Since the right hand does not change position from bar 7, beat 2 until this point, the right hand is still at the $\mathbf{X}_{+}$ position. In bar 9, beat 2, both hands change position and transition to the position $_{0}(\mathbf{V/IX})_{+}$.

In case the hands assume a cross-hands posture in PVT performance, the P_R position will be smaller than P_L. However, if the cross-hands posture has to be specified in notation, it can be represented with the symbol C.H. (Figure 3.60).

Figure 3.60 : Sinan Ayyıldız's arrangement of *Moonlight Sonata Mov. 3 Presto Agitato* by L.V. Beethoven, measures 39-42.

3.4 Pitch Generation Techniques (PGTs) in PVT

The pitches that are produced in *saz* performance can be generated through various techniques. These techniques are included in our study with the abbreviation PGT (Pitch Generation Technique). PGTs that are used in *saz* performance can be defined and classified according to the answers to two fundamental questions. One of these questions is what the vibrative impact source that causes the string to vibrate, and the other is what the pitch determination source is. These sources constitute one of the PGTs.

The following table presents the primary and secondary sources of vibrative impact that cause the sound vibration in different *saz* performance techniques (Table 3.7.).

Accordingly, the *vibrative impact source* that causes the strings to vibrate in *saz* performances outside PVT is usually provided by the RH fingers, or the pick, a medium held in the RH. Sounds that are generated through LH hammer-on & pull-off techniques are used in both picking and pickless techniques, and thus are an important part of the general *saz* playing style. LH hammer-on & pull-off techniques are the secondary *vibrative impact sources* in techniques other than PVT.

Table 3.7 : *Vibrative impact sources* in different *saz* playing techniques.

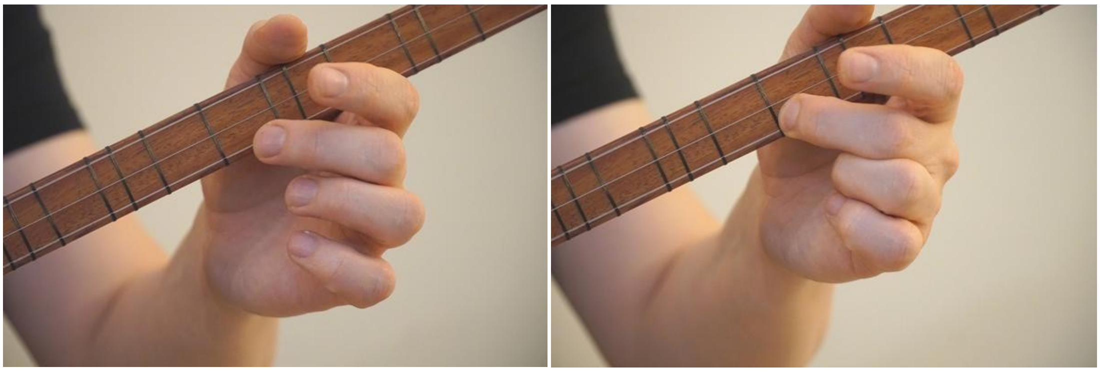
Playing Style		**Primary** ***Vibrative Impact Source***	**Secondary** ***Vibrative Impact Source***
Picking Technique		RH – Pick Strikes	LH hammer-on & pull-off
Pickless Playing Techniques	*Pençe Technique*	RH – Strumming	LH hammer-on & pull-off
	Tel çekme Technique	RH - Plucking	LH hammer-on & pull-off
	Parmak Vurma Technique	LH hammer-on & pull-off	RH hammer-on & pull-off

In PVT, the primary technique that causes vibrations is the LH hammer-on & pull-off technique. RH hammer-on & pull-off techniques are not used in playing styles other than PVT, and these are the secondary techniques that generate sound vibrations in PVT. The pitches that constitute the tune are shared between LH and RH in PVT.

In some cases, LH or RH fingers both provide the impact that starts the vibration, and determine its pitch at the same time. This is only possible through the application of hammer-on techniques. As in many necked, lute-shaped chordophones, the typical function of the LH in *saz* performance is pitch determination. The LH fingers modify the length of the vibrating string by pressing (or not pressing) the frets on the fretboard, and ultimately modify the pitch. The techniques used to generate the primary sounds in PVT melody generation are LH hammer-on, LH pull-off, RH hammer-on, and RH pull-off. Additionally, pitch changes through glissandos, and LH plucking are PGTs that are sometimes used in PVT.

3.4.1 LH hammer-on

The LH hammer-on movements in PVT are generally applied with the LH fingers apart from the thumb (Fig 3.61).



(a) **(b)**

Figure 3.61 : LH hammer-on : (a) Before the movement. (b) After the movement) (See Appendix M: CD, Video Track-1).

LH hammer-on is a technique that can be successively applied. Performers call this technique *parmak vurma* (finger tapping), *vurma* (tapping, striking), *çarpma* (hitting), and similar terms.

It is very difficult to generate sound by striking the fretboard with the LH thumb. This is why it is not used in PVT. However, rare exceptions exist. This may happen over a string that is previously vibrated (Figure 3.62).

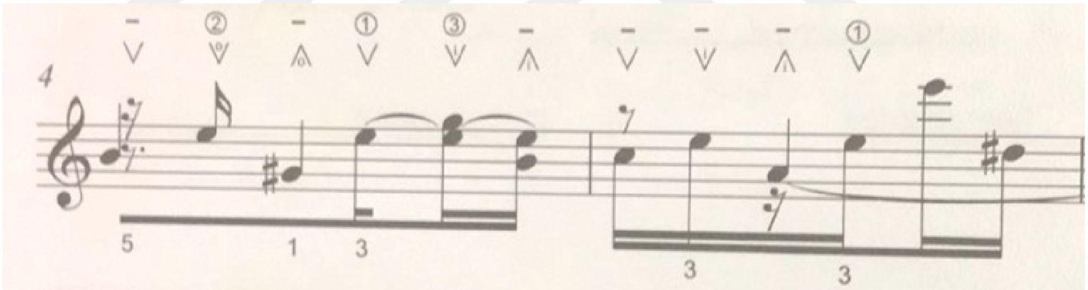


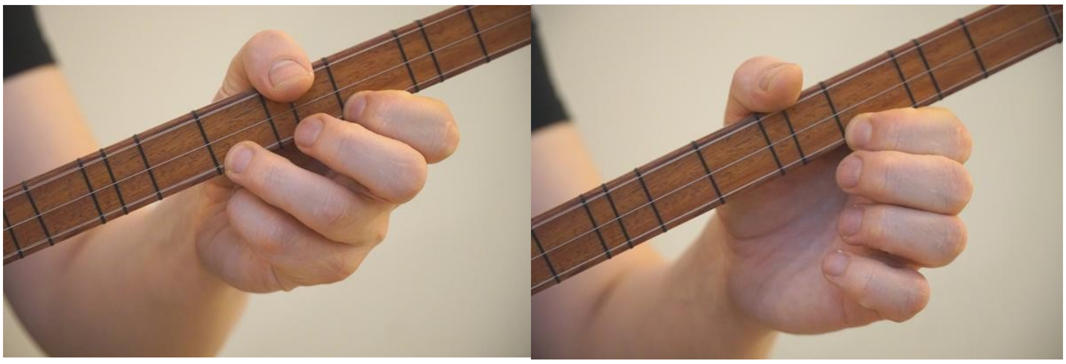
Figure 3.62 : Sinan Ayyıldız's arrangement of Beethoven's Fur Elise, measure 4-5 (Parlak, 2005)

3.4.2 LH pull-off

LH pull-offs can be performed with all the LH fingers. This is executed by the LH fingers that press the fretboard (Figure 3.63).

The LH pull-off in the PVT is executed by gently pulling the LH finger that presses the fretboard downward with an angle. This is why, in Turkish the term *çekme* (pulling) is used to define this technique.

The pull-off that is performed on a string is executed to change from a higher frequency pitch, to a lower frequency pitch. Thus, the pull-off capacities of the LH fingers differ.



(a) **(b)**

Figure 3.63 : LH pull-off to LH finger : (a) Before the movement. (b) After the movement (See Appendix M: CD, Video Track-2).

In the hands' common posture during PVT performance, the LH fingers can perform the following pull-offs:

a- pull-offs from the 4th finger to the 5th, 3rd, 2nd, 1st fingers and to the open string.

b- pull-offs from the 3rd finger to the 5th, 2nd, 1st fingers and to the open string.

c- pull-offs from the 2nd finger[95] 1st finger and to the open string.

d- pull-offs from the 1st finger to the open string.

e- pull-offs from the 5th finger to the open string.

In the cross-hands posture of hands during PVT performance, the LH fingers can pull-off to any finger, except the RH thumb. (Figure 3.64).

(a) **(b)**

Figure 3.64 : LH pull-off to RH finger on cross-hands posture : (a) Before the movement. (b) After the movement (See Appendix M: CD, Video Track-3).

---

[95] While it is theoretically possible to perform a pull-off from the 1st and 2nd fingers to the 5th finger, this is not observed in practice.

3.4.3 RH hammer-on

RH hammer-on is a unique *saz* performance technique that solely seen in PVT. It is executed by the RH fingers that tap the fretboard (Figure 3.65)

(a) **(b)**

Figure 3.65 : RH hammer on : (a) Before the movement. (b) After the movement (See Appendix M : CD, Video Track-4).

In the traditional performance of PVT, the RH index is heavily used. In Dirmil region the RH middle finger is used as frequently as the RH index finger (Parlak, 2000, p. 214). In contemporary PVT, the RH ring and little fingers that are not used in traditional performance are also frequently used (Fig. 3.66.).

It is almost technically impossible to generate sound by hammering-on the RH thumb. While this technique is used on the bass strings of the *guitar* (Çoğulu, 2010), it is not observed in *saz* performances.

(a) **(b)**

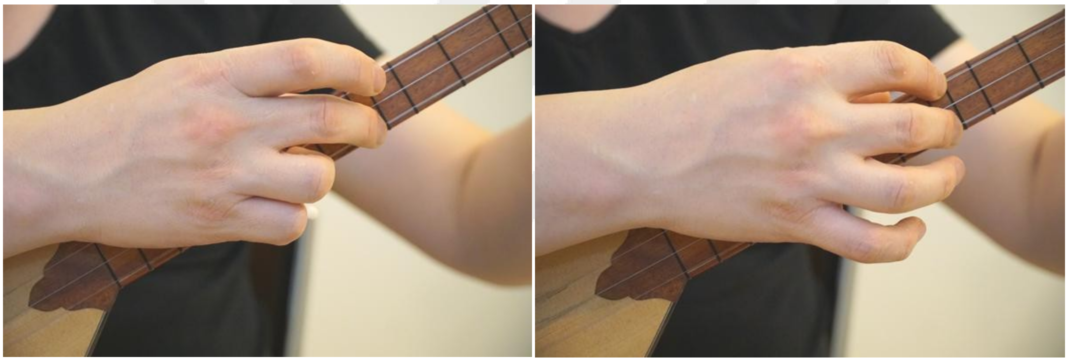
Figure 3.66 : Use of the ring and little fingers in RH hammer-on technique : (a) Before the movement. (b) After the movement (See Appendix M : CD, Video Track-5).

In the common posture of hands in PVT performance, the RH fingers generate the proper pitch of the melody, or its higher octave through hammer-on in the melodic flow. Especially in RH hammer-on performances on the bottom string, the higher octave equivalents of the pitch of the melody are frequently used. In the crosshand posture of hands in PVT performance, the left hand may undertake this function.

In figure that is generated by repeatedly hammering/pulling a certain pitch with the RH, it is common to use the RH fingers successively (Fig. 3.67).

Figure 3.67 : Erol Parlak's arrangement of Dertli Divani's *Efsaneyim* as an example of the use of successive RH hammer-ons on one fret (Parlak, 2005).

In PVT, RH's fingers can perform successive hammer-ons (Fig. 3.68). These hammer-ons can be on different strings, as well as on the same string.



(a) **(b)**

Figure 3.68 : Successive RH hammer-ons : (a) First RH hammer-on. (b) Second RH hammer-on (See Appendix M : CD, Video Track-6).

3.4.4 RH pull-off

In PVT, the RH Pull-Off is performed by pulling the RH fingers that have been pressed the fretboard. In this regard, it is different than the plucking that occurs in the *tel çekme* technique, which frequently pulls the string that is not pressed. While this type of plucking can be used in PVT, it is not considered a PVT move. “The plucking technique may be used, though in a limited way, on the neck as well. Here it is used only as a pull-off from a string that has been hammered on” (Parlak, 2010, p.43)

In the common posture of hands in PVT performance, the RH fingers that press the fretboard are pulled, and generally sound a fret pressed by the LH or the open string.

In the cross-hands posture of hands in PVT performance, the right hand mostly pulls the open string (Figure 3.69).

(a) (b)

Figure 3.69 : RH pull-off to LH fingers : (a) before the movement. (b) after the movement) (See Appendix M : CD, Video Track-7).

In the RH pull-off in contemporary use of PVT, sometimes the pressed RH finger can be pulled to sound another fret that is pressed by the RH in R(++) fingering type (Figure 3.70).

(a) (b)

Figure 3.70 : RH pull-off to RH fingers (a) Before the movement. (b) After the movement (See Appendix M : CD, Video Track-8).

Pulling a RH finger to another RH finger can be performed in a couple of ways:

(a) Pulling the RH middle finger to the RH index finger

(a) Pulling the RH ring finger to the RH middle finger

(a) Pulling the RH ring finger to the RH index finger

(a) Pulling the RH little finger to the RH index finger

(a) Pulling the RH little finger to the RH middle finger

(a) Pulling the RH little finger to the RH ring finger

This technique poses some difficulties in practice, but allows gaining time when playing notes that can't be easily reached by the LH.

The pull-off techniques in PVT are carried out through the fingers that are currently pressing the fretboard. A finger can press the fretboard in two different circumstances. The first is the possibility that the finger may have produced sound through a hammer-on, and may be pressing on the fretboard. In this case, this pitch can be generated as long as the finger keeps pressing, until the vibration amplitude falls below the human hearing threshold. The second one is the possibility that the finger can be silently pressing the fretboard in order to be used in a pull-off. Whatever the case, a finger that presses the fretboard always has the potential to produce sound through a pull-off.

3.4.5 Glissando

Glissando techniques are sometimes used in picked and pickless traditional *saz* playing techniques. Glissando is defined as playing at least two notes with a slide along the fretboard. In *saz* performance, glissando means changing frets by sliding the finger on a string that is being vibrated. When glissando is performed, the LH that is pressing the previously vibrated string is slid over the string that is pressed by LH (See Appendix M: CD, Video Track-9). This allows changing the position of the hand without a new impact. As the *saz* is a fretted instrument, the actual sound is not an uninterrupted sound between two pitches, but a sound that produces all the pitches between the first pitch and the last one (Figure 3.71).

(a)

(b)

Figure 3.71 : Glissando in PVT : (a) Notation (b) Sound.

RH can also be used to perform glissando in PVT (See Appendix M: CD, Video Track-10). This causes the RH to change its position on the fretboard (Figure 3.72).

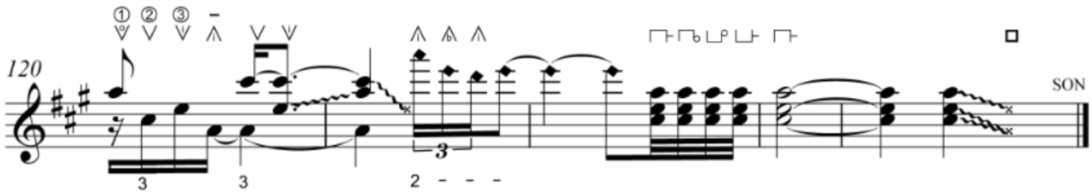


Figure 3.72 : Erol Parlak's arrangement of W.A.Mozart's *Rondo Alla Turca,* measures 120-124 as an example of LH and RH glissando (Parlak, 2005).

3.4.6 LH plucking technique

This PGT is observed in all picked and pickless *saz* techniques, and is sometimes also used in PVT. When the LH is not pressed, LH plucking consists of rapidly bringing the LH finger to the fretboard, and pulling the string without actually touching, or minimally touching the fretboard (Figure 3.73).

(a) **(b)** **(c)**

Figure 3.73 : LH plucking to LH Finger : (a) Before the movement. (b) During the movement. (c) After the movement (See Appendix M : CD, Video Track-11).

While the LH can be plucked to an open string, it can also be plucked to a LH finger that is pressing the fretboard. It is generally used in performances to repeat the same note (Fig. 3.74). Its timbre characteristics are different when plucking the currently pressed fret, and plucking an unpressed note.

Figure 3.74 : Erol Parlak's arrangement of traditional Istanbul song "Katibim" measure 3 as an example of repeating notes with LH Plucking (Parlak, 2005).

3.4.7 Other pitch generation techniques used in PVT

Natural and artificial harmonics are sometimes used in PVT performances. These harmonics can be generated through plucking and pull-off techniques. Additionally, the successive application of the hammer-on and pull-off techniques on the fret can also generate harmonic sounds in PVT (Parlak, 2010).

It is possible to produce 'muted notes' by pressing on (not between) frets with fingers, or 'ghost notes' by not pressing the strings in PVT. These sounds can also be generated through hammer-on, pull-off, and plucking techniques.

In addition to the PGTs above, other PGTs are possible in PVT performances. RH Plucking, *Pençe* techniques and percussive techniques are among these. However, these are not techniques that are specific for PVT, and can be used in PVT when combining PVT and other pickless *saz* playing techniques. Especially the percussive techniques are not part of any pickless playing technique, and have to be addressed as a separate technique.

3.5 Structures occurred during PVT performance of melodic patterns

The performance of melodic patterns with PVT causes the emergence of three different structures:

1- *Position difference class* (PDC)

2- *Pitch generation technique order pattern* (PGTOP)

3- *String order pattern* (SOP)

A melodic pattern that is performed through PVT can be described by coding these structures.

3.5.1 *Position difference class* (PDC): creating a transposable closed system

Creating a closed system without using open strings during the performance of scales and melodic patterns is a known strategy in string instruments, and is mentioned in many training books. (Chapman, 1993, p.104; Phillips, 1984, p.22, Bredice V., 2010, p.58, Ricker W., 1994, p.15). This allows changing the LH position, and makes the patterns, scales and chords movable. This type of performance is also called "position playing" (Leawitt W., p. 56).

To establish a model that presents all the melodic pattern performance options in PVT, the first step is to establish a structure that can be transposed when the position is changed. Such a system can only be established in PVT by maintaining the position difference between the RH and LH, and their fingering types.

Such structures that emerge through a certain position difference are called "*Position difference class*es" (PDCs) in this study. The PDC will be represented with the following symbolization (Figure 3.75).

$$ {}^{a}_{t}(\Delta\mathrm{P})_{d} $$

$\Delta P = P_R - P_L$ = RH position - LH position

ΔP : *Position difference class* (PDC) (with Roman Numerals)

P_L : LH position

P_R : RH position

t : The symbol represents LH thumb position in fingering type

a : The symbol represents LH fingers position in fingering type

d : The symbol represents RH fingering type

Figure 3.75 : PDC symbolization.

For example the PDC symbol ${}_{0}(\Delta\mathrm{III})_{+}$ represents all situations where there are 2 empty chromatic columns (thus, a position difference of 3) between the RH and LH index fingers, and where the left hand has the fingering type L(0), while the right hand has the type R(+) (Figure 3.76).

$$ {}_{0}(\Delta\mathrm{III})_{+} = \begin{cases} {}_{0}(-\mathrm{I}/\mathrm{III})_{+} \\ {}_{0}(\mathrm{I}/\mathrm{IV})_{+} \\ {}_{0}(\mathrm{II}/\mathrm{V})_{+} \\ {}_{0}(\mathrm{III}/\mathrm{VI})_{+} \\ {}_{0}(\mathrm{IV}/\mathrm{VII})_{+} \\ {}_{0}(\mathrm{V}/\mathrm{VIII})_{+} \\ {}_{0}(\mathrm{VI}/\mathrm{IX})_{+} \\ {}_{0}(\mathrm{VII}/\mathrm{X})_{+} \\ {}_{0}(\mathrm{VIII}/\mathrm{XI})_{+} \\ {}_{0}(\mathrm{IX}/\mathrm{XII})_{+} \\ {}_{0}(\mathrm{X}/\mathrm{XIII})_{+} \\ {}_{0}(\mathrm{XI}/\mathrm{XIV})_{+} \end{cases} $$

Figure 3.76 : Position pairs that create the PDC ${}_{0}(\Delta\mathrm{III})_{+}$.

Position pairs shown in Figure 3.77 create the *position difference class* ${}_0(\Delta III)_+$. The views of these positions on the *saz* are shown in Figure 3.78. PDC symbols will be especially used to represent the scales and the melodic patterns that are created within the scales.

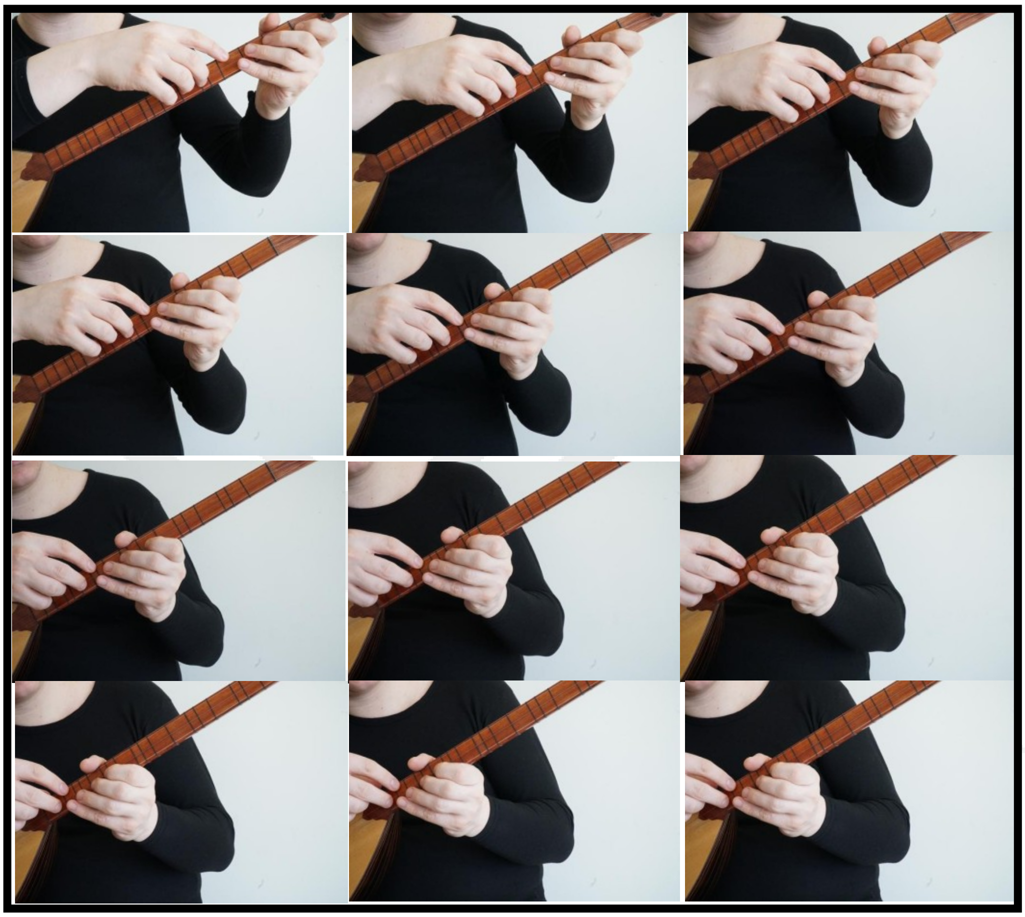


Figure 3.77 : Representation of ${}_0(\Delta III)_+$ PDC on *saz*.

3.5.2 *Pitch generation technique order pattern* (PGTOP)

As stated in Chapter 3.4, pitches can be generated through different methods during melodic pattern playing in PVT. The successive application of these techniques establishes an order. This order can be used as a pattern that can be applied to other sounds. Thus, the pattern that emerges from the sequence of PGTs will be named as *pitch generation technique order pattern* (PGTOP) in our study.

The following table shows the vibrative impact source that is required to vibrate the sound, and the factors that determine the frequency of the pitch (LH fingers, RH fingers or open strings) in the main PVT techniques (Table 3.8.).

Table 3.8 : Pitch Generation Possibilities.

Technique	Vibrative Impact Sources	Pitch Determination Sources		
LH hammer-on	a LH finger	Same LH finger that vibrates the string		
LH pull-off	a LH finger	(To) Another LH finger	(To) open string	(To) a RH finger*
RH hammer- on	a RH finger	Same RH finger that vibrates the string		
RH pull-off	a RH finger	(To) a LH finger**	(To) open string	(To) Another RH finger
LH plucking	a LH finger	(To) Another LH finger	(To) open string	(To) a RH finger*
Glissando	-	RH or LH fingers that had produced the beginning pitch before glissando		

*: It is seen only in cross-hands posture in PVT
**: It is seen only in the common posture of hands in PVT

As shown in Table 3.8, the vibrative impact and pitch determination are performed by the same source in hammer-on techniques. In pull-off techniques, the pitch can be determined in 3 ways, independent of the source of vibrative impact.

The successive execution of PGTs allows producing melodies in PVT. The symbols that we will use for PGTOP coding in our study establish a symbolization system that aims to define the melodic pattern in terms of PGTs in PVT performance. These symbols were not created to be used in notation. Parlak's transcription symbols can be used for notation.

As stated in Chapter 3.4, the primary PGTs in PVT are LH hammer-on, and LH pull-off, while the secondary PGTs are RH hammer-on and RH pull-off. Additionally, the LH plucking technique, and glissando that allows changing the pitch, which are also used in other *saz* playing techniques, can be listed among PGTs of PVT. Table 3.9 shows the PGT symbols that will be used to code for PGTOP in PVT.

Table 3.9 : PGT symbols.

PGT Symbols	**Explanation**
L	Left hand hammer on
R	Right hand hammer on
L^{L}	LH pull off to an another LH finger
R^{L}	LH pull off to a RH finger
0^{L}	LH pull off to open string
L^{R}	RH pull off to a LH finger
R^{R}	RH pull off to an another RH finger
0^{R}	RH pull off to open string
L^{LP}	LH plucking to LH finger
R^{LP}	LH plucking to RH finger
0^{LP}	LH plucking to open string
R^{γ}	RH finger glissando
L^{γ}	LH finger glissando

As shown in Table 3.9, the *pitch determination source* is written as the main symbol in capital letters. The *vibrative impact source* is specified in the upper right corner as superscript. Since pitch determination and vibrative impact come from the same source in hammer-on techniques, this source is shown as the main source, and a superscript symbol is not used.

PGTs can be classified in 3 categories in terms of *pitch determination source* when creating a melody during PVT performance. 1- PGTs that determine pitch by LH fingers "L" 2- PGTs that determine pitch by RH fingers "R" 3- PGTs that determine pitch by Open Strings "0". The distribution of techniques represented by PGTOP symbols into PGT categories is presented in Table 3.10.

Table 3.10 : PGT categories and included PGTs.

PGTs	PGTs that determine pitch by LH fingers "$\boxed{L}$"	PGTs that determine pitch by RH fingers "$\boxed{R}$"	PGTs that determine pitch by open strings "$\boxed{0}$".
Hammer- On	L	R	
Glissando	L^{γ}	R^{γ}	
LH Pull-Off	L^{L}	R^{L}	0^{L}
RH Pull-Off	L^{R}	R^{R}	0^{R}
LH Plucking	L^{LP}	R^{LP}	0^{LP}

PGTOP symbols are shown over the stave that shows the melodic pattern within "{ }" symbols, separated with a comma. The sub-symbol *p* is used in the lower right corner of the closing curly brace "}" to indicate that it is a PGTOP symbol. For example, the PGTOP for the six-pitch melodic pattern in Figure 3.78 can be represented as $\{\mathbf{L}, \mathbf{L}, \mathbf{R}, \mathbf{R}, \mathbf{L^R}, \mathbf{L^L}\}_\mathbf{p}$

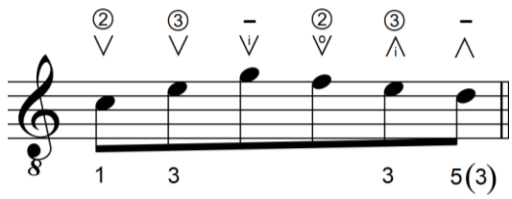


Figure 3.78 : A melodic pattern created with PVT.

3.5.3 *String order pattern* (SOP)

In addition to PGTOP, another important concept in the performance of melodic patterns is the *string order pattern* (SOP) that determines the order of the strings to which the pitches that are produced belong.

SOP symbols are 1, 2, and 3 that identify the string that is used. As in PGTOP, these symbols will also be shown over the stave that shows the melodic pattern within curly braces "{ }" separated with a comma. The superscript symbol *s* is used on the upper right corner of the closing curly brace "}" to indicate that it is a SOP symbol. For example, the SOP for the six-pitch melodic pattern in Figure 3.79 can be represented as $\{\mathbf{2}, \mathbf{3}, \mathbf{3}, \mathbf{2}, \mathbf{3}, \mathbf{3}\}^\mathbf{s}$

3.5.4 Coding melodic pattern with PDC, PGTOP and SOP symbols

The performance of a melodic pattern in PVT can be represented by coding the 3 structures mentioned above. Especially, since PGTOP and SOP that express temporal dimension of melodic patterns in PVT will frequently be represented together, a single symbolization system can be used. When representing the SOP and PGTOP symbols together, the subscript symbol *p* and the superscript symbol *s* are used together after the closing curly brace "}". Pitches are separated with vertical lines instead of commas. The PGTOP and SOP for the structure in Figure 3.79 are shown as $\left\{\begin{array}{c|c|c|c|c|c} 2 & 3 & 3 & 2 & 3 & 3 \\ \mathrm{L} & \mathrm{L} & \mathrm{R} & \mathrm{R} & \mathrm{L^R} & \mathrm{L^L} \end{array}\right\}_p^s$ in Figure 3.79. The PDC symbol that shows spatial dimension of melodic patterns in PVT can be shown over the PGTOP and SOP symbol with an arrowed curly brace (Figure 3.79).

PGTOP&SOP&PDC symbolization represents *performance methods* that are main scope of this study.

Melodic Pattern on Staff :

PDC Symbolization : $_{+}(\Delta V)_0$

PGTOP Symbolization : $\{\mathbf{L}, \mathbf{L}, \mathbf{R}, \mathbf{R}, \mathbf{L^R}, \mathbf{L^L}\}_p$

SOP Symbolization : $\{\mathbf{2}, \mathbf{3}, \mathbf{3}, \mathbf{2}, \mathbf{3}, \mathbf{3}\}^s$

SOP&PGTOP Symbolization : $\left\{\begin{array}{c|c|c|c|c|c} \mathbf{2} & \mathbf{3} & \mathbf{3} & \mathbf{2} & \mathbf{3} & \mathbf{3} \\ \mathbf{L} & \mathbf{L} & \mathbf{R} & \mathbf{R} & \mathbf{L^R} & \mathbf{L^L} \end{array}\right\}_p^s$

PGTOP&SOP&PDC Symbolization : $\overbrace{\left\{\begin{array}{c|c|c|c|c|c} \mathbf{2} & \mathbf{3} & \mathbf{3} & \mathbf{2} & \mathbf{3} & \mathbf{3} \\ \mathbf{L} & \mathbf{L} & \mathbf{R} & \mathbf{R} & \mathbf{L^R} & \mathbf{L^L} \end{array}\right\}}^{_{+}(\Delta \mathbf{V})_\mathbf{0}}$

Figure 3.79 : Summary of symbolizations for coding PVT melodic patterns.

4. CREATING MELODIC PATTERNS USING PVT

4.1 Melodic Movement in PVT

The smallest unit of melodic patterns is the melodic movement between two pitches. As discussed before, a melodic pattern can consist of 2 or more pitches in a sequence. In other words, the melodic movement between 2 pitches can constitute a melodic pattern on its own, while being the building blocks of other melodic patterns.

As specified in the previous section, there are 2 different movement types between two pitches of different frequency: ascending, and descending. Additionally, two pitches in the same frequency give rise to horizontal movements that require repeating the pitch. There are some technical differences in the adaptation of these movements into the PVT technique.

4.1.1 Ascending movement in PVT

In PVT, the initial sound can generally be produced with hammer-on movements when no fingers are already pressed on the fretboard. The PGT that provides melodic movement is the PGT that is applied on the second pitch. The ascending melodic movements that follow this initial movement can only be produced through hammer-on and glissando techniques.

The PGTOPs that are required for ascending melodic movement in 2 pitches in PVT are the following (Table 4.1.):

Table 4.1 : PGTOPs that are used in ascending melodic movement of two pitches.

No.	1	2	3	4	5	6
PGTOPs	$\{L,R\}_p$	$\{R,L\}_p$	$\{L,L^{\gamma}\}_p$	$\{R, R^{\gamma}\}_p$	$\{L,L\}_p$	$\{R,R\}_p$

Glissando is preferred in special circumstances both due to its musical effect, and the fact that it causes a position change. Glissando changes the position of the performing hand. Thus, glissando is especially a performance option when position changes are necessary. Usually hammer-ons are used when an ascending movement is necessary without changing position.

In Table 4.1, the PGT category changes in the PGTOPs Nos. 1 and 2. The PGT category remains the same in PGTOPs Nos. 3 and 4, but the position transitions to a higher number position. In PGTOPs Nos. 5 and 6, the melody is performed in a single PGT category.

If there are fingers that are pressed on the fretboard before the ascending movement, it is possible to perform ascending movements through pull-offs. However, this happens in SOPs in which two pitches are played on different strings.

4.1.2 Descending movement of 2 pitches in PVT

The PGTOPs that are available for melodic movement between 2 frets in PVT in a passage that begins with a hammer-on are the following (Table 4.2):

Table 4.2 : PGTOPs that are used in descending melodic movement of two pitches.

No	1	2	3	4	5	6	7	8	9	10	11	12
PGTOPs	$\{L,R\}_p$	$\{R,L\}_p$	$\{L,L^y\}_p$	$\{R, R^y\}_p$	$\{L,L\}_p$	$\{R,R\}_p$	$\{L,L^L\}_p$	$\{L,R^L\}_p$	$\{L,0^L\}_p$	$\{R,R^R\}_p$	$\{R,L^R\}_p$	$\{R,0^R\}_p$

In Table 4.2, The PGT category changes during the descending movement in the PGTOPs Nos. 1 and 2. The PGT category does not change in the PGTOPs Nos. 3 and 4, but a position with a smaller number is assumed. The PGT category also changes in the PGTOPs Nos. 8, 9, 11 and 12. However these patterns cannot be played on different strings. They can only be performed on a single string. The PGTOPs Nos. 5, 6, 7 and 10 occur in a single PGT category.

4.1.3 Repeating of one pitch in PVT

Repetition of the same pitch is rarer in PVT than other *saz* techniques. The main reason for this is that hammer-on/pull-off based PVT has restrictions that make it difficult to produce the same pitch. PGTOPs in which the same pitch can be repeated are the following (Table 4.3):

Table 4.3 : PGTOPs that are used in repeating pitch.

No	1	2	3	4	5	6
PGTOPs	$\{L,R\}_p$	$\{R,L\}_p$	$\{L,L\}_p$	$\{R,R\}_p$	$\{L,L^{LP}\}_p$	$\{R,R^{LP}\}_p$

In Table 4.3, PGTOPs nos. 1, 2, 3, and 4 are usually performed with SOPs $\{2,3\}^s$ or $\{3,2\}^s$. When the repetition of the same pitch on the same string is applied in these PGTOPs, the result is a staccato. This is why pitch repetitions on the same string and pitch are usually carried out with the PGTOP no. 5.

L^{LP} is a technique used to repeat pitches not only in PVT, but in general *saz* performance, and is frequently used in PVT. LH plucking can also be used in cross-hand posture with the PGTOP no. 6.

4.1.4 Limitations during melodic movement in PVT

PGTs that are used during melodic movement are classified based on their effects on whether the PGT category changes or not. According to Table 4.4, LH plucking and glissando techniques don't change the PGT category. Whether the PGT category changes in hammer-on technique depends on which PGT category was in use before. In that regard, the hammer-on technique may be suitable for both cases. The superscript symbols used to represent the pull-off technique may provide information on whether the PGT category changes. If the pull-off superscript symbol is the same with the main symbol, the PGT category remains the same, otherwise it changes.

Table 4.4 : The effect of PGTs on changing PGT category.

PGT	Staying in $\boxed{L}$ PGT category	Staying in $\boxed{R}$ PGT category	Staying in $\boxed{0}$ PGT category	Transition between PGT categories			
				$\boxed{R}\rightarrow\boxed{L}$	$\boxed{L}\rightarrow\boxed{R}$	$\boxed{L}\rightarrow\boxed{0}$	$\boxed{R}\rightarrow\boxed{0}$
Hammer-On	L^{*}	R^{**}	-	L^{**}	R^{*}	-	-
Pull-Off	L^{L}	R^{R}	-	R^{L}	L^{R}	0^{L}	L^{R}
Glissando	L^{γ}	R^{γ}	-	-	-		-
LH Plucking	L^{LP}	R^{LP}	0^{LP}	-	-		-

* If it comes after $\boxed{L}$ PGT Category
** If it comes after $\boxed{R}$ PGT Category

Limitations that emerge when the PGT category changes or remains the same when performing the melody differ. This is why the order in which a category will be used in performance is important. Limitations that emerge based on whether the PGT category changes or remains the same in melody performance are determined according to conditions in Table 4.5.

Table 4.5 : The limitations during PVT performance.

PGT Categories Condition	PGT	Maximum Melodic Range
Transition between PGT Categories	Hammer-On	Fretboard Range
	Pull-Off	Fretboard range of one string
Remains in $\boxed{L}$ or $\boxed{R}$	Hammer-On or Pull-Off	Hand Span
	Glissando	Fretboard range of one string
Remains in $\boxed{0}$	Any PGT in $\boxed{0}$	Pitches of Open String

According to Table 4.5, as long as the same PGT category does not repeat, any two frets on the fretboard can be played successively. This means that any fret on the fretboard can be generated with the RH after the sound that is generated with the LH, and vice versa.

However, when the successive pitches are generated using only one category above, other limitations emerge. For example, pitches in a melodic passage that are played on only open strings on the *saz model* are limited to the three pitches that identify *bağlama düzeni*: “D4-G3-A3.” Performance of successive frets using the fingers of only one hand also has limitations depending on the hand’s position and fingering type. The intervals that emerge may be intervals included in the chromatic columns within the hand span of the fingering type. Despite all limitations, PVT performers don’t change PGT categories in each pitch change. Because changing the PGT category for every new pitch will cause frequent LH and RH position changes. Frequent position changes are another factor that makes performance more difficult. This is why performers choose from these two difficulties according to the structure of the song they will perform, their habits, training and physical conditions.

The factor that determines the limitations in the performance of successive pitches without changing the position of one hand's fingers is the hand span. Table 4.6 presents intervals that emerge when two successive pitches are played using only the LH or RH fingers. The numbers on the top of the table represent the chromatic column difference (Δcc) between the two pitches. Microtonal intervals are not specified in the table. However, the microtonal intervals in any chromatic column in the table can be considered to be within the hand span. The maximum and minimum intervals in hand span can be found assuming one of frets of Δcc is microtonal. These values are also shown in Table 4.7.

Intervals labeled with * in Table 4.6 are played with pull-offs on the same hand. All other intervals are obtained with hammer-ons. The fields in the table are colored based on the melodic movement that is performed. Orange fields represent ascending intervals between two pitches, and lilac fields represent descending intervals. Fields that represent the repetition of the same pitch are yellow. The fields below these specify the finger variations that play the first and second pitches in various left and right hand fingering types. As evident from the table, LH can only successively play two pitches with a maximum of 11 ascending or descending half tones interval between them. 11 half tones can be performed by applying one of L(ocs) fingering types that can access 5 ascending chromatic columns on the middle and bottom strings. In this case, the LH index and little fingers are used. A maximum of 10 half tones can be performed with the right hand using R(+) fingering type. When they are applied in *saz model* fretting maximum pitch skip/leap will increase to 11,35 for L(ocs) and 10,35 for R(+) fingering types (See Table 4.7.).

Pitch repetitions on the same string cannot be played as legato with hammer-ons. As presented in yellow fields in the table, legato pitch repetitions with hammer-ons can only be played with the second and third strings. LH plucking can be used for legato pitch repetitions on same string.

Intervals and finger variations used in different fingering types are colored differently in Table 4.6. The fingering types with the largest hand span are L(ocs) for LH, and R(+) for RH.

Table 4.6 : Possible melodic movements in one hand span in chromatic columns.

SOP \ Δcc	4		3		2		1		0		1		2		3		4		
$\{2,1\}^s$	3		4		5		6		7		8		9		10		11		Semitone(s)
$\{3,1\}^s$	1		2		3		4		5		6		7		8		9		
$\{2,3\}^s$	-2		-1		0		1		2		3		4		5		6		
$\{3,3\}^s$, $\{2,2\}^s$ or $\{1,1\}^s$	-4*		-3*		-2*		-1*		0		1		2		3		4		
$\{3,2\}^s$	-6		-5		-4		-3		-2		-1		0		1		2		
$\{1,3\}^s$	-9		-8		-7		-6		-5		-4		-3		-2		-1		
$\{1,2\}^s$	-11		-10		-9		-8		-7		-6		-5		-4		-3		
Pitch Order	1.p	2.p	1.p	2.p	1.p	2.p	1.p	2.p	1.p	2.p	1.p	2.p	1.p	2.p	1.p	2.p	1.p	2.p	
In L(0), L(+), L(-) and L(i)			4	1	3 4	1 2	2 3 4	1 2 3	-	-	1 2 3	2 3 4	1 2	3 4	1	4			Left hand fingers
In L(ocs)**	4	1	3 4	1 2	2 3 4	1 2 3			-	-			1 2 3	2 3 4	1 2	3 4	1	4	
In R(+) and R(++)***			s	i	y s	i o	o y s	i o y	-	-	i o y	o y s	i o	y s	i	s			Right hand finger
In R(0)					s	i	y s	i o	i o	o i	i o	y s	i	s					
In R(-)							i y	o o	i y	y i	i y	s s							

*It is performed with L^L or R^R

**Only abducted fingers in different L(ocs) fingering types are showed

***R(++) fingering type is possible only on $\{3,3\}^s$, $\{2,2\}^s$ or $\{1,1\}^s$

- Ascending Intervals (as semitone(s))
- Descending Intervals (as minus semitone(s))
- Repeating Pitch (0)
- LH Fingers order used in L(0), L(+), L(-), L(i) fingering types
- LH Fingers order used in L(ocs) fingering types
- RH Fingers order used in R(+) and R(++) fingering types
- RH Fingers order used in only R(0) fingering type
- RH Fingers order used in only R(-) fingering type

Table 4.7 : Maximum ascending and maximum descending movements of different SOP&PGTOP variations without changing PGT category on the *saz model.*

LEFT HAND			RIGHT HAND		
PGTOP& SOP	**Max. Descending Movement**	**Max. Ascending Movement**	**PGTOP& SOP**	**Max. Descending Movement**	**Max. Ascending Movement**
$\begin{Bmatrix}2 & \vert 3\\ L & \vert L\end{Bmatrix}^S_P$	-2,35	6,35	$\begin{Bmatrix}2 & \vert 3\\ R & \vert R\end{Bmatrix}^S_P$	-1,35	3
$\begin{Bmatrix}3 & \vert 2\\ L & \vert L\end{Bmatrix}^S_P$	-6,35	2,35	$\begin{Bmatrix}3 & \vert 2\\ R & \vert R\end{Bmatrix}^S_P$	-3	1,35
$\begin{Bmatrix}3 & \vert 1\\ L & \vert L\end{Bmatrix}^S_P$	0,65	9,35	$\begin{Bmatrix}3 & \vert 1\\ R & \vert R\end{Bmatrix}^S_P$	3,65	8,35
$\begin{Bmatrix}1 & \vert 3\\ L & \vert L\end{Bmatrix}^S_P$	-9,35	-0,65	$\begin{Bmatrix}1 & \vert 3\\ R & \vert R\end{Bmatrix}^S_P$	-8,35	-3,65
$\begin{Bmatrix}2 & \vert 1\\ L & \vert L\end{Bmatrix}^S_P$	2,65	11,35	$\begin{Bmatrix}2 & \vert 1\\ R & \vert R\end{Bmatrix}^S_P$	5,65	10,35
$\begin{Bmatrix}1 & \vert 2\\ L & \vert L\end{Bmatrix}^S_P$	-11,35	-2,65	$\begin{Bmatrix}1 & \vert 2\\ R & \vert R\end{Bmatrix}^S_P$	-10,35	-5,65
$\begin{Bmatrix}1 & \vert 1\\ L & \vert L^L\end{Bmatrix}^S_P \vee$ $\begin{Bmatrix}2 & \vert 2\\ L & \vert L^L\end{Bmatrix}^S_P \vee$ $\begin{Bmatrix}3 & \vert 3\\ L & \vert L^L\end{Bmatrix}^S_P$	-4,35	-	$\begin{Bmatrix}1 & \vert 1\\ R & \vert R^R\end{Bmatrix}^S_P \vee$ $\begin{Bmatrix}2 & \vert 2\\ R & \vert R^R\end{Bmatrix}^S_P \vee$ $\begin{Bmatrix}3 & \vert 3\\ R & \vert R^R\end{Bmatrix}^S_P$	-3,35	-
$\begin{Bmatrix}1 & \vert 1\\ L & \vert L\end{Bmatrix}^S_P \vee$ $\begin{Bmatrix}2 & \vert 2\\ L & \vert L\end{Bmatrix}^S_P \vee$ $\begin{Bmatrix}3 & \vert 3\\ L & \vert L\end{Bmatrix}^S_P$	-	4,35	$\begin{Bmatrix}1 & \vert 1\\ R & \vert R\end{Bmatrix}^S_P \vee$ $\begin{Bmatrix}2 & \vert 2\\ R & \vert R\end{Bmatrix}^S_P \vee$ $\begin{Bmatrix}3 & \vert 3\\ R & \vert R\end{Bmatrix}^S_P$	-	3,35

4.2 Complexity Factors in PVT

As discussed in the previous chapter, there are many possibilities in order to execute a melodic movement between two pitches. Thus, different PGTOP, SOP or PDC alternatives may be used to perform a melodic pattern in PVT. The performance of the same melodic pattern with different PGTOPs may produce different results in terms of timbre and ergonomics. The selection of PGTOPs and PDCs that will be used in performance vary depending on the performer's experience and preferences.

However, the execution of some fingering types and PGTs is more complex than others. These situations is called as complexity factors (Heijink and Meulenbroek, 2002).

> The position of maximal static grip strength is the neutral wrist with a supinated forearm. Decrements from the neutral position for wrist flexion, hyperextension, radial flexion and ulnar flexion are 30%, 22%, 18% and 15%, respectively. The pronated forearm allows only 87% of the strength of the supinated forearm, and the differences between the supinated and the midposition forearm are not significant. Wrist deviation can also affects the grip strength, according to a study, grip strength found to be less with radial deviation as compared to ulnar deviation. (Limbasiya et al., 2016)

The statement above states that grip strength in positions that are away from the hand's neutral position is less than the grip strength at neutral position. Accordingly, the highest grip strength in *saz* performance is produced in the L(0) fingering type. The radial and ulnar flexions of the wrist in L(+), R(+), L(-), R(-), L(++), R(++) fingering types produce less grip strength than the neutral position. This is especially felt in R(++) and L(++) fingering types. The grip strength that comes from the ulnar deviation of the wrist (L(+) and R(+) fingering types) is slightly more advantageous than the grip strength that comes from its radial deviation (L(-) and R(-) fingering types). This is felt in R(-) and L(-) fingering types, in which radial deviation is heavily used.

In the light of this information, the fingering types that should be preferred after the L(0) fingering type are L(i), L(+), L(-), L(++), successively. Fingers are ordered according to the "next finger-next chromatic column" rule in these fingering types. As we can see all the fingering types of musical pieces presented in Appendix F exhibit exactly this order in terms of frequency of use (L(0) =%59,11, L(i)= %10,10, L(+) =%8,25 , L(-) =%0,18 , L(++)=%0 for PVT), (See Appendix G, Table G2).

Instead of L(0) fingering type, fingering types in which a finger controls the same chromatic column with another finger (designated L(ics) in this study) may be preferred by performers. Although, the presence of two LH fingers on the same fret is a less-preferred situation in *guitar* performances for melody playing (Grozman and Norman, 2013), It is sometimes used in *saz* performance. The pieces in Appendix F reveal that L(ics) fingering types are used with L(+), L(i) and L(-) fingering types. The proportion of L(ics) use is %22,35 in PVT parts of musical pieces in Appendix F. L(ics) fingering types preferred in *saz* performance are L(+)&L(+2m), L(-)&L(-1),

L(+)&L(-4), L(i)&L(-4), L(+)&L(-1,-4). Partitions with these fingering types actually can be performed with L(0) or L(i) fingering type. So we can say these L(ics) fingering types on *saz* performance are ergonomical choices of performers to perform notes more clearly.

The last fingering types to be preferred for the left hand are fingering types that stretch the hand span, and designated L(ocs) in this study. While these fingerings can be used with the pull-off technique, they are not suitable for hammer-ons. This is why they should be considered the last option that can be used in the performance of a melodic pattern. Pieces in Appendix F reveal that this fingering type is not used in PVT performances.

The performance facilities of right hand are limited relative to the left hand in PVT performance. The fingering types that can be preferred after the R(0) fingering type are R(+), R(-) and R(++), successively. Musical pieces in Appendix F show that R(0), R(+) and R(-) fingering types are frequently used with strong fingers such as the index and middle fingers of the RH. While RH index-ring fingers are occasionally used, this is not as frequent as RH index-middle finger performances. In melodic movement, the RH middle finger-ring finger option can be easily played on the same string, especially in the R(0) fingering type. Similarly, the RH middle finger-little finger option is also present in the R(0) fingering type on the same string. However, using the RH middle finger-ring finger option or RH middle finger-little finger option between different strings relatively complicates performance, and they are used less. Cases in which melodic movement is performed with the RH index-little finger variation are almost non-existent. Cases in which the R(++) fingering type is used are usually played by changing the PGT category.

In conclusion, the following fingerings should be selected for melodic movements. These orders can be assume as *complexity factor criteria* of fingering use of PDC selection.

1. The order of preference for LH fingering should be L(0) > L(i) > L(+) > L(-) > L(++) > L(ics) variations> L(i) and L(ics) > L(ocs).[96]

[96] ">" sign used to express the priority order. In this priority order, place of L(ics) and L(i)&L(ics) fingering types is thought for situations that it can't be played using any fingerings except L(ics) and

2. The order of preference for RH fingering type should be R(0) > R(+) > R(-) > R(++). Melodic movements in which the index and middle fingers of the RH are used should be preferred, regardless of fingering type.

Hence, the following PGTOP preferences should be selected for melodic movements. These orders can be assume as *complexity factor criteria* of PGTOP selection.

1. When a finger has to be lifted off the fretboard in successive melodic movements, PGTOP variations that allow it to be lifted while generating sound through pull-offs should be preferred, if possible. This will allow producing more sound with less movement.
2. In cases where the fingers of the LH are pressing the fretboard, the amplitude of the sound generated by the left hand hammer-on is reduced. Thus, 4 successive LH hammer-ons "$\{\mathbf{L},\mathbf{L},\mathbf{L},\mathbf{L}\}_{\mathbf{p}}$" should not be performed if not performing a chromatic passage Apart from L(ocs) fingering types, a maximum of 3 LH hammer-ons "$\{\mathbf{L},\mathbf{L},\mathbf{L}\}_{\mathbf{p}}$" can be executed successively. In L(ocs) fingering types, maximum of 2 successive LH hammer-ons "$\{\mathbf{L},\mathbf{L}\}_{\mathbf{p}}$" is suitable. This rule always should applied except performing on chromatic notes.
3. For the right hand, 3 successive RH hammer-ons $\{\mathbf{R},\mathbf{R},\mathbf{R}\}_{\mathbf{p}}$ should not be performed if not performing a chromatic passage. A maximum of 2 successive RH hammer-ons "$\{\mathbf{R},\mathbf{R}\}_{\mathbf{p}}$" can be performed. This rule always should applied except performing on chromatic notes.

Table 4.8 shows fingering types that are created by 2 note-melodies in different SOPs. "0" shows pitch repetition. The numbers other than "0" show amount of semitones of ascending or descending melodic movement of two notes. The results are valid for ascending or descending movements, and are symmetrical in that regard. For example, according the table, it is not possible to perform the ↑7 and ↑11 ascending movements with L(0) fingering type. When the notes are inversed, it is also not possible to perform the ↓7 and ↓11 descending movements with L(0)

L(i)&L(ics) fingering types. The situations other than this L(ics) fingering types can be preffered as alternative of L(0) fingering types.

fingering type. SOPs in Table 4.8 are written for order in ascending movement. So, they should be inverted for descending movement.

Table 4.8 : Fingering types during performing intervals in one PGT category[97].

PGT Category	SOPs on 2-note melodies (semitone number)												Fingering Types
	0	1	2	3	4	5	6	7	8	9	10	11	
L	$\{1,1\}^s$ $\{2,2\}^s$ $\{3,3\}^s$	$\{1,1\}^s$ $\{2,2\}^s$	$\{1,1\}^s$ $\{2,2\}^s$	$\{1,1\}^s$ $\{2,2\}^s$ $\{2,3\}^s$	$\{2,1\}^s$ $\{2,3\}^s$ $\{3,1\}^s$	$\{2,1\}^s$ $\{2,3\}^s$	$\{2,1\}^s$		$\{2,1\}^s$	$\{2,1\}^s$	$\{2,1\}^s$	-	**L(0) and L(+), L(++), L(-) fingering types without thumb use**
	$\{2,3\}^s$ $\{3,2\}^s$	$\{3,2\}^s$ $\{2,3\}^s$ $\{3,3\}^s$	$\{3,1\}^s$ $\{3,3\}^s$	$\{2,3\}^s$ $\{3,1\}^s$ $\{3,3\}^s$	$\{3,1\}^s$		$\{3,1\}^s$	$\{3,1\}^s$	$\{3,1\}^s$	-	-	-	**L(i)**
	$\{2,3\}^s$ $\{3,2\}^s$	$\{2,3\}^s$ $\{3,2\}^s$	$\{2,3\}^s$	-	-	$\{3,1\}^s$	$\{3,1\}^s$	$\{3,1\}^s$	$\{3,1\}^s$	-	-	-	**L(+) with thumb**
	-	$\{2,3\}^s$	$\{2,3\}^s$	$\{2,3\}^s$ $\{3,1\}^s$	$\{2,3\}^s$ $\{3,1\}^s$	$\{3,1\}^s$	$\{3,1\}^s$		-	-	-	-	**L(−) with thumb**
	$\{2,3\}^s$ $\{3,2\}^s$	$\{2,3\}^s$ $\{3,2\}^s$	$\{2,3\}^s$	-	-	-	$\{3,1\}^s$	$\{3,1\}^s$	$\{3,1\}^s$	-	-	-	**L(++) with thumb**
	-	-	-	-	-	-	-	$\{2,1\}^s$	-	-	-	-	**L(ics)**
	-	-	$\{2,3\}^s$	-	-	$\{3,1\}^s$	-	-	-	-	-	-	**L(i)& L(ics)**
	-	-	-	$\{2,1\}^s$	$\{1,1\}^s$ $\{2,2\}^s$	-	$\{2,3\}^s$	-	-	-	-	$\{2,1\}^s$	**L(ocs)**
	-	$\{3,1\}^s$	$\{3,2\}^s$	-	$\{3,3\}^s$	-	-	-	-	$\{3,1\}^s$	-	-	**L(i)& L(ocs)**
R	-	$\{1,1\}^s$ $\{2,2\}^s$	$\{2,3\}^s$ $\{1,1\}^s$ $\{2,2\}^s$	-	-	$\{3,1\}^s$	-	$\{2,1\}^s$	-	-	-	-	**R(0)**
	$\{2,3\}^s$ $\{3,2\}^s$	$\{2,3\}^s$	-	-	-	-	$\{3,1\}^s$	$\{3,1\}^s$	$\{2,1\}^s$ $\{3,1\}^s$	$\{2,1\}^s$	$\{2,1\}^s$	-	**R(+)**
	-	-	-	$\{2,3\}^s$	$\{3,1\}^s$	-	$\{2,1\}^s$	-	-	-	-	-	**R(−)**
	-	$\{1,1\}^s$ $\{2,2\}^s$ $\{3,3\}^s$	$\{1,1\}^s$ $\{2,2\}^s$ $\{3,3\}^s$	$\{1,1\}^s$ $\{2,2\}^s$ $\{3,3\}^s$	-	-	-	-	-	-	-	-	**R(++)**

The vertical positioning of the right hand allow notes on the same chromatic column to be easily performed with the R(0) fingering type. Red SOPs in Table 4.8 are frequently used RH SOPs in which the index and middle fingers can be successively played. Their performance is relatively easier than others.

[97] Red SOPs shows melodic movements that are executed by RH index finger&RH middle finger

As presented in Table 4.8, the melodic movements 0,↑3,↑4,↑6,↑8,↑9,↑10 and ↑11 cannot be performed with the R(0) fingering type. However, the melodic movements ↑3,↑4,↑6, ↑8 can be performed in other fingering types using the RH index and middle fingers. Thus, melodic movements that are more complicated than others for the right hand are 0,↑9 and ↑10. ↑11 can't be performed with any RH fingering type.

Consequently, the prioritized fingering type order for melodic movements can be presented for the left and right hands as below (Table 4.9).

Table 4.9 : *Complexity factor criteria* for fingering use in one PGT category in melodic movements[98].

Melodic movement in TUMP	***Complexity factor criteria* for melodic movements**	
	$\{\boxed{L}, \boxed{L}\}_p$	$\{\boxed{R}, \boxed{R}\}_p$
0	$L(0) > L(i) > L(+) > L(-) > L(++)$	$R(+)$
↑ 1 ∨ ↓ 1	$L(0) > L(i) > L(+) > L(-) > L(++) > L(i)\&L(ocs)$	$R(+) > R(0) > R(++)$
↑ 2 ∨ ↓ 2	$L(0) > L(i) > L(+) > L(-) > L(++) > L(i) \wedge L(ics) > L(i)\&L(ocs)$	$R(0) > R(++)$
↑ 3 ∨ ↓ 3	$L(0) > L(i) > L(+) > L(-) > L(++) > L(ocs)$	$R(-) > R(++)$
↑ 4 ∨ ↓ 4	$L(0) > L(i) > L(+) > L(-) > L(++) > L(ocs) > L(i)\&L(ocs)$	$R(-)$
↑ 5 ∨ ↓ 5	$L(0) > L(+) > L(-) > L(++) > L(i)\&L(ics)$	$R(0)$
↑ 6 ∨ ↓ 6	$L(0) > L(i) > L(+) > L(-) > L(++) > L(ocs)$	$R(+) > R(-)$
↑ 7 ∨ ↓ 7	$L(i) > L(+) > L(++) > L(-) > L(ics)$	$R(0) > R(+)$
↑ 8 ∨ ↓ 8	$L(0) > L(i) > L(+) > L(-) > L(++) > L(i)$	$R(+)$ $[\{2,1\}^s > \{3,1\}^s]$
↑ 9 ∨ ↓ 9	$L(0) > L(+) > L(-) > L(++) > L(i)\&L(ocs)$	$R(+)$
↑ 10 ∨ ↓ 10	$L(0) > L(+) > L(-)$	$R(+)$
↑ 11 ∨ ↓ 11	$L(ocs)$	-

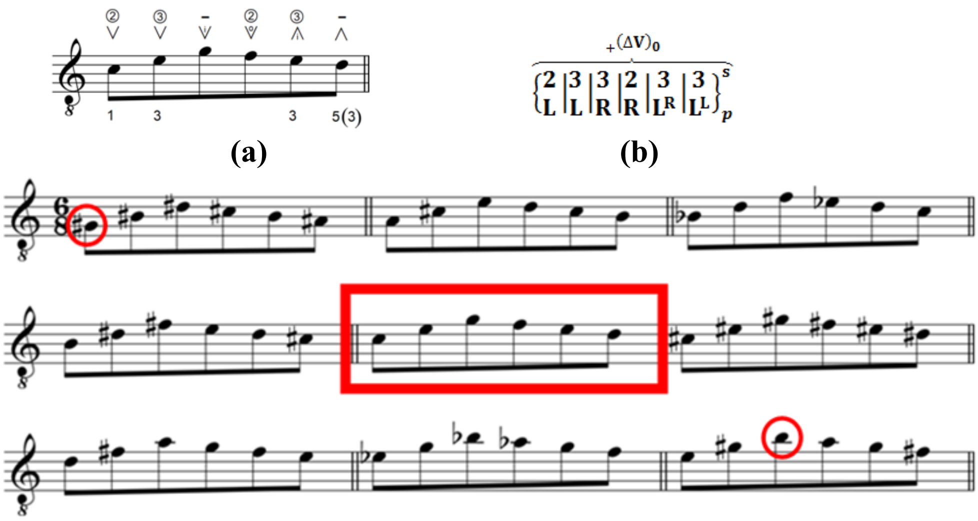
The priorities specified here can be termed the *complexity factor criteria* of fingering use. Melodic movements in Table 4.8 and Table 4.9 do not contain microtonal intervals for simplicity. However, since microtonal intervals form the same fingering

[98] ">" sign used to express the priority order. "V" sign means "or".

types with the chromatic intervals in its chromatic column, the results from this table are also valid for those intervals.

4.3 *Tonally Unconnected Melodic Patterning* (TUMP) in PVT

As previously specified, "Tonally Unconnected Melodic Patterning" (TUMP) is simply the type of patterning that is carried out by preserving the interval relations of a melodic pattern. In this regard, TUMP causes a chromatic transposition of the melody. In order to perform TUMP with PVT, the SOP, PGTOP and PDC of the main pattern must not be changed when transferring to the desired tone. Figure 4.1-a presents the melodic pattern represented by the symbol for PGTOP, SOP and PDC performed with TUMP without changing the structures. Figure 4.1-b shows the main pattern SOP, PGTOP and PDC structures that create the other melodic patterns. Figure 4.1-c allows chromatically patterning both the lower and higher pitch regions the main melodic pattern that is shown with the red frame. Notes encircled in red are the lower and upper limits that limit the performance range of the pattern. While the pitch produced by the first fret in the middle string determines the lower pitch limit, the last fret of the top string determines the upper pitch limit of the SOP, PGTOP and PDC combination.



(c)

Figure 4.1 : TUMP of a melodic pattern : (a) Representation of source pattern in stave (b) SOP&PGTOP&PDC structure of source pattern (c) Copied patterns produced with TUMP.

A melodic pattern can be played using different PGTOP, SOP and PDC combinations. The Figure 4.2 presents the melodic pattern above with three alternative methods played with different PGTOP, SOP and PDC combinations. Each method's performance range on the fretboard is different (See Table 4.10). Knowing all the methods and the performance range of the melodic pattern offers significant advantages in order to use TUMP effectively in PVT performance. The reason is that a melodic pattern can be transposed all over the fretboard by applying different methods. At this point, we have to consider the *complexity factor criteria* in the previous section. In other words, SOP&PGTOP structures that are performed with fingering types that make performance difficult should not be preferred. In Figure 4.3, method 2 and method 3 has L(0) and R(0) fingering types that has priority on *complexity factor criteria* for PDC selection. Method 1 has L(+) and R(0) fingering types and it can be though as secondary choice as PDC.

However, the numbers of movements of these variations are different. Method 1 has no silent pull-off. In other words, all pull-offs are used to produce pitches in it. Method 2 and method 3 has silent pull-offs. Red circles that connected with a line in Figure 4.2 shows successive hammer-ons of one hand that cause silent pull-off in method 2 and method 3.

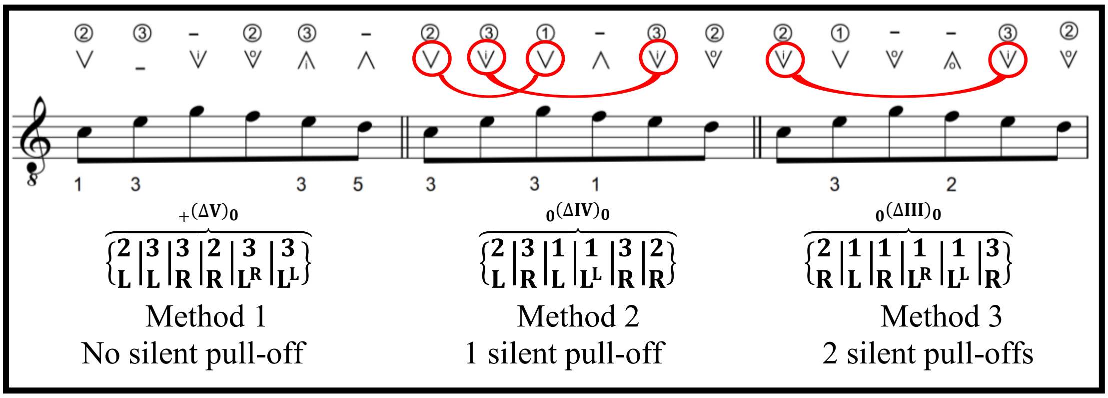
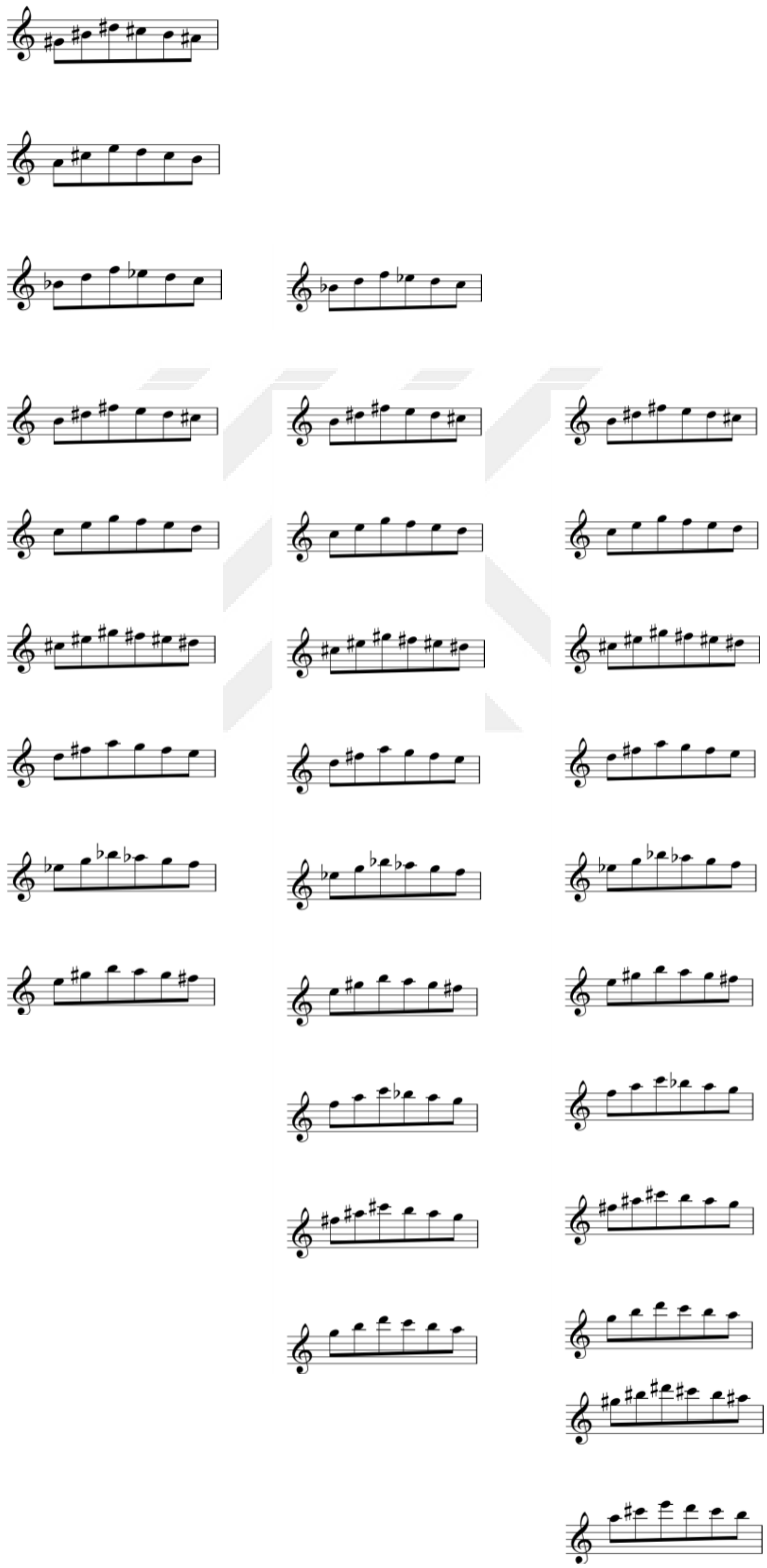


Figure 4.2 : Silent pull-offs of different performance methods for melodic pattern in figure 4.1.

Method 1 has no silent pull-offs. Accordingly it is more advantageous in terms of first criterium of *complexity factor criteria* of PGTOP selection. Here is the point that performer has to make a preference. Especially the PGTOP, SOP and PDC combinations that offer the possibility of chromatic position from the lowest to the highest pitch have to be known (See Table 4.10, Methods 1 and 3). Other variations may be applied to develop performance capabilities (See Table 4.10, Method 2).

Table 4.10 : Ranges of different performance methods in Figure 4.2.

Melodic Pattern	Method 1	Method 2	Method 3
SOP&PGTOP& PDC Structures	$\overbrace{\left\{\begin{array}{c\|c\|c\|c\|c\|c} 2 & 3 & 3 & 2 & 3 & 3 \\ \mathbf{L} & \mathbf{L} & \mathbf{R} & \mathbf{R} & \mathbf{L}^{\mathbf{R}} & \mathbf{L}^{\mathbf{L}} \end{array}\right\}}^{_{+}(\Delta \mathrm{V})_0}$	$\overbrace{\left\{\begin{array}{c\|c\|c\|c\|c\|c} 2 & 3 & 1 & 1 & 3 & 2 \\ \mathbf{L} & \mathbf{R} & \mathbf{L} & \mathbf{L}^{\mathbf{L}} & \mathbf{R} & \mathbf{R} \end{array}\right\}}^{_{0}(\Delta \mathrm{IV})_0}$	$\overbrace{\left\{\begin{array}{c\|c\|c\|c\|c\|c} 2 & 1 & 1 & 1 & 1 & 3 \\ \mathbf{R} & \mathbf{L} & \mathbf{R} & \mathbf{L}^{\mathbf{R}} & \mathbf{L}^{\mathbf{L}} & \mathbf{R} \end{array}\right\}}^{_{0}(\Delta \mathrm{III})_0}$
Available Range of Melodic Patterns on Fretboard			

Another dimension is the timbre differences between performances. The PGTOP and SOP structures in which the same melodic pattern is performed may have different timbre characteristics. Thus, a melodic pattern that is played using an ergonomically difficult PDC structure can also be preferred sometimes.

4.4 *Tonally Linked Melodic Patterning* in PVT

Another melodic patterning type that we mentioned in Chapter 2.3 is the Tonally Linked Melodic Patterning (TLMP). TLMP is the type of patterning that is carried out by preserving the degree difference relationships in the melodic pattern's scale. This type of patterning causes modal transposition, and there are two basic strategies when implementing it in PVT[99].

1- Performing the pattern by keeping the PDC fixed, while changing SOP&PGTOP structures;

2- Performing the pattern by keeping the SOP&PGTOP structures fixed, while changing the PDC based on the relationship between the scale's degrees.

While one of the strategies can be applied when performing TLMP, both strategies can also be used successively in order to conclude the performance. In order to better understand TLMP's application in PVT, we have to identify the PDC structures of scales for PVT performance.

4.4.1 Scale playing in PVT

Scale studies are an important part of the practice of every instrument. Especially in non-atonal music genres, scales determine the travel and expansion areas of melodies. In this regard, practicing scales offer many advantages to the performer, especially during improvisations. The contemporary *saz* fretting contains all the chromatic pitches according to the tempered system. This is why all scales that consist of tempered pitches, and can be expressed within the fretboard range can be played on the *saz*. Additionally, the microtonal frets on the *saz* are used in some "fret tuning systems"[100].

---

[99] See Chapter 4.4.6. For detailed information.
[100] See Chapter 4.4.1.4. For detailed information.

Since musical performance is a time-constrained process, the fingering process and hand repositionings have to be minimized (Radicioni and Lombardo, p. 51). Consequently, performance styles that allow expression with a single PDC structure have to be identified. In that regard, scales have to be examined separately based on the number of pitches they contain in an octave.

4.4.1.1 Heptatonic scales

There are many SOP and PDC alternatives for playing heptatonic scales using PVT in a closed system. The SOP variations that arise in the performance of heptatonic scales, and PDC variations that are based on the Ionian scale are presented in Table 4.11. Accordingly, 16 SOP alternatives can be used to play scales. The SOP variations are designated with numbers, and PDCs are designated with letters in Table 4.11. The numbers and letters are arbitrarily assigned in this SOP and PDC labeling system.

SOP variations in Table 4.11 show that all SOPs except SOP No. 2 begin in the 2nd string, and end in the 1st string. Due to the interval structure of *bağlama düzeni*, if only one PDC is used in ascending scales, after the bottom string is used for the first time, the remaining degrees can also only be played on the bottom string. This feature of *bağlama düzeni* causes the SOPs with which the 2nd tetrachord of Ionian can be played to be limited.

In most of these variations, the 2nd tetrachord can be used with the SOP variation $\{1,1,1,1\}^s$ (See Table 4.11, SOP No. 1, 2, 4, 6, 8, 9, 10, 12, 14). In some variations, the 2nd tetrachord can be played with SOP variations $\{3,1,1,1\}^s$ (See Table 4.11, SOP No. 5,7,11,15) or $\{2,1,1,1\}^s$ (See Table 4.11, SOP No. 3). The first tetrachord of Ionian can be played using many different SOP variations. Consequently, there are many SOP alternatives that can be used to play the Ionian scale. The ability to perform a scale with so many SOP variations demonstrates how using two hands in PVT improves the *saz*'s performance capabilities.

Table 4.11 intentionally includes models that can be expressed with a single PDC. Not complying with these criteria may allow building numerous models by changing the PDC during performance. However, in order to produce a basic model for performance, we only considered models that can express scale playing with a single PDC.

Table 4.11 : SOP and PDC combinations of Ionian scale playing.[101]

The Degrees of Ionian Scale		I	II	III	IV	V	VI	VII	VIII	Ascending-Descending Ionian PDCs without LH Thumb		Descending Ionian PDCs with LH Thumb		
										a	b	c	d	SOP No.
SOP VARIATIONS	Variations with 2 strings	②	②	②	②	①	①	①	①	${}_{i}(\Delta IV)_{+}$	${}^{1}_{i}(\Delta V)_{0}$	-	-	1
		③	③	③	③	①	①	①	①	${}^{1}_{i}(\Delta V)_{0}$	-	-	-	2
		②	②	②	②	②	①	①	①	${}^{1}_{i}(\Delta V)_{\ddagger}$	-	-	-	3
	Variations with 3 string	②	③	③	③	①	①	①	①	${}^{-1}_{i}(\Delta II)_{+}$	-	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta III)_{+}$	4
		②	③	③	③	③	①	①	①	${}^{-1}_{i}(\Delta III)_{\ddagger}$	-	${}_{+}(\Delta III)_{\ddagger}$	-	5
		②	③	③	②	①	①	①	①	${}^{-1}_{i}(\Delta II)_{+}$	-	${}_{+}(\Delta II)_{+}$	-	6
		②	③	③	②	③	①	①	①	${}^{-1}_{i}(\Delta V)_{-}$	-	${}_{+}(\Delta V)_{-}$	-	7
		②	③	②	②	①	①	①	①	${}^{-1}_{i}(\Delta IV)_{\ddagger}$	-	-	-	8
		②	③	②	③	①	①	①	①	${}^{-1}_{i}(\Delta III)_{+}$	-	${}_{+}(\Delta III)_{+}$	-	9
		②	②	③	③	①	①	①	①	${}_{i}(\Delta II)_{+}$	-	${}_{-}(\Delta III)_{+}$	${}^{1}(\Delta III)_{+}$	10
		②	②	③	③	③	①	①	①	${}^{m}_{i}(\Delta II)_{+}$	-	${}_{-}(\Delta III)_{+}$	${}^{1}(\Delta III)_{\ddagger}$	11
		②	②	③	②	①	①	①	①	${}_{i}(\Delta II)_{+}$	${}^{m}_{i}(\Delta V)_{-}$	-	-	12
		②	②	③	②	③	①	①	①	${}^{m}_{i}(\Delta V)_{-}$	-	${}^{1}(\Delta V)_{0}$	-	13
		②	②	②	③	①	①	①	①	${}_{i}(\Delta III)_{+}$	${}^{1}_{i}(\Delta III)_{+}$	-	-	14
		②	②	②	③	③	①	①	①	${}_{i}(\Delta V)_{-}$	${}^{1}_{i}(\Delta III)_{\ddagger}$	-	-	15
		②	②	②	②	③	①	①	①	${}^{1}_{i}(\Delta V)_{0}$	-	-	-	16

Table 4.11 shows that more than one PDC can be applied in some SOP variations. As specified in previous sections, the ascending movement in PVT can only be carried out with hammer-ons in PVT. Since the LH is limited in its function to produce sound by tapping with the thumb, the thumb does not play an active role in ascending scales. For that reason, the PDC structures that emerge in the ascending-descending Ionian scale in which the LH thumb is not used (L(i) fingering type) are presented in columns a and b. PDC structures that use the LH thumb and emerge in the

[101] SOP variations in the Table 4.11 are provided in detail to express the string on which a certain degree will be played with Erol Parlak's "transcription signs" in Appendix C, instead of the SOP symbolization system. So, SOPs can be extrapolated to read degrees. For example, SOP 7 is {2,3,3,2,3,1,1,1} for ascending playing of heptatonic scale and {1,1,1,3,2,3,3,2}for descending playing of heptatonic scale.

descending Ionian scale are presented in columns c and d. All PDC structures in a and b column in Table 4.11 are presented along with transcription signs on the stave in Appendix H, in reference to C Ionian scale.

Due to their natures, some PDCs that are created for PVT performance of heptatonic scales have the potential to be able to play the 9th degree, which is an extra-octave sound. Thus, these PDCs allow playing a second scale in their structures (the neighbouring mode of the first scale). For example, while it is possible to play the C major scale with the PDC ($_{i}(\Delta\mathbf{IV})_{+}$) labeled 1a in Table 4.11, which uses the 1st and 3rd fingers of the LH, the same scale can also be played with the 2nd and 4th fingers (Figure 4.3-b).

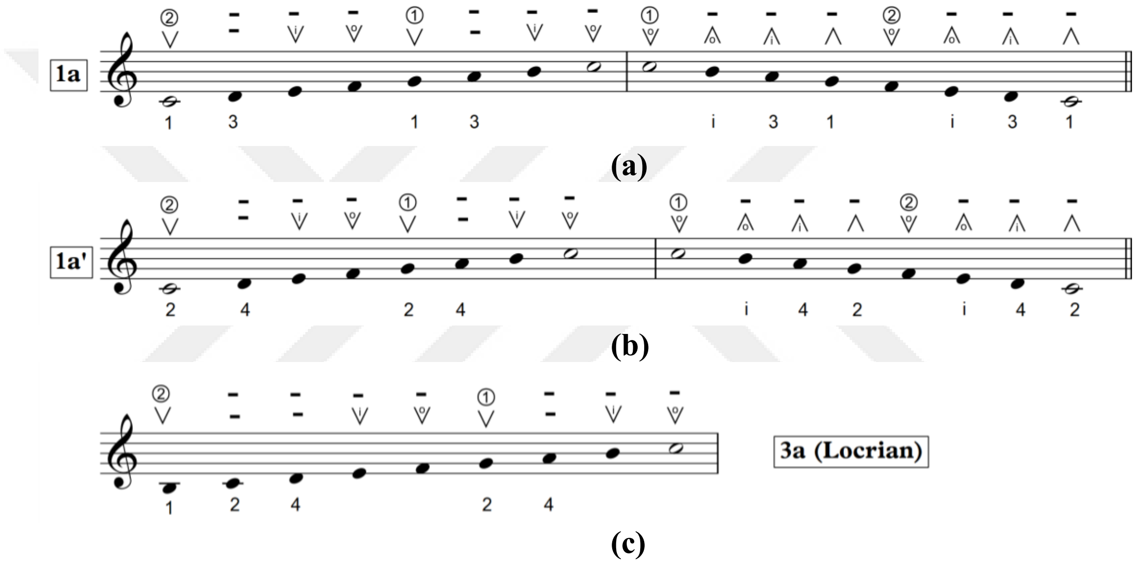


Figure 4.3 : Ionian playing (a) With PDC of 1a. (b) With different PDC variation of SOP-1 (1a'). (c) With PDC of 3a.

This PDC is labelled as " 1a' " in the figure, and is actually the PDC labelled " 3a " in Table 4.11, transformed to play the Locrian scale. Since the most comprehensive scale playing approach/model cannot be generated from these structures, which are the neighbouring modes of another scale's PDC, Table 4.11 does not include such structures.

Playing both the ascending and the descending scales with one PDC model offers advantages in terms of performance. Using the LH thumb on the top string offers new melodic opportunities to use the other 4 fingers of the LH for other pitches in the scale. Accordingly, the ascending scale should be played with PDCs in the "c" and "d" columns of Table 4.11, which include the LH thumb, an important part of *saz* performance. The strategy to apply in order to find SOPs and PDCs that can form a basis for heptatonic scale performance, the PDCs in columns c and d of Table 4.11 should be used for descending playing, and the compatible PDCs in columns a and b for ascending playing.

The term “compatible” here is used to state that the position difference between the LH and the RH has to be maintained, and the right hand fingering has to remain the same. Since the left hand thumb is inactive in ascending scales, the left hand thumb position is not taken into consideration. Since PDCs that can perform the ascending-descending scale in Table 4.11 don’t use the LH thumb, the LH thumb’s position is represented as "i". PDCs that is used left hand finger on 3rd string (4a, 5a, 6a, 7a, 8a 9a, 11a, 12b and 13a) contain the one of L(ics) fingering types, which is L(i)&L(-1) and L(i)&L(m) in Ionian example, are not compatible with the PDCs that have an active LH thumb in the c and d columns. Other PDCs can be used by placing the LH thumb to positions specified by PDCs in the c and d columns.

Compatible PDCs in Table 4.11 are matched in the same row in Table 4.12. The PDC structure that emerges depending on the ascending or descending playing of the scale is the PDC structure in the SOP variation that is descending in Table 4.12. The main reason for PDCs from different SOPs are compatible is the fact that the PGTOP structures differ in descending and ascending playing, due to the use of the top string and the thumb. The performance of all PDC structures in Table 4.12 in PVT are presented in Appendix I for the Ionian scale.

In order to determine the proper SOP variation for all heptatonic scales, the mentioned ascending-descending models in Table 4.12 were tested on other heptatonic scales. The conversions of PDC types that emerge from the SOP variations in Table 4.12 to major, melodic minor, harmonic minor scales and the modes of these scales is presented in Table 4.13. As shown in the table, all these structures can be performed as ascending or descending with a single PDC that is determined for Ionian, and when they are applied to other heptatonic scales, other PDC types emerge. In some SOP variations, some scales are anatomically impossible to play.

Table 4.12 : Ionian PDCs that is "compatible" in different SOPs.

Ascending-Descending Ionian PDCs without LH Thumb		**Descending Ionian PDCs with LH Thumb**		**Ascending-Descending Ionian PDCs with LH Thumb (Resulting PDC)**
10a	${}_{i}(\Delta\mathbf{II})_{+}$	**4c**	${}_{+}(\Delta\mathbf{II})_{+}$	${}_{+}(\Delta\mathbf{II})_{+}$
10a	${}_{i}(\Delta\mathbf{II})_{+}$	**6c**	${}_{+}(\Delta\mathbf{II})_{+}$	${}_{+}(\Delta\mathbf{II})_{+}$
12a	${}_{i}(\Delta\mathbf{II})_{+}$	**4c**	${}_{+}(\Delta\mathbf{II})_{+}$	${}_{+}(\Delta\mathbf{II})_{+}$
12a	${}_{i}(\Delta\mathbf{II})_{+}$	**6c**	${}_{+}(\Delta\mathbf{II})_{+}$	${}_{+}(\Delta\mathbf{II})_{+}$
14a	${}_{i}(\Delta\mathbf{III})_{+}$	**4d**	${}_{+}(\Delta\mathbf{III})_{+}$	${}_{+}(\Delta\mathbf{III})_{+}$
14a	${}_{i}(\Delta\mathbf{III})_{+}$	**9c**	${}_{+}(\Delta\mathbf{III})_{+}$	${}_{+}(\Delta\mathbf{III})_{+}$
14a	${}_{i}(\Delta\mathbf{III})_{+}$	**10c**	${}_{-}(\Delta\mathbf{III})_{+}$	${}_{-}(\Delta\mathbf{III})_{+}$
14b	${}^{1}_{i}(\Delta\mathbf{III})_{+}$	**10d**	${}^{1}(\Delta\mathbf{III})_{+}$	${}^{1}(\Delta\mathbf{III})_{+}$
15a	${}_{i}(\Delta\mathbf{V})_{-}$	**7c**	${}_{+}(\Delta\mathbf{V})_{-}$	${}_{+}(\Delta\mathbf{V})_{-}$
15b	${}^{1}_{i}(\Delta\mathbf{III})_{\ddagger}$	**11d**	${}^{1}(\Delta\mathbf{III})_{\ddagger}$	${}^{1}(\Delta\mathbf{III})_{\ddagger}$
16a	${}^{1}_{i}(\Delta\mathbf{V})_{0}$	**13c**	${}^{1}(\Delta\mathbf{V})_{0}$	${}^{1}(\Delta\mathbf{V})_{0}$

As shown in Table 4.13, all of the heptatonic scales in the table can be played with PDC structures generated by the 14a-19c and 14a-10c SOP variations. The structures 14a-4d, 15b-11d, and 16a-13c can create proper PDCs for heptatonic scales other than one scale. In addition to these five SOP variations, the other SOP variations in the table are not suitable for playing heptatonic scales. The main reason is that the PGTOP types applied to these SOP variations contain pitches that are outside the hand span limit in different scales.

Examination of the remaining 5 SOP variations in terms of *complexity factor criteria* for fingering use reveals the following findings:

- Scales that contain whole tone or augmented second intervals between their 4th and 5th degrees of the 15b-11d SOP variation generate successive hammer-ons in PDC structures that contain the R(++) position which is very difficult to play with the right hand (Figure 4.4). In addition to this, scales that contain major third interval between tonic and 3rd degrees of 15b-11d generate L(ocs) fingering types.

Table 4.13 : Transformation of PDCs in different SOPs that showed in Table 4.11. according to performance of heptatonic modes.

	10a-4c	10a-6c	12a-4c	12a-6c	14a-4d	14a-9c (α)	14a-10c	14b-10d	15a-7c	15b-11d	16a-13c (β)
Ionian	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta III)_{+}$	${}_{+}(\Delta III)_{+}$	${}_{-}(\Delta III)_{+}$	${}^{1}(\Delta III)_{+}$	${}_{0}(\Delta V)_{-}$	${}^{1}(\Delta III)_{\ddagger}$	${}^{1}(\Delta V)_{0}$
Dorian	-	-	-	-	${}_{+}(\Delta III)_{0}$	${}_{+}(\Delta III)_{0}$	${}_{0}(\Delta III)_{0}$	${}_{0}(\Delta III)_{+}$	-	${}_{0}(\Delta III)_{\ddagger}$	${}_{0}(\Delta V)_{0}$
Phrygian	-	-	-	-	${}_{\ddagger}(\Delta III)_{0}$	${}_{\ddagger}(\Delta III)_{0}$	${}_{0}(\Delta III)_{0}$	${}_{0}(\Delta III)_{+}$	-	${}_{0}(\Delta III)_{\ddagger}$	${}_{0}(\Delta V)_{0}$
Lydian	${}_{+}(\Delta II)_{+}$	-	-	-	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta IV)_{0}$	${}_{-}(\Delta IV)_{0}$	${}^{1}(\Delta IV)_{+}$	-	${}^{1}(\Delta IV)_{+}$	${}^{1}(\Delta V)_{0}$
Mixolydian	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta III)_{0}$	${}_{+}(\Delta III)_{0}$	${}_{-}(\Delta III)_{0}$	${}^{1}(\Delta III)_{+}$	${}_{0}(\Delta V)_{-}$	${}^{1}(\Delta III)_{\ddagger}$	${}^{1}(\Delta V)_{0}$
Aeolian	-	-	-	-	${}_{+}(\Delta III)_{0}$	${}_{+}(\Delta III)_{0}$	${}_{0}(\Delta III)_{0}$	${}_{0}(\Delta III)_{+}$	-	${}_{0}(\Delta III)_{\ddagger}$	${}_{0}(\Delta V)_{0}$
Locrian	-	-	-	-	${}_{+}(\Delta IV)_{0}$	${}_{+}(\Delta IV)_{0}$	${}_{-}(\Delta IV)_{0}$	${}^{4}_{-}(\Delta III)_{+}$	-	${}_{0}(\Delta III)_{+}$	${}_{0}(\Delta VI)_{+}$
Mel. Minor	-	-	-	-	${}_{+}(\Delta III)_{0}$	${}_{+}(\Delta III)_{0}$	${}_{0}(\Delta III)_{0}$	${}_{0}(\Delta III)_{+}$	-	${}^{1}_{+}(\Delta IV)_{\ddagger}$	${}_{0}(\Delta V)_{-}$
Dorian ♭2	-	-	-	-	${}_{\ddagger}(\Delta III)_{0}$	${}_{\ddagger}(\Delta III)_{0}$	${}_{0}(\Delta III)_{0}$	${}_{0}(\Delta III)_{+}$	-	${}_{0}(\Delta III)_{\ddagger}$	${}_{0}(\Delta V)_{0}$
Lydian #5	${}_{+}(\Delta II)_{+}$	-	-	-	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta IV)_{0}$	${}_{-}(\Delta IV)_{0}$	${}^{4}_{-}(\Delta IV)_{+}$	-	${}^{1}(\Delta IV)_{\ddagger}$	${}^{1}(\Delta VI)_{-}$
Lydian ♭7	${}_{+}(\Delta II)_{+}$	-	-	-	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta IV)_{0}$	${}_{-}(\Delta IV)_{0}$	${}^{1}(\Delta IV)_{+}$	-	${}^{1}(\Delta IV)_{+}$	${}^{1}(\Delta V)_{+}$
Mixolydian ♭6	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta III)_{0}$	${}_{+}(\Delta III)_{0}$	${}_{-}(\Delta III)_{0}$	${}^{4}_{-}(\Delta III)_{+}$	${}_{0}(\Delta V)_{-}$	-	-
Half Dim.	-	-	-	-	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta IV)_{0}$	${}_{-}(\Delta IV)_{0}$	-	-	${}_{0}(\Delta III)_{+}$	${}_{0}(\Delta IV)_{+}$
Altered	-	-	-	-	${}_{+}(\Delta III)_{+}$	${}_{+}(\Delta III)_{+}$	${}_{0}(\Delta III)_{+}$	${}^{4}_{-}(\Delta III)_{+}$	${}_{0}(\Delta IV)_{-}$	${}_{0}(\Delta II)_{\ddagger}$	${}_{0}(\Delta IV)_{0}$
Har. Minor	-	-	-	-	${}_{+}(\Delta III)_{0}$	${}_{+}(\Delta III)_{0}$	${}_{0}(\Delta III)_{0}$	${}_{0}(\Delta III)_{+}$	-	${}_{0}(\Delta III)_{\ddagger}$	${}_{0}(\Delta V)_{-}$
Locrian ♮6	-	-	-	-	${}_{+}(\Delta IV)_{0}$	${}_{+}(\Delta IV)_{0}$	${}_{0}(\Delta IV)_{0}$	-	-	${}_{0}(\Delta III)_{\ddagger}$	${}_{0}(\Delta IV)_{+}$
Ionian #5	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta III)_{+}$	${}_{+}(\Delta III)_{+}$	${}_{-}(\Delta III)_{+}$	-	-	${}^{1}(\Delta III)_{\ddagger}$	${}^{1}(\Delta VI)_{-}$
Dorian #4	-	-	-	-	${}_{+}(\Delta IV)_{-}$	${}_{+}(\Delta IV)_{-}$	${}_{0}(\Delta IV)_{-}$	${}_{0}(\Delta IV)_{+}$	-	${}_{0}(\Delta IV)_{+}$	${}_{0}(\Delta V)_{+}$
Super Phryg.	${}_{\ddagger}(\Delta II)_{+}$	${}_{\ddagger}(\Delta II)_{+}$	${}_{\ddagger}(\Delta II)_{+}$	${}_{\ddagger}(\Delta II)_{+}$	-	${}_{\ddagger}(\Delta III)_{0}$	${}_{-}(\Delta III)_{0}$	${}^{3,4}_{-}(\Delta III)_{+}$	${}_{0}(\Delta V)_{-}$	${}^{3,4}_{-}(\Delta III)_{+}$	${}^{3,4}_{-}(\Delta V)_{0}$
Lydian #2	${}_{0}(\Delta II)_{+}$	-	-	-	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta IV)_{0}$	${}_{-}(\Delta IV)_{0}$	${}^{1}(\Delta IV)_{+}$	-	${}^{1}(\Delta IV)_{+}$	${}^{1}(\Delta V)_{0}$
Har. Altered	-	-	-	-	${}_{+}(\Delta IV)_{0}$	${}_{+}(\Delta IV)_{0}$	${}_{-}(\Delta IV)_{0}$	-	${}_{0}(\Delta IV)_{-}$	${}_{0}(\Delta II)_{\ddagger}$	${}_{0}(\Delta IV)_{0}$

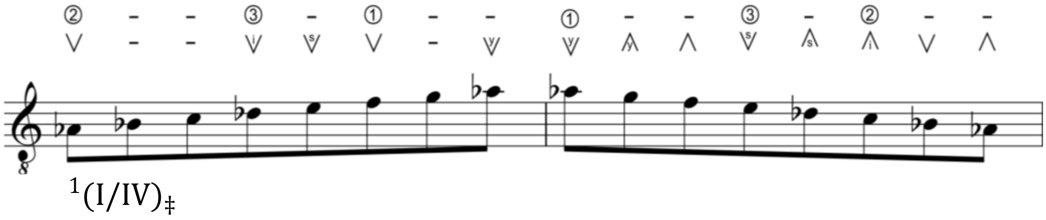


Figure 4.4 : A♭ Ionian ♯5 version of 15b-11d SOP variation.

- PDC structures that emerge in the 14a-10c SOP variation give rise to the L(ocs) fingering type in scales with a major 3rd degree. (Figure 4.5)

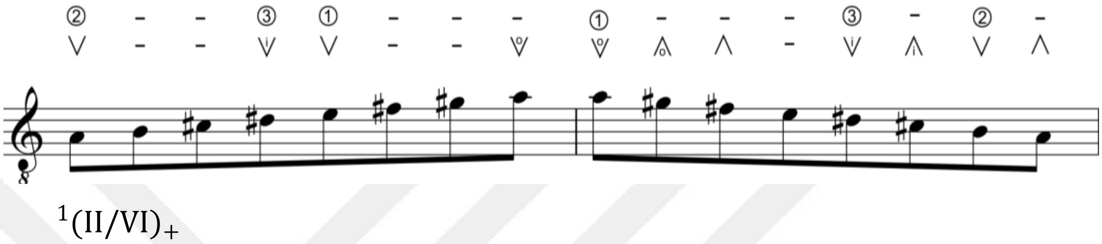


Figure 4.5 : A Lydian version of 14a-10c SOP variation

- PDC structures that emerge in the performance of the variations 14a-4c and 14a-9c are the same, and seem to be interchangeable. However, two successive pull-offs are observed on the third string, in the descending performance of the heptatonic scales with the SOP variation 14a-4c. Additionally, in scales that have a semitone between their 2nd and 3rd degrees, a rare pull-off from the 2nd finger to the 5th finger on the top string is required (Figure 4.6.). This is why it has more disadvantages in terms of playing heptatonic scales against the 14a-9c SOP variation that does not have this complexity.

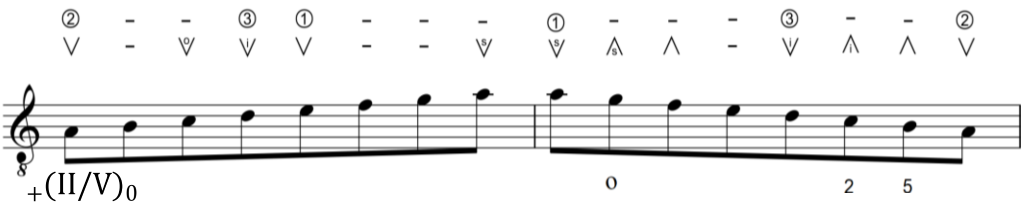


Figure 4.6 : A Aeolian version of 14a-4c SOP variation.

- Scales that contain ♭2 interval in their second degree form the L(++) fingering type in SOP variations 14a-4d and 14a-9c (Fig. 4.7 and Fig. 4.8)

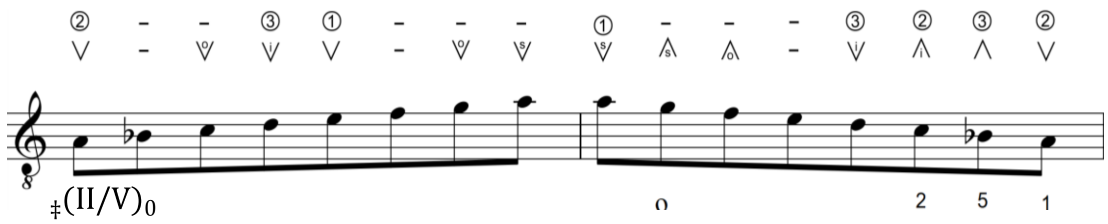


Figure 4.7 : A Phyrigian version of 14a-9c SOP variation.

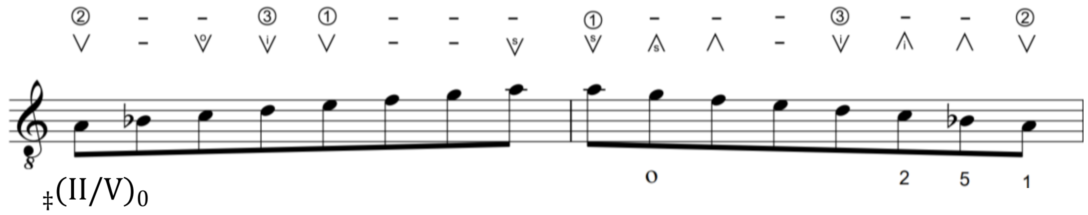


Figure 4.8 : A Phyrigian version of 14a-4d SOP variation.

- The first 3 pitches of the scale played with 16a-13c are played in the L PGT category. Thus it forms PDC types that contain the L(ocs) fingering types that are difficult to implement in scales with ♮3 in the third degree, such as the Ionian scale. (Figure 4.9).

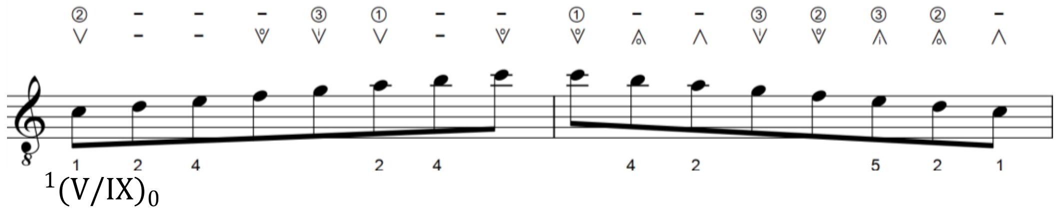


Figure 4.9 : C Ionian playing via 16a-13c SOP variation.

- However, playing a scale with ♭3 for its 3rd degree is very easy with the same SOP variation (16a-13c) (Figure 4.10).

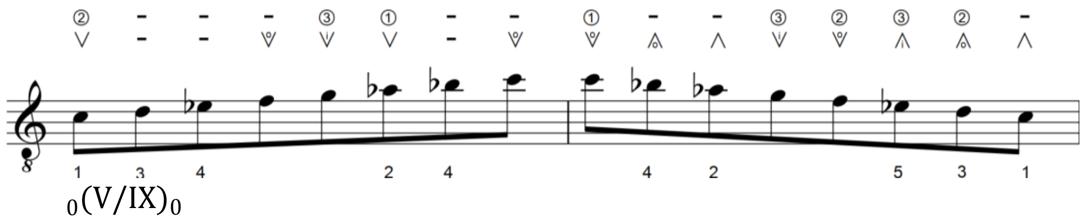
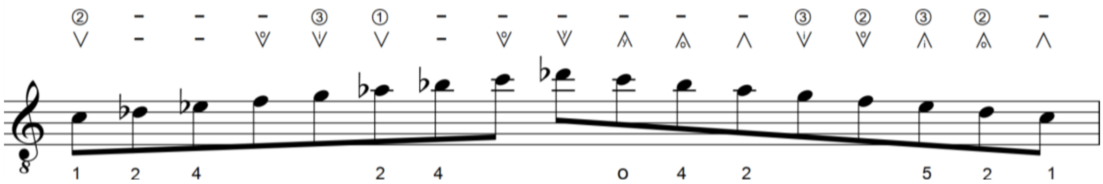


Figure 4.10 : C Aeolian version of 16a-13c SOP variation.

- Another feature of PDC types that are formed by playing heptatonic scales with the 16a-13c SOP variation is the ability to play extra-octave pitches. (Figure 4.11).



$_0(V/IX)_0$

Figure 4.11 : C Phyrigian version with 9th degree of 16a-13c SOP variation.

Thus, using this SOP variation in scales with ♭3 in its 3rd degree would be advantageous. Other scales can be played with the 14a-9c SOP variation. In conclusion, these two SOP variations (14a-9c, 16a-13c) can be used to build a general model for playing heptatonic scales.

Since these two SOP variations upon which we will build our heptatonic scale playing model, and the PGTOPs and PDCs that emerge during the performance of these variations will be frequently used, some abbreviations were necessary. The 14a-9c SOP variation is termed "α," and the 16a-13c SOP variation is termed "β." PGTOPs that emerge during heptatonic scale playing with the α SOP variation are called α-type PGTOPs, and the PDC groups are called α-type PDCs. Similarly, PGTOPs that emerge during heptatonic scale playing with the β SOP variation are called β-type PGTOPs, and the PDC groups are called β-type PDCs.

An α-type PDC is the PDC structure that emerges when the scale is played with an α-type SOP&PGTOP structure. Different scales performed with the α-type SOP&PGTOP generate different α-type PDCs. Thus, this varies based on the scale structures. The same is true for β-type PDCs (see Table 4.13).

It is possible to perform almost all heptatonic scales with α. In this context, knowing the application of the α structure in all scales is advantageous in terms of performance. Choosing β for scales with ♭3 in its 3rd degree has certain advantages, as specified in the previous section.

PGTOPs that are used for α differ according to the scale structure. It is possible to play the 7th degree when playing scales with ♭7 in the 7th degree using α with $\boxed{L}$ instead of $\boxed{R}$. This prevents two successive PGTs from the $\boxed{R}$ PGT category on the bottom string, and offers advantages in performance. This structure will be named as $\alpha^{7\text{-}L}$ to show changing on 7th degree. Thus, the $\alpha^{7\text{-}L}$ PGTOP type, in which the 7th degree is played with the LH, which is the same with α-type PGTOP in all other respects, is formed. This PGTOP type is suitable for scales with ♮3 in the 3rd degree, and ♭7 in the 7th degree (Figure 4.12).

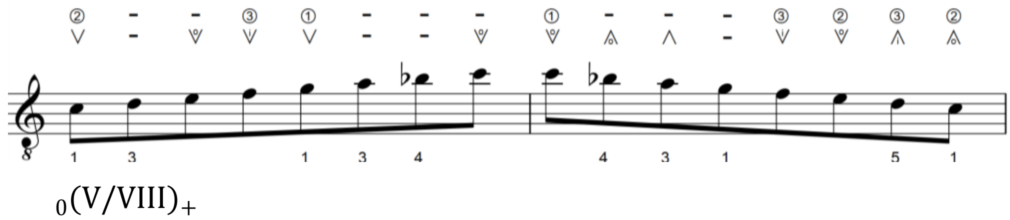


Figure 4.12 : Playing C Mixolydian with $\alpha^{7\text{-}L}$ PGTOP.

Playing scales with ♭3 in the 3rd degree and ♮7 in the 7th degree with β, causes the formation of the R(-) fingering type. These scales can be played with PDCs that have more advantageous *complexity factor criteria* of fingering use due to the application of a different PGTOP to an α SOP variation. This structure will be named as $\alpha^{3\text{-}L}$ to show changing on 3th degree. Thus, it is possible to better position the right hand to perform the 7th and 8th, by playing the 3rd degree with the LH instead of the RH. Thus, the $\alpha^{3\text{-}L}$ PGTOP type, in which the 3rd degree is played with the LH, which is the same with α-type PGTOP in all other respects, is formed. This PGTOP type is suitable for scales with ♭3 in the 3rd degree, and ♮7 in the 7th degree (Figure 4.13)

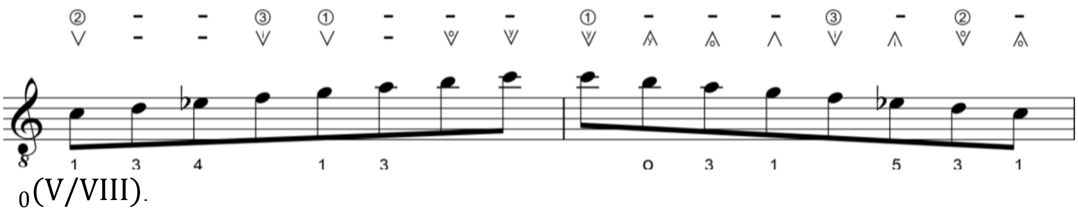
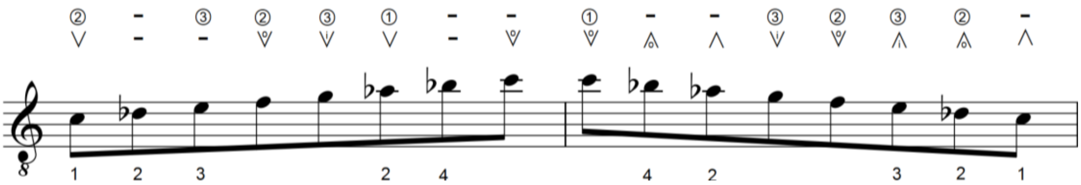


Figure 4.13 : Playing C Melodic Minor with $\alpha^{3\text{-}L}$ PGTOP.

β and β-type PGTOPs are suitable for heptatonic scales with ♭3 in the 3rd degree. The first 3 degrees of the scale are played in the L PGT category in β, and it causes difficult fingering types L(+4) or L(+3, +4) in scales with an augmented second between its 2nd and 3rd degrees. Playing these scales with the 13a-13a SOP variation instead of the β-type PGTOP and β-SOP variation allows better results in performance. The SOP variation that forms is the same with β, apart from playing the 3rd degree on the 3rd string (See Figure 4.14). This is the reason why it is called $\beta^{3\text{-}3}$.



$_0(V/X)_0$

Figure 4.14 : Playing Super Phrygian with $\beta^{3\text{-}3}$ SOP.

In conclusion, the performance of heptatonic scales in PVT is possible through 5 playing types based on variations of SOPs and PGTOPs: α, $\alpha^{3\text{-}L}$, $\alpha^{7\text{-}L}$, β, $\beta^{3\text{-}3}$. These structures are summarized in Table 4.14.

Table 4.14 : SOP&PGTOP coding and preferred scales for α and β structures and their derivations.

SOP	PGTOP	SOP& PGTOP	Ascending	Descending	Preferred Scales
α	α-type	α	$\left\{{2 \atop L}\vert{2 \atop L}\vert{2 \atop R}\vert{3 \atop R}\vert{1 \atop L}\vert{1 \atop L}\vert{1 \atop R}\vert{1 \atop R}\right\}^s_p$	$\left\{{1 \atop R}\vert{1 \atop R^R}\vert{1 \atop L^R}\vert{1 \atop L^L}\vert{3 \atop R}\vert{2 \atop R}\vert{3 \atop L^R}\vert{2 \atop L^R}\right\}^s_p$	Heptatonic scales
	$\alpha^{7\text{-}L}$ - type	$\alpha^{7\text{-}L}$	$\left\{{2 \atop L}\vert{2 \atop L}\vert{2 \atop R}\vert{3 \atop R}\vert{1 \atop L}\vert{1 \atop L}\vert{1 \atop L}\vert{1 \atop R}\right\}^s_p$	$\left\{{1 \atop R}\vert{1 \atop L^R}\vert{1 \atop L^L}\vert{1 \atop L^L}\vert{3 \atop R}\vert{2 \atop R}\vert{3 \atop L^R}\vert{2 \atop L^R}\right\}^s_p$	Heptatonic scales with ♮3 & ♭7 on their 3th and 7th degree
	$\alpha^{3\text{-}L}$ - type	$\alpha^{3\text{-}L}$	$\left\{{2 \atop L}\vert{2 \atop L}\vert{2 \atop L}\vert{3 \atop R}\vert{1 \atop L}\vert{1 \atop L}\vert{1 \atop L}\vert{1 \atop R}\right\}^s_p$	$\left\{{1 \atop R}\vert{1 \atop L^R}\vert{1 \atop L^L}\vert{1 \atop L^L}\vert{3 \atop R}\vert{2 \atop L}\vert{3 \atop L^R}\vert{2 \atop L^R}\right\}^s_p$	Heptatonic scales with ♭3 & ♮7 on their 3th and 7th degree
β	β-type	β	$\left\{{2 \atop L}\vert{2 \atop L}\vert{2 \atop L}\vert{2 \atop R}\vert{3 \atop R}\vert{1 \atop L}\vert{1 \atop L}\vert{1 \atop R}\right\}^s_p$	$\left\{{1 \atop R}\vert{1 \atop L^R}\vert{1 \atop L^L}\vert{3 \atop R}\vert{2 \atop R}\vert{3 \atop L^R}\vert{2 \atop L^R}\vert{2 \atop L^L}\right\}^s_p$	Heptatonic scales with ♭3 & ♭7 on their 3th and 7th degree
$\beta^{3\text{-}3}$		$\beta^{3\text{-}3}$	$\left\{{2 \atop L}\vert{2 \atop L}\vert{3 \atop L}\vert{2 \atop R}\vert{3 \atop R}\vert{1 \atop L}\vert{1 \atop L}\vert{1 \atop R}\right\}^s_p$	$\left\{{1 \atop R}\vert{1 \atop L^R}\vert{1 \atop L^L}\vert{3 \atop R}\vert{2 \atop R}\vert{3 \atop L^R}\vert{2 \atop L^R}\vert{2 \atop L^L}\right\}^s_p$	Heptatonic scales that have augmented second interval between 2nd and 3rd degree

While the LH thumb is responsible for the second degree during descending playing with α-type PGTOPs, it is responsible for the 3rd degree in β-type PGTOPs. The LH thumb cannot be used because of $\beta^{3\text{-}3}$ SOP variation use same SOP in ascending and descending playing of scale.

Table 4.15 presents the proposed PDC and proposed SOP&PGTOP structures for the major scale and its modes based on this data.

Table 4.15 : Proposed PDC and SOP&PGTOP types for major scale modes.

	Ionian	**Dorian**	**Phrygian**	**Lydian**	**Mixolydian**	**Aeolian**	**Locrian**
Proposed PDC	$_{+}(\Delta III)_{+}$	$_{0}(\Delta V)_{0}$	$_{0}(\Delta V)_{0}$	$_{+}(\Delta IV)_{0}$	$_{+}(\Delta III)_{+}$	$_{0}(\Delta V)_{0}$	$_{0}(\Delta IV)_{+}$
Proposed SOP& PGTOP	α	β	β	α	$\alpha^{7\text{-}L}$	β	β

As presented in the table, the SOP&PGTOPs proposed for the major scale and its modes are of three types: α, β and $\alpha^{7\text{-}L}$. β and β-type PGTOPs are selected for scales with ♭3 in the 3rd degree. For scales with ♮3 in the 3rd degree, α-type, Ionian and Lydian, scales with 7 in their 7th degrees are performed with α-type PGTOP, and Mixolydian with ♭7 in its 7th degree is performed with the $\alpha^{7\text{-}L}$-type SOP&PGTOP.

PDCs and PGTOPs recommended for melodic minor scales and modes are presented in Table 4.16.

Table 4.16 : Proposed PDCs and SOP&PGTOP types for melodic minor scale and its modes.

	Melodic Minor	**Dorian ♭2**	**Lydian ♯5**	**Lydian ♭7**	**Mixo-lydian ♭6**	**Half Diminis-hed**	**Altered**
Proposed PDC	$_{0}(\Delta III)_{+}$	$_{0}(\Delta V)_{0}$	$_{0}(\Delta IV)_{0}$	$_{+}(\Delta IV)_{0}$	$_{+}(\Delta III)_{+}$	$_{0}(\Delta IV)_{+}$	$_{0}(\Delta IV)_{0}$
Proposed SOP& PGTOP	$\alpha^{3\text{-}L}$	β	α	$\alpha^{7\text{-}L}$	$\alpha^{7\text{-}L}$	β	β

The melodic minor scale can be expressed as the Ionian with a flat on its 3rd degree. In this context, it is suitable to play with the $\alpha^{3\text{-}L}$-type SOP&PGTOP. Other modes of the melodic minor use the SOP&PGTOP types: α. β and $\alpha^{7\text{-}L}$.

PDC and SOP&PGTOP types that are recommended for harmonic minor scales that contain 3 semitone intervals between two degrees and their modes are presented in Table 4.17.

Since the harmonic minor scale is a scale with ♭3 in its 3rd degree and ♮7 in its 7th degree, it is recommended to perform it with the SOP&PGTOP type $\alpha^{3\text{-}L}$. While it is suitable to play the Super Phrygian scale with the SOP&PGTOP type $\beta^{3\text{-}3}$ since it contains an augmented second between its second and third degrees.

Table 4.17 : Proposed PDCs and SOP&PGTOP types for harmonic minor scale and its modes.

	Harmonic Minor	**Locrian ♮6**	**Ionian #5**	**Dorian #4**	**Super Phrygian**	**Lydian #2**	**Harmonic Altered**
Proposed PDC	${}_{+}(\Delta III)_{+}$	${}_{0}(\Delta IV)_{+}$	${}_{+}(\Delta III)_{+}$	${}_{0}(\Delta IV)_{+}$	${}_{0}(\Delta V)_{0}$	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta IV)_{0}$
Proposed SOP& PGTOP	$\alpha^{3\text{-}L}$	β	α	$\alpha^{3\text{-}L}$	$\beta^{3\text{-}3}$	α	β

PDC and SOP&PGTOP types that are recommended for other common heptatonic scales and their modes are presented in Table 4.18.

Table 4.18 : Proposed PDCs and SOP&PGTOP types for other heptatonic scales and their modes.

Harmonic Major	**Source Scale**	**Mode2**	**Mode3**	**Mode4**	**Mode5**	**Mode6**	**Mode7**
Proposed PDC	${}_{+}(\Delta III)_{+}$	${}_{0}(\Delta IV)_{+}$	${}_{\ddagger}(\Delta II)_{+}$	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta V)_{0}$	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta IV)_{+}$
Proposed SOP&PGTOP	α	β	α	$\alpha^{3\text{-}L}$	$\beta^{3\text{-}3}$	α	β
Neapolitan	**Source Scale**	**Mode2**	**Mode3**	**Mode4**	**Mode5**	**Mode6**	**Mode7**
Proposed PDC	${}_{0}(\Delta III)_{+}$	${}_{+}(\Delta IV)_{0}$	${}_{+}(\Delta IV)_{0}$	${}_{+}(\Delta IV)_{0}$	${}_{0}(\Delta IV)_{\ddagger}$	${}_{0}(\Delta IV)_{0}$	${}_{+}(\Delta IV)_{0}$
Proposed SOP&PGTOP	$\alpha^{3\text{-}L}$	α	$\alpha^{7\text{-}L}$	$\alpha^{7\text{-}L}$	α	β	β
Neapolitan minor	**Source Scale**	**Mode2**	**Mode3**	**Mode4**	**Mode5**	**Mode6**	**Mode7**
Proposed PDC	${}_{0}(\Delta III)_{+}$	${}_{+}(\Delta IV)_{0}$	${}_{+}(\Delta III)_{+}$	${}_{0}(\Delta V)_{0}$	${}_{0}(\Delta IV)_{+}$	${}_{0}(\Delta III)_{+}$	${}_{+}(\Delta IV)_{0}$
Proposed SOP&PGTOP	$\alpha^{3\text{-}L}$	α	$\alpha^{7\text{-}L}$	β	$\beta^{3\text{-}3}$	α	β
Mixolydian b5	**Source Scale**	**Mode2**	**Mode3**	**Mode4**	**Mode5**	**Mode6**	**Mode7**
Proposed PDC	${}_{0}(\Delta IV)_{\ddagger}$	${}_{+}(\Delta II)_{+}$	${}_{+}(\Delta IV)_{+}$	${}_{0}(\Delta V)_{-}$	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta V)_{0}$	${}_{+}(\Delta IV)_{0}$
Proposed SOP&PGTOP	α	α	β	$\beta^{3\text{-}3}$	α	β	α
Melodic minor #5	**Source Scale**	**Mode2**	**Mode3**	**Mode4**	**Mode5**	**Mode6**	**Mode7**
Proposed PDC	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta V)_{-}$	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta V)_{0}$	${}_{0}(\Delta IV)_{0}$	${}_{0}(\Delta IV)_{+}$	${}_{0}(\Delta IV)_{0}$
Proposed SOP&PGTOP	$\beta^{7\text{-}R}$	β	$\alpha^{3\text{-}L}$	$\beta^{3\text{-}3}$	α	β	β

In conclusion, there are 5 PGTOP types for major, melodic minor and harmonic minor scales and their modes: α, $\alpha^{3\text{-}L}$, $\alpha^{7\text{-}L}$, β, and $\beta^{3\text{-}3}$. These 5 PGTOPs can be used to play other heptatonic scales (Table 4.18). It is possible for different variations to emerge in different heptatonic scales. For example, the melodic minor ♯5 scale can be played with $\beta^{7\text{-}R}$. $\beta^{7\text{-}R}$ can be described as a β-type PGTOP with its 7th degree obtained via the $\boxed{\mathrm{R}}$ PGT category.

PDCs vary depending on the character of scales. The LH and RH position difference in all recommended PDCs for heptatonic scales vary between ΔII and ΔV.

4.4.1.2 Chromatic scale

The LH fingers successively move on the chromatic columns in the ascending performance of the chromatic scale. LH 1st finger plays firs degree on the middle string and the eight degree on the bottom string. Thus, the 1st, 2nd, 3rd and 4th degrees of the scale can be played on the middle string, and its 8th, 9th, 10th and 11th degrees can be played on the bottom string with the LH fingers. In this case, the 12th and 13th degrees (octave of the 1st degree) have to be played with the RH fingers. When played in this manner, the most appropriate PDC for the ascending performance of the chromatic scale will be ${}_0(\Delta IV)_0$.

As stated in the third criterium of *complexity factor criteria* of PGTOP selection, playing 3 successive ascending or descending pitches is difficult for RH fingers, so one of the 5th, 6th or 7th degrees have to be played by the LH fingers. The most appropriate SOP&PGTOP for the ascending chromatic scale that meets this condition is $\left\{\genfrac{}{}{0pt}{}{2}{\mathrm{L}}\middle|\genfrac{}{}{0pt}{}{2}{\mathrm{L}}\middle|\genfrac{}{}{0pt}{}{2}{\mathrm{L}}\middle|\genfrac{}{}{0pt}{}{2}{\mathrm{L}}\middle|\genfrac{}{}{0pt}{}{2}{\mathrm{R}}\middle|\genfrac{}{}{0pt}{}{3}{\mathrm{L}}\middle|\genfrac{}{}{0pt}{}{3}{\mathrm{R}}\middle|\genfrac{}{}{0pt}{}{1}{\mathrm{L}}\middle|\genfrac{}{}{0pt}{}{1}{\mathrm{L}}\middle|\genfrac{}{}{0pt}{}{1}{\mathrm{L}}\middle|\genfrac{}{}{0pt}{}{1}{\mathrm{L}}\middle|\genfrac{}{}{0pt}{}{1}{\mathrm{R}}\middle|\genfrac{}{}{0pt}{}{1}{\mathrm{R}}\right\}_{\mathrm{P}}^{\mathrm{s}}$.

Different alternatives are possible in the performance of the chromatic scale with ${}_0(\Delta IV)_0$. The SOP&PGTOP alternative that is appropriate for using the thumb in the L(0) fingering type is $\left\{\genfrac{}{}{0pt}{}{1}{\mathrm{R}}\middle|\genfrac{}{}{0pt}{}{1}{\mathrm{R}^{\mathrm{R}}}\middle|\genfrac{}{}{0pt}{}{1}{\mathrm{L}^{\mathrm{R}}}\middle|\genfrac{}{}{0pt}{}{1}{\mathrm{L}^{\mathrm{L}}}\middle|\genfrac{}{}{0pt}{}{1}{\mathrm{L}^{\mathrm{L}}}\middle|\genfrac{}{}{0pt}{}{1}{\mathrm{L}^{\mathrm{L}}}\middle|\genfrac{}{}{0pt}{}{3}{\mathrm{R}}\middle|\genfrac{}{}{0pt}{}{2}{\mathrm{R}}\middle|\genfrac{}{}{0pt}{}{3}{\mathrm{L}^{\mathrm{R}}}\middle|\genfrac{}{}{0pt}{}{3}{\mathrm{L}^{\mathrm{L}}}\middle|\genfrac{}{}{0pt}{}{2}{\mathrm{L}^{\mathrm{R}}}\middle|\genfrac{}{}{0pt}{}{2}{\mathrm{L}^{\mathrm{L}}}\middle|\genfrac{}{}{0pt}{}{2}{\mathrm{L}^{\mathrm{L}}}\right\}_{\mathrm{P}}^{\mathrm{s}}$ for playing of descending chromatic scale. The figure presents the performance of the C chromatic scale in PVT with the recommended PDC, SOP&PGTOP (Figure 4.15).

Figure 4.15 : Chromatic scale playing with $_0(\Delta IV)_0$.

4.4.1.3 Octatonic scales

The most common used octatonic scales are diminished scales that exhibit a symmetrical interval structure. β-type PGTOPs that can reach beyond the octave in heptatonic scales can be adapted to octatonic scales. While HW diminished scales are performed with the PDC $_0(\Delta IV)_0$, WH diminished scales are performed with the PDC $_0(\Delta IV)_+$ (Table 4.19).

Since diminished scales are symmetrical, they are also modes of each other. This means that the 1st mode of a WH diminished scale will be a HW scale. A WH with its 2nd mode built upon the 3rd degree of the main scale will be a diminished scale. Thus, it is enough to know the PDC and SOP&PGTOP structures in Table 4.19 for the performance of diminished scales and their modes.

Table 4.19 : Symetrical octatonic scales.

Symmetrical Octatonic Scales	Proposed PDC	SOP&PGTOP that is derived from
WH diminished scale	$_0(\Delta IV)_+$	β
HW diminished scale	$_0(\Delta IV)_0$	β

8-Pitch bebop scales are formed by adding a chromatic transition note to a scale such as Ionian, Dorian, Mixolydian and melodic minor. In commonly used meters such as 4/4, the tendency to coincide strong chord tones with strong beats is one of the reasons why bebop scales are adopted (Levine, 1995, p.172). The most frequently used bebop scales are scales derived from Ionian, Dorian, Mixolydian and melodic minor scales. The bebop scale that is derived from the Mixolydian is called dominant scale, the one derived from the Ionian is called bebop major scale, the one derived from the Dorian is called bebop Dorian scale, and the one derived from melodic minor is called bebop melodic minor scale. These scales can be performed with a new PDC derived from the PDC of the heptatonic scale on which they are based. The main criterion is the chromatic transition degrees.

A chromatic transition note can be added to all heptatonic scales. Table 4.20 specifies the chromatic passing notes that cause the PDC structure to change in heptatonic scales played with the 5 main SOP&PGTOP structures in Table 4.20. Accordingly, adding a chromatic transition note between the 4th and 5th degrees causes the PDC structure to change in all 5 of the SOP&PGTOP structure types. Moreover, adding a chromatic transition note between the 3rd and 4th degrees in β-type PGTOPs causes the PDC structure to change.

Table 4.20 : Chromatic transition notes that cause the PDC to change.

SOP&PGTOP	**α**	**α^{7-L}**	**α^{3-L}**	**β**	**β^{3-3}**
Chromatic passing notes that cause changing PDC	IV-V	IV-V	IV-V	III-IV IV-V	IV-V

Table 4.21 presents the chromatic transition notes in these scales based on their source scales, the proposed PDCs and the proposed SOP&PGTOP structures. According to Table 4.21, bebop scales except the bebop Dorian scale can be performed with the SOP&PGTOP structures and PDC structures of the scale from which they are derived.

Table 4.21 : Proposed PDCs and SOP&PGTOPs for common bebop scales.

Bebop Scales	**Chromatic Note (Between)**	**Proposed PDC**	**SOP&PGTOP that is derived from**
Bebop Major Scale	V-VI	$_{+}(\Delta III)_{+}$	α
Bebop Dorian Scale	III-IV	$_{0}(\Delta III)_{+}$	α^{3-L}
Bebop Dominant Scale	VII-VIII	$_{+}(\Delta III)_{+}$	α^{7-L}
Bebop Melodic Minor Scale	V-VI	$_{0}(\Delta III)_{+}$	α^{3-L}

The Dorian bebop scale that contains a chromatic transition between its 3rd and 4th degrees cannot be played with the PDC for the Dorian scale that is played with the β-type PGTOP. However, the added chromatic note ensures that the Dorian bebop scale also contains all notes from the Mixolydian. Thus, it can be played with the PDC for Mixolydian "$_{+}(\Delta III)_{+}$" and its SOP&PGTOP structure, $\alpha^{3\text{-}L}$.

4.4.1.4 *Fret tuning systems* (FTSs)

Melodic patterns of makams can be defined based on the concept of *düzen*[102], which is a collection of makams that Öztürk (2014) compiled from musicological sources. The meaning of FTS in this study is one octave span variation of *düzen* for fretting system of *saz model* that is commonly used in contemporary *saz*s. Makam performance of *saz* with contemporary *saz* fretting system shows some small differences than makam performance in *tanbur, oud*, or a fretless instrument. For example, the *karar* fret of makams with *Segâh* fret like *Segâh Makam, Hüzzam Makam,* etc. is played with equally-tempered notes in contemporary *saz*. Thus, the "fret tuning systems" (FTSs) in our study are defined based on the frets/notes/pitches in the contemporary *saz* fretting on the *saz model*.

The fretting system of *saz model* represents tendency of PVT performers in present. As mentioned before, the frets of *saz* are tunable/movable and specially microtonal frets are moved/tuned. In makam performance, performers can choose different amount of microtonality than *saz model* allows. However, these fret tuning choices will be in same chromatic columns with performance in *saz model.* Accordingly, all findings in this study are valid with different fret tuning choices in terms of PDC and SOP&PGTOP structures in maqam playing.

Makam based melodic patterns moves on FTSs that we created based on the *düzen* concept. This approach was adopted both for consistency with the previous section on scale playing, and because it eliminates the complexity of using the same PDCs in many makam flows in same FTS. FTSs in this study are based on a need for classification for performance practice. Thus, FTSs are selected between frets of *saz*

[102] For details, see Chapter 1.6.3. and 2.1.5.

that presents a *general scale*[103] for *saz* player. In that regard, while the approach is based on *düzen* as defined in musicological sources, the names of these *düzen*s in those sources are not used[104]. Instead of that, a unique and subjective classification was made from a PVT performer's perspective. The purpose of this classification is the establishment of a practical and useful system for performers. Indeed, our study focuses on the methods of obtaining melodic patterns. This is why FTSs are encoded with numbers and letters instead of the names of *düzen*s.

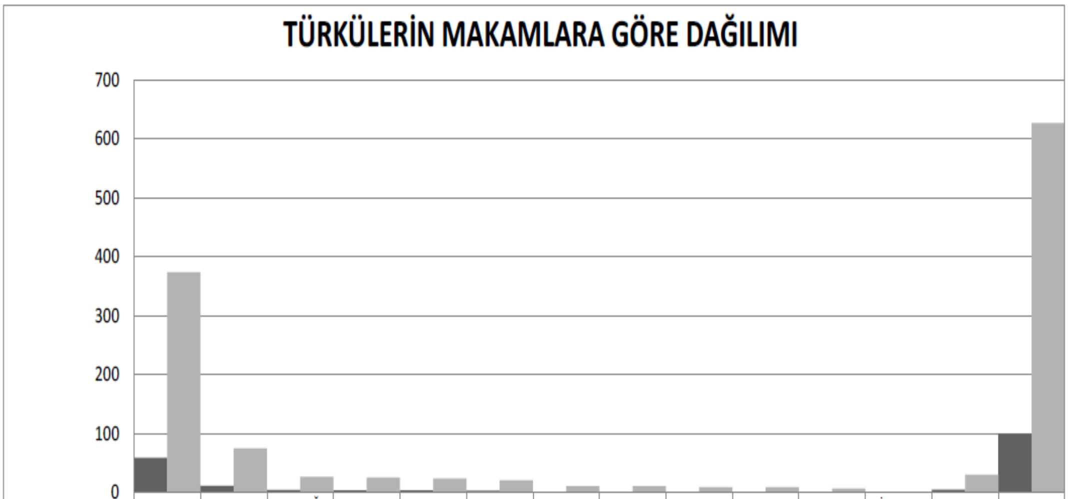
While melodic patterns that emerge on the FTS can be based on makams (makam based melodic patterns), they can also be free of any makam context. The solution to problems such as how the melodic pattern can be used in the makam context, or which melodic pattern can be used in a certain makam is directly related to the performer's "makam knowledge". The performance of makams in PVT can be the subject of another study that examines the FTSs performed in this study, and the melodic patterns that develop on these FTSs.

The *Traditional Fret System*[105] (TFS) that consists of *tam perde*s is called *Rast Düzeni* in historical sources (Öztürk, 2014, p. 31). Öztürk (2016) states that the FTSs, which are used in traditional music, are derived only from the TFS in "old" makam performance.

Bilgin (2013) observes the frequency of use of makams in *türkü*s[106] in a graphic (Figure 4.16). While the makam categorization here is controversial[107], it provides a clear idea on the most frequently used FTSs. The most frequently used FTS in Turkish Folk Music is the TFS that is represented with the *Hüseyni Makam* and *Rast Makam* in the graph.

---

[103] *General Scale (Fr.echelle generale)* : An organizational structure that qualifies them to be the "system" designation (Öztürk,2018). It consists of all frets in a music. For example *general scale of Indian music, general scale of Western classical music etc.,*
[104] These *düzen*s are named after pitches or makams such as *Rast Düzeni, Hicaz Düzeni, Buselik Düzeni*, etc. However there are some differences between the pitches in these makams and the contemporary *saz* fretting of the *saz model*.
[105] For details, see Chapter 2.1.5.
[106] Songs that constitute the repertoire of Turkish Folk Music (TFM).
[107] This graph assumes that all musical pieces that are in the "Traditional Fret System" are in *Hüseyni* and *Rast* Makams.



	HÜSEYNİ	HİCAZ	KARCIĞAR	SEGAH	KÜRDİ	ÇARGAH	EVİÇ	SABA	RAST	HÜZZAM	NİKRİZ	NİHAVENT	DİĞER	TOPLAM
MAKAMLAR %	59,8	12	4,3	4,1	3,8	3,3	1,8	1,8	1,4	1,4	1,1	0,3	4,9	100
f	374	75	27	26	24	21	11	11	9	9	7	2	31	627

Figure 4.16 : Distribution of makams in *türkü*s (Bilgin, 2013).

Today, both Turkish Classic Music and Turkish Folk Music repertoires show that the great majority of makams have a *karar* (tonic note) on *Dügâh* fret/pitch[108]. This is why we classified FTSs based on the *Dügâh* fret/pitch in our study. Makams with *karar*s other than *Dügâh* can be defined with FTSs built on *Dügâh*. This is because the expansion of FTSs on different degrees (similar to playing many modal structures on the same scale through modal expansions that we described in the scale playing section) allows the performance of a wide collection of makams.

Since our study concerns the performance of melodic patterns on multiple keys, each FTS is classified based on a single reference fret/pitch. According to us, this reference fret should be *Dügâh* fret/pitch for this kind of study. The most frequently used FTSs on the *saz* according to the features specified above can be categorized into 3 categories based on their first 3 frets/pitches, beginning with the *Dügâh* fret/pitch (Table 4.22).

Makams that don't begin with *Dügâh* fret/pitch can be represented to have tonic notes on different degrees of the FTSs below Also, FTSs to which makams that don't contain the *Dügâh* fret/pitch are represented as transposed to the *Dügâh* fret/pitch.

[108] The frets/pitches of makams are not absolute pitches but they are relative. One can select a reference fret (In this situation, it is *Dügâh*) as A or D or E, etc.. But other frets has positional relation with the reference fret.

Table 4.22 : FTS classes.

FTS Class	First 2 intervals on *saz model*. (starting fret : *Dügâh*)
FTS-1 class	1.65+1.35
FTS-2 class	1+2
FTS-3 class	1+3

The FTS-1 Class above is the class of the FTSs that contain the Traditional Fret System and the first 3 frets/pitches of this system (*Dügâh*, *Segâh* and *Çargâh*).

Öztürk (2008) states *düzen*s are defined in 2-octave range. The main reason for this is that it is easier to represent different pitch organizations in different octaves. However, α-PDC structures let to play maximum 8-notes and the frets/pitches in the higher octave are positioned as the eighth of the frets/pitches in the lower octave in many cases. Hence, the melodic range our *saz model* is one and half octave, nearly. Accordingly, we defined FTSs in 1 octave span of *düzen*s in this study. They can be defined with FTSs that are connected to different degrees in different positions of the octave.

To play frets/pitches of a FTS ascending or descending way can be expressed with PDC structures. Ascending playing that begin on a fret/pitch in a FTS are represented at the end of the FTS' name, with numerals that specify the beginning fret/pitch on the FTS in the lower right corner. Structures that emerge with pitch changes on the FTS are represented with a superscript modifier symbol at the end of the FTS' name.

For example FTS-1$b_1^{\sharp 6}$ represents that the 6th pitch of FTS-1b is sharpened (it is 65 cent in *saz model*) and ascending playing of it begins from the 1st fret/pitch of the FTS-1b.

The "Traditional Fret System" that begins in the *Dügâh* pitch is named as FTS-1a. FTS-1a Contains microtonal pitches, and cannot be chromatically performed on every tone due to the asymmetric nature of the *saz model*'s fretting system. FTS-1a can be played only if it is matched to 5 different *karar* pitches, "G," "A," "C," "D," "E." FTS-1as that can be performed on the *saz model* are shown in the Figure 4.17.

Figure 4.17 : FTS-1a established on different pitches (G,A,C,D,E respectively) on the *saz*.

In makam playing, it is frequently seen that some pitches vary according to the flow of the melody. Frequently, multiple FTSs are used successively when playing a makam. Especially transitions between variations of same FTSs are done. This is called *with-girift* performance (Öztürk, 2018). While some variations are unique to the makam that is used, others are independent of makams.

For example, the *Acem-Eviç* pitch variation in makams that travel between the *Neva* and *Gerdaniye* pitches is makam-independent. Öztürk (2014) notes the following on the matter:

> ...it is a fact that the variation that emerges in the specified fret/pitch range based frequently on the direction of the melodic movement and sometimes even on aesthetic preference exhibits a makam-independent character. In other words, this descending-ascending variation is not specific to a "single" makam in terms of the usage of the area. The *Acem* and *Eviç* pitch variations are frequently seen in many makams that travel in the same region such as *Nevâ, Hüseynî, Muhayyer, Tahir, Isfahan, Acem, Uşşak, Bayâtî, Hicaz, Uzzâl, Hümayun, Nikriz, Rast, Pençgâh*, etc. and this variation is not "characteristic" to any of these makams, it is not unique to a "single" makam. To the contrary, it is completely "regional," and thus "specific to the *düzen*". (Öztürk, 2014, p.24)

Thus, such variations are not addressed as new FTSs, but only as an articulation to the existing fret/pitch in the FTS. This is why they will be represented with a superscript symbol at the end of the FTS' name.

For example FTS 1-a's version with *acem*, FTS-1a$^{\natural 6}$ can be represented as follows (Figure 4.18).

Figure 4.18 : A FTS -1a$_1^{\natural 6}$.

The graphical representation of the placement of frets of other FTS variations in FTS-1 class are presented in Figure 4.19. As evident in Figure 4.19, other FTSs in FTS-1 class are derived from FTS-1a.

Similar to the formation of modes from the main scale that was discussed in the scale playing section, certain sequences can be formed starting with different frets/pitches on FTS-1a. The PDC, SOP and PGTOP structures that are recommended for these FTSs are presented in Table 4.23. Ascending performances that begin on different frets/pitches of FTS-1a are represented with the order number of the pitch on FTS as a sub-symbol on the lower right corner of the symbol FTS-1a. Makams in FTS-1a are formed as different frets become central in terms of introductional central note (*agaz*) and tonic notes (*karar*) on these FTSs. The center fret in these playing systems can be any pitch on the PDC.

Structures that begin on different degrees of FTS 1-a exhibit different SOP&PGTOP and PDC characteristics. Additionally, the *Acem-Eviç* variation in FTS 1-a that begin on the same pitch can create different PDC and SOP&PGTOP structures. This is because *Eviç* and *Acem* pitches are located on neighbouring chromatic columns.

As specified in previous sections, L(+2m) fingering type is frequently preferred instead of L(0) when playing FTS 1-a$_1$. This is why we used L(+2m) for the LH position for FTS 1-a$_1$ in our study. The PVT performer has to know about the *Acem* and *Eviç* versions of PDCs and SOP&PGTOPs in Table 4.23 when performing makams such as *Hüseyni Makam, Uşşak Makam, Rast Makam, Neva Makam* and *Muhayyer Makam* that are formed on FTS 1-a.

Another FTS in the FTS-1 class is FTS-1b. FTS-1b contains microtonal pitches and similar to FTS-1a, it can be played on the *saz model* when it is matched to 5 different pitches, G, A, C, D, and E.

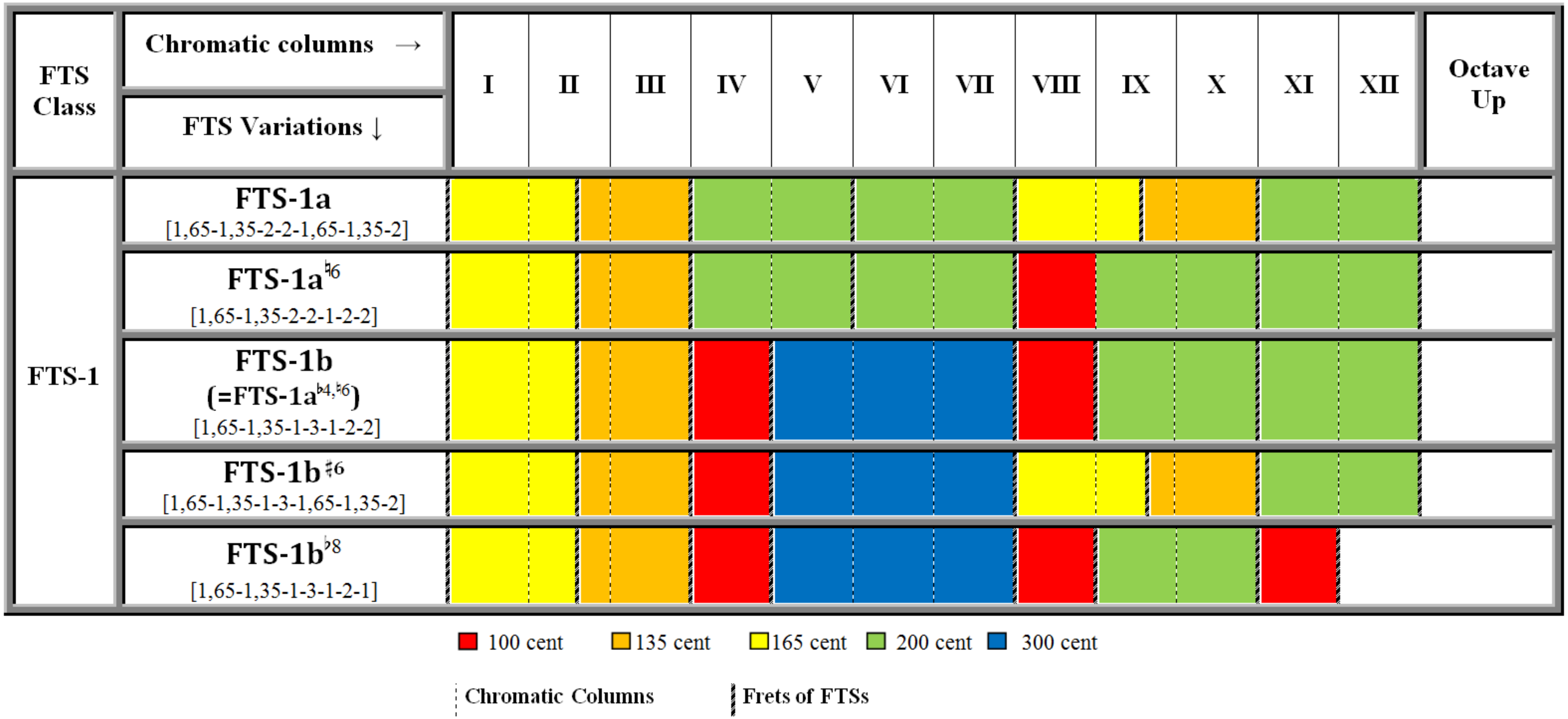


Figure 4.19 : Graphical representation of FTSs on FTS-1 class on *saz model*

Table 4.23 : Proposed PDC and SOP&PGTOP structures of FTS 1-a and FTS 1-a$^{\natural 6}$.

FTS − 1a	FTS 1-a_1	FTS 1-a_2	FTS 1-a_3	FTS 1-a_4	FTS 1-a_5	FTS 1-a_6	FTS 1-a_7
Proposed PDC	$^{m}_{+}(V)_0$	$_0(\Delta V)_0$	$_0(\Delta IV)_0$	$_+(\Delta III)_+$	$_0(\Delta V)_0$	$_0(\Delta IV)_+$	$_+(\Delta III)_+$
Proposed SOP& PGTOP	β	β	α	α	β	β	α
FTS − 1a$^{\natural 6}$	FTS-1$a_1^{\natural 6}$	FTS-1$a_2^{\natural 6}$	FTS-1$a_3^{\natural 6}$	FTS-1$a_4^{\natural 6}$	FTS-1$a_5^{\natural 6}$	FTS-1$a_6^{\natural 6}$	FTS-1$a_7^{\natural 6}$
Proposed PDC	$_0(\Delta V)_0$	$_0(\Delta IV)_+$	$_0(\Delta IV)_+$	$_0(\Delta V)_0$	$_0(\Delta V)_0$	$_0(\Delta III)_+$	$_+(\Delta III)_+$
Proposed SOP& PGTOP	β	β	α	β	β	α	$\alpha^{7\text{-}L}$

A FTS-1b can be represented on the stave as follows (Figure 4.20).

Figure 4.20 : A FTS-1b_1.

The *Saba Makam* is played on FTS-1b. One of the frequently used variations of FTS-1b is FTS-1b$^{\sharp 6}$. FTS-1b$^{\sharp 6}$ is used in the regions lower than the *karar* pitch in *Saba Makam*. The PDC, SOP and PGTOP structures that are recommended for these variations are presented in Table 4.24.

Table 4.24 : Proposed PDC and SOP&PGTOP Structures of FTS-1b and FTS-1b$^{\sharp 6}$.

FTS-1b	**FTS-1b_1**	**FTS-1b_2**	**FTS-1b_3**	**FTS-1b_4**	**FTS-1b_5**	**FTS-1b_6**	**FTS-1b_7**
Proposed PDC	$_0(\Delta V)_-$	$_0(\Delta IV)_+$	$_0(\Delta V)_-$	$_0(\Delta IV)_0$	$_0(\Delta V)_0$	$_+(\Delta IV)_0$	$_0(\Delta IV)_+$
Proposed SOP& PGTOP	β	β	$\beta^{3\text{-}3}$	α	β	α	α
FTS-1b$^{\sharp 6}$	**FTS-1$b_1^{\sharp 6}$**	**FTS-1$b_2^{\sharp 6}$**	**FTS-1$b_3^{\sharp 6}$**	**FTS-1$b_4^{\sharp 6}$**	**FTS-1$b_5^{\sharp 6}$**	**FTS-1$b_6^{\sharp 6}$**	**FTS-1$b_7^{\sharp 6}$**
Proposed PDC	$^{m}_{+}(V)_-$	$_0(\Delta V)_0$	$^4(\Delta V)_0$	$_0(\Delta IV)_0$	$_0(\Delta V)_0$	$_0(\Delta IV)_+$	$_0(\Delta IV)_+$
Proposed SOP& PGTOP	β	β	$\beta^{3\text{-}3}$	α	β	β	α

In addition to makam-independent variations such as the *Acem-Eviç* variation, there are makam-specific pitch variations. Another variation for FTS-1b is FTS-1b$^{\flat 8}$. This variation is frequently used in the performance of the *Saba Makam* (Figure 4.21). In this version, the octave of the *karar* pitch is lowered; this pitch is frequently the highest pitch in the ascending-descending performance and generally does not pass to the higher octave[109]. PDC and SOP&PGTOP structures in which the *karar* pitch variations are applied are the same with FTS 1-b.

Figure 4.21 : A FTS-1b$_1^{\flat 8}$.

Shifting the *Segâh* fret, which is the second pitch in FTS-1 Class to the *kürdi* fret, FTSs of the FTS-2 class emerge (See Figure 4.22).

Figure 4.22 : A FTS-2a$_1$.

The graphical representation of the placement of frets of other FTS variations in FTS-2 class are presented in Figure 4.23.

FTS 2-a has the same structure with the major mode *Phrygian*. This is why PDC and SOP&PGTOP structures that emerge in FTS performances are identical to the major scale mode structures of the Phrygian scale and its neighbouring modes. Some variations on FTS-2a can be represented with FTS-2a$^{\natural 6}$, FTS-2a$^{\sharp 6}$ etc...

Table 4.25 presents the PDC and SOP&PGTOP structures that emerge in FTS-2a and FTS-2a$^{\sharp 6}$. FTS-2a $^{\natural 6}$ has same PDC and SOP&PGTOP structures with FTS-2a$^{\sharp 6}$.

As mentioned before the *karar* fret of makams with *Segâh* fret like *Segâh Makam, Hüzzam Makam,* etc. is played with equally-tempered notes in contemporary *saz*. This changing results in FTSs of this kind of makams are classified under FTS-2 class. FTS-2b is commonly used in the *Segâh* makam that uses the B pitch as the tonic note.

---

[109] Cases when the higher octave is used can be represented with FTS-3b or FTS-3c that are built upon the 3rd degree of FTS-1b.

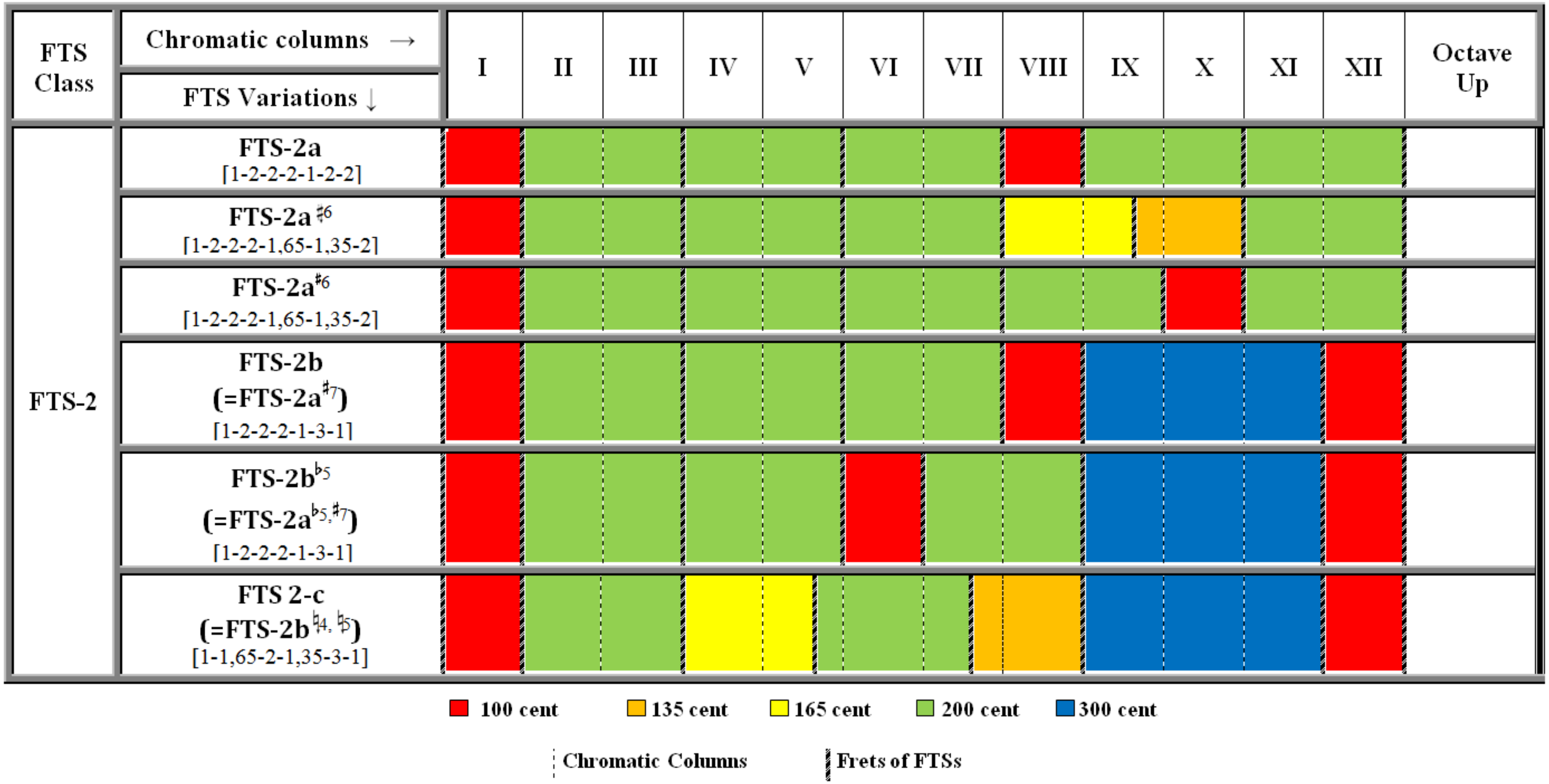


Figure 4.23 : Graphical representation of FTS-2 class FTSs on *saz model.*

Table 4.25 : Proposed PDC and SOP&PGTOP structures for FTS-2a and FTS-2a$^{\sharp6}$.

FTS-2a	**FTS-2a$_1$**	**FTS-2a$_2$**	**FTS-2a$_3$**	**FTS-2a$_4$**	**FTS-2a$_5$**	**FTS-2a$_6$**	**FTS-2a$_7$**
Proposed PDC	$_0(\Delta V)_0$	$_+(\Delta IV)_0$	$_+(\Delta III)_+$	$_0(\Delta V)_0$	$_0(\Delta IV)_+$	$_+(\Delta III)_+$	$_0(\Delta V)_0$
Proposed SOP& PGTOP	β	α	$\alpha^{7\text{-}L}$	β	β	α	β
FTS-2a$^{\sharp6}$	FTS 2-a$_1^{\sharp6}$	FTS 2-a$_2^{\sharp6}$	FTS 2-a$_3^{\sharp6}$	FTS 2-a$_4^{\sharp6}$	FTS 2-a$_5^{\sharp6}$	FTS 2-a$_6^{\sharp6}$	FTS 2-a$_7^{\sharp6}$
Proposed PDC	$_0(\Delta V)_0$	$_+(\Delta IV)_0$	$_+(\Delta IV)_0$	$_+(\Delta III)_0$	$_0(\Delta IV)_+$	$_+(\Delta IV)_0$	$_0(\Delta III)_0$
Proposed SOP& PGTOP	β	α	$\alpha^{7\text{-}L}$	$\alpha^{7\text{-}L}$	β	β	$\alpha^{3\text{-}L}$

While the tonic note of this makam is *Segâh*, in contemporary *saz* performance the natural B pitch is used (Figure 4.24).

Figure 4.24 : B FTS-2b$_1$.

The *Eviç-Acem* variation in FTS-2b creates different PDC and SOP&PGTOP structures. The resulting FTS after *Acem* fret (♭5 in this situation) instead of *Eviç* (♮5 in this situation) is FTS-2b$^{\flat5}$ (Figure 4.25).

(a)
(b)

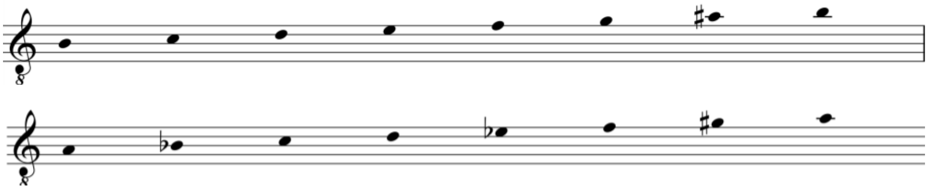


Figure 4.25 : FTS-2b$_1^{\flat5}$: (a) B FTS-2b$_1^{\flat5}$ (b) A FTS-2b$_1^{\flat5}$.

Table 4.26 presents the PDC and SOP&PGTOP structures that emerge in FTS-2b and FTS-2b$^{\flat5}$.

Table 4.26 : Proposed PDC and SOP&PGTOP structures for FTS-2b.

FTS-2b	FTS-2b$_1$	FTS-2b$_2$	FTS-2b$_3$	FTS-2b$_4$	FTS-2b$_5$	FTS-2b$_6$	FTS-2b$_7$
Proposed PDC	${}_{0}(\Delta\text{III})_{+}$	${}_{+}(\Delta\text{IV})_{0}$	${}_{0}(\Delta\text{IV})_{+}$	${}_{0}(\Delta\text{V})_{0}$	${}_{0}(\Delta\text{IV})_{+}$	${}_{0}(\Delta\text{III})_{+}$	${}_{+}(\Delta\text{IV})_{0}$
Proposed SOP& PGTOP	$\alpha^{3\text{-}L}$	α	$\alpha^{7\text{-}L}$	β	$\beta^{3\text{-}3}$	α	β
FTS-2b$^{\flat 5}$	**FTS 2-b$_1^{\flat 5}$**	**FTS 2-b$_2^{\flat 5}$**	**FTS 2-b$_3^{\flat 5}$**	**FTS 2-b$_4^{\flat 5}$**	**FTS 2-b$_5^{\flat 5}$**	**FTS 2-b$_6^{\flat 5}$**	**FTS 2-b$_7^{\flat 5}$**
Proposed PDC	${}_{0}(\Delta\text{IV})_{0}$	${}_{+}(\Delta\text{III})_{+}$	${}_{0}(\Delta\text{VI})_{-}$	${}_{+}(\Delta\text{V})_{0}$	${}_{+}(\Delta\text{IV})_{0}$	${}_{0}(\Delta\text{III})_{+}$	${}_{+}(\Delta\text{IV})_{0}$
Proposed SOP& PGTOP	$\beta^{7\text{-}R}$	α	β	β	α	$\alpha^{7\text{-}L}$	β

The basic FTS that is performed the *Hüzzam makam* is FTS-2c in contemporary *saz*. Figure 4.26 shows B FTS-2c.

Figure 4.26 : B FTS-2c$_1$.

Hüzzam Makam has a narrowed augmented second interval that needs two different microtonal frets with different comma amount. However, this choice is not suitable in fretting system of *saz model*. So, FTS-2c can be thought as the variation of *Hüzzam Makam* in fretting system of *saz model*. While the frets/pitches of FTS-2c are different than FTS-2b, the chromatic columns containing the frets/pitches are same. Because of this reason, the PDC and SOP&PGTOP structures that emerge in performances on FTS-2c are the same with FTS-2b.

FTSs in FTS- 3 class are used in the performance of makams in the *Hicaz* makam family, or some others that contain augmented seconds (Figure 4.27).

C FTS-3a$_1$, a member of FTS-3a class on the *saz model* is represented as below (Figure 4.28).

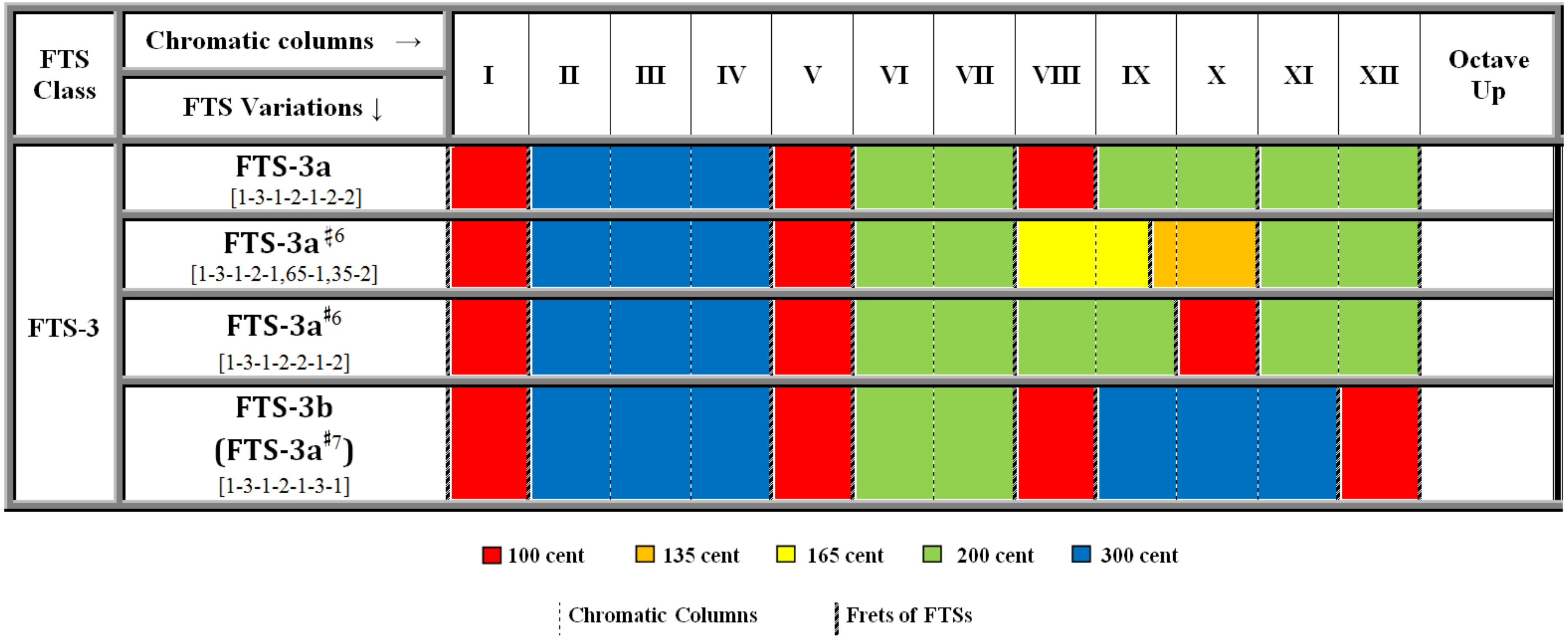


Figure 4.27 : Graphical representation of FTS-3 class FTSs on the *saz model.*

Figure 4.28 : C FTS-3a_1.

The *Eviç-Acem* variation in FTS 3-a creates different PDC and SOP&PGTOP structures as emerged in other FTSs. FTS-3$a^{\sharp 6}$ is sometimes used instead of FTS-3$a^{\sharp\downarrow 6}$ in FTS 3a variations. FTS-3$a^{\sharp 6}$ and FTS-3$a^{\sharp\downarrow 6}$ have the same PDC and SOP&PGTOP structures. Some makams that contain augmented seconds can also be represented with the FTS-3$a^{\sharp 6}$ that emerges from this variation. This is why two variations, FTS-3$a^{\sharp 6}$, FTS 3-$a^{\sharp\downarrow 6}$ were necessary.

In makam performance of *saz* it is sometimes preferred to use smaller interval than the augmented second in FTSs. This is executed by lowering the higher pitch of the augmented second interval and turning it into the microtonal interval (265 cents on the *saz model*) in *saz* performance. Our experience and observations allow us to state that this is a frequent situation in the performance of tunes from certain regions on *Hicaz*, and in makams that contain augmented seconds on various degrees such as the *Karcığar* makam. This changing that occurs in a chromatic column can be shown as FTS-3$a^{\sharp\downarrow 3}$ and doesn't affect PDC and SOP&PGTOP structures.

Another member of FTS-3 class is FTS-3$a^{\sharp 7}$. It contains two augmented second intervals (Figure 4.27). Some makams like *Zirgüleli Hicaz Makam, Hicazkar Makam, Neveser Makam* use FTS-3$a^{\sharp 7}$. A FTS-3$a_1^{\sharp 7}$ can be shown as below (Figure 4.29).

Figure 4.29 : A FTS-3$a_1^{\sharp 7}$.

PDC&SOP&PGTOP structures that emerge in the PVT performance of FTS-3 class are presented in Table 4.27.

Table 4.27 : Proposed PDC and SOP&PGTOP structures for FTS-3a and FTS-3a $^{\sharp 6}$, FTS-3a$^{\#6}$, FTS-3b and FTS-3c.

FTS-3a	FTS-3a$_1$	FTS-3a$_2$	FTS-3a$_3$	FTS-3a$_4$	FTS-3a$_5$	FTS-3a$_6$	FTS-3a$_7$
Proposed PDC	$_0(\Delta V)_0$	$_0(\Delta IV)_0$	$_0(\Delta IV)_0$	$_0(\Delta III)_+$	$_0(\Delta IV)_+$	$_+(\Delta III)_+$	$_0(\Delta V)_0$
Proposed SOP& PGTOP	$\beta^{3\text{-}3}$	α	β	$\alpha^{3\text{-}L}$	β	α	β
FTS 3-a$^{\#6}$ &FTS-3a $^{\sharp 6}$	FTS 3-a$_1^{\#6}$	FTS 3-a$_2^{\#6}$	FTS 3-a$_3^{\#6}$	FTS 3-a$_4^{\#6}$	FTS 3-a$_5^{\#6}$	FTS 3-a$_6^{\#6}$	FTS 3-a$_7^{\#6}$
Proposed PDC	$_0(\Delta V)_0$	$_0(\Delta IV)_0$	$_0(\Delta IV)_+$	$_+(\Delta III)_+$	$_0(\Delta IV)_+$	$_0(\Delta V)_-$	$_0(\Delta IV)_0$
Proposed SOP& PGTOP	$\beta^{3\text{-}3}$	α	β	α	β	β	$\alpha^{3\text{-}L}$
FTS-3b	FTS-3b$_1$	FTS-3b$_2$	FTS-3b$_3$	FTS-3b$_4$	FTS-3b$_5$	FTS-3b$_6$	FTS-3b$_7$
Proposed PDC	$_{\ddagger}(\Delta III)_+$	$_0(\Delta IV)_0$	$_0(\Delta V)_-$	$_0(\Delta V)_0$	$_0(\Delta IV)_+$	$_0(\Delta III)_+$	$_+(\Delta IV)_+$
Proposed SOP& PGTOP	α	α	β	$\alpha^{3\text{-}L}$	$\beta^{3\text{-}3}$	α	β

Many makams that contain *augmented second* interval can be performed using the PDC and SOP&PGTOP structures built upon different pitches of FTS-3a's variations.

As we mentioned before, PVT performers has to know variations of FTSs to be able to do *with-girift* performance of makams. These transitions emerges at least two PDC structures. PVT performers should have knowledge of PDC and PGTOP&SOP structures of the variation of FTSs.

There is a special occasion in *with-girift* performance. If the ascending-descending playing starts and finishes with the changing/variated notes and this process results with narrowed octave span, performer can play two FTS variation in one PDC structure.

This performance is shown with supersymbol that shows accidentals of two variations (beginning and ending) in parenthesis on right-upper side of FTSs. Some FTSs *with-girift* that can play in single PDC represented as below (Figure 4.30).

Figure 4.30 : Ascending and descending playing of some FTSs *with-girift* performance when the "changing note" is starting note : (a) D FTS-1$a_6^{(\sharp-\natural)6}$. (b) D FTS-3$a_6^{(\sharp-\natural)6}$. (c) E FTS-2$b_5^{(\sharp-\natural)5}$. (d) D FTS-3$a_6^{(\sharp-\natural)6}$.

Following table presents proposed PDC and PGTOP&SOP structures for FTSs *with-girift* above (Table 4.28).

Table 4.28 : Proposed PDC and SOP&PGTOP structures for ascending-descending playing of FTSs in Figure 4.30.

FTSs	Proposed PGTOP&SOP	Proposed PDCs
FTS-1$a_6^{(\sharp-\natural)6}$	β	$_0(\Delta IV)_-$
FTS-3$a_6^{(\sharp-\natural)6}$	α^{3-L}	$_0(\Delta II)_+$
FTS-2$b_5^{(\sharp-\natural)5}$	β^{3-3}	$_0(\Delta IV)_0$
FTS-3$a_6^{(\sharp-\natural)6}$	α^{3-L}	$_0(\Delta II)_+$

In conclusion, performer who knows proposed PDC and PGTOP&SOP structures of all FTSs has big advantage on performance of makams. However, this knowledge is redundant without "makam knowledge" in performance of makam music.

Following score shows a PVT improvisation played by my student Mücahit Kol who is also *tanbur* player after completed his training in PVT (Figure 4.31) (See Appendix M : CD, Video Track-12). This notation represents a melodic passage performed with PVT in the *Karcığar* makam. The *Karcığar* makam can be performed using PDC and SOP&PGTOP structures that occur in certain FTSs. Other PDCs on the PDC tree[110] can also be used sometimes (Figure 4.31).

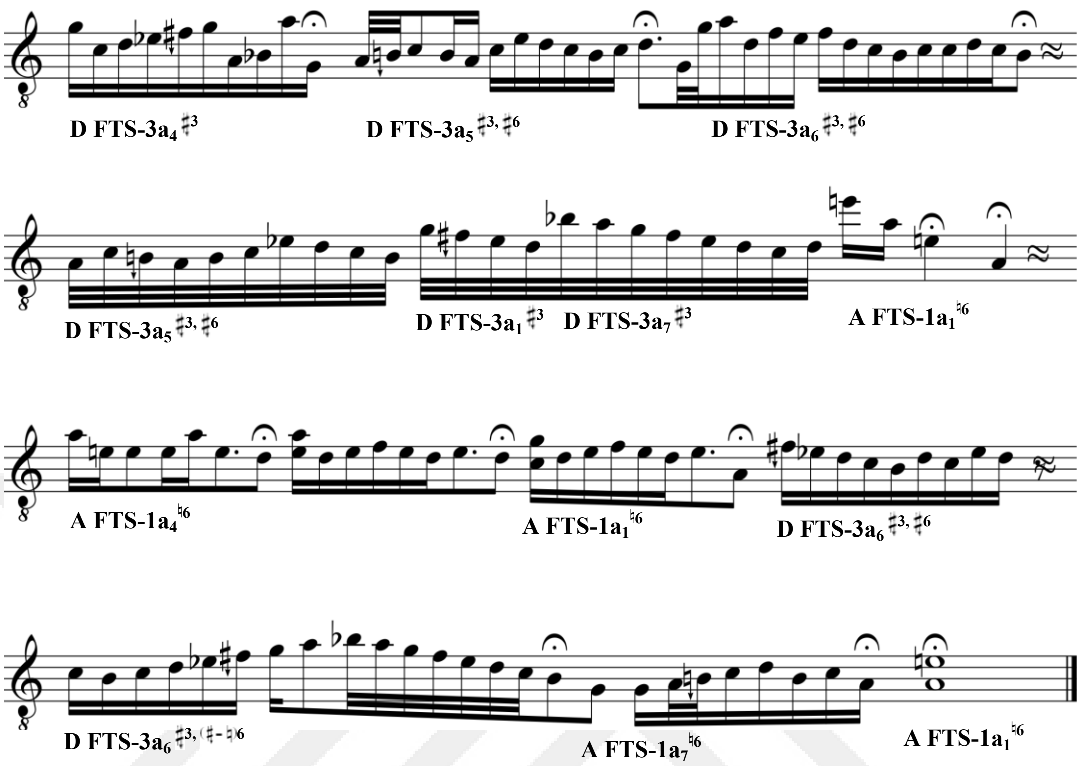


Figure 4.31 : A *Karcığar* taxim melody that use different FTSs in PVT (Kol, 2018).

4.4.1.5 Pentatonic scales

One of the known methods of deriving pentatonic scales is to play uncompleted heptatonic scales by not using two pitches from the heptatonic scale. Pentatonic scales formed by this method also known as the “delete note method,” (Miller, 1996b, p.89) can be played based on the heptatonic scale’s PDC (Figure 4.32).

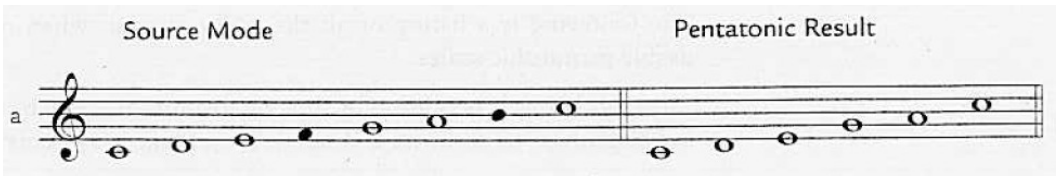


Figure 4.32 : Major Pentatonic Scale (Miller, 1996b, p.89).

The most frequently used SOP&PGTOP structure that is used for the ascending performance of the pentatonic scale is $\left\{\begin{matrix}2\\ \mathrm{L}\end{matrix}\middle|\begin{matrix}2\\ \mathrm{L}\end{matrix}\middle|\begin{matrix}2\\ \mathrm{R}\end{matrix}\middle|\begin{matrix}3\\ \mathrm{R}\end{matrix}\middle|\begin{matrix}1\\ \mathrm{L}\end{matrix}\middle|\begin{matrix}1\\ \mathrm{R}\end{matrix}\right\}_{\mathrm{P}}^{\mathrm{s}}$. It can also be played

[110] See Chapter 4.4.2.4 for detailed information.

changing the PDC structure, by replacing $\left\{\begin{matrix}3\\ \mathrm{R}\end{matrix}\right\}_{\mathrm{P}}^{\mathrm{s}}$ with $\left\{\begin{matrix}1\\ \mathrm{L}\end{matrix}\right\}_{\mathrm{P}}^{\mathrm{s}}$ in the 4th degree of the scale. The $\left\{\begin{matrix}1\\ \mathrm{R}\end{matrix}\middle|\begin{matrix}1\\ \mathrm{L}^{\mathrm{R}}\end{matrix}\middle|\begin{matrix}3\\ \mathrm{R}\end{matrix}\middle|\begin{matrix}2\\ \mathrm{R}\end{matrix}\middle|\begin{matrix}3\\ \mathrm{L}^{\mathrm{R}}\end{matrix}\middle|\begin{matrix}2\\ \mathrm{L}^{\mathrm{R}}\end{matrix}\right\}_{\mathrm{P}}^{\mathrm{s}}$ SOP&PGTOP structure in which the thumb can be used for the descending performance of the pentatonic scale is recommended. An alternative that can be used as a variation without changing the PDC is the variation in which the 3rd degree of the scale is $\left\{\begin{matrix}3\\ \mathrm{L}^{\mathrm{R}}\end{matrix}\right\}_{\mathrm{P}}^{\mathrm{s}}$ instead of $\left\{\begin{matrix}2\\ \mathrm{R}\end{matrix}\right\}_{\mathrm{P}}^{\mathrm{s}}$. In this case, the 2nd degree of the scale will be obtained with $\left\{\begin{matrix}3\\ \mathrm{L}^{\mathrm{L}}\end{matrix}\right\}_{\mathrm{P}}^{\mathrm{s}}$ instead of $\left\{\begin{matrix}3\\ \mathrm{L}^{\mathrm{R}}\end{matrix}\right\}_{\mathrm{P}}^{\mathrm{s}}$. These SOP&PGTOP variations and PDCs that provide the major pentatonic scales and their modes are presented in the Table 4.29.

Table 4.29 : Proposed PDCs for major pentatonic scale and its modes for $\left\{\begin{matrix}2\\ \mathrm{L}\end{matrix}\middle|\begin{matrix}2\\ \mathrm{L}\end{matrix}\middle|\begin{matrix}2\\ \mathrm{R}\end{matrix}\middle|\begin{matrix}3\\ \mathrm{R}\end{matrix}\middle|\begin{matrix}1\\ \mathrm{L}\end{matrix}\middle|\begin{matrix}1\\ \mathrm{R}\end{matrix}\right\}_{\mathrm{P}}^{\mathrm{s}}$.

Major Pentatonic Scale	**Source Scale**	**Mode 2**	**Mode 3**	**Mode 4**	**Mode 5**
Proposed PDC	$_{+}(\Delta\mathrm{V})_{-}$	$_{+}(\Delta\mathrm{V})_{0}$	$_{0}(\Delta\mathrm{VI})_{-}$	$_{+}(\Delta\mathrm{V})_{0}$	$_{0}(\Delta\mathrm{V})_{0}$

Major pentatonic scale Mode 5, which is one of the frequently used pentatonic modes, is also known as the minor pentatonic scale. Another pentatonic scale that is named minor pentatonic scale, especially in terms of compositional purpose, is the Dorian pentatonic scale (Figure 4.33).

Figure 4.33 : Dorian pentatonic scale.

The PDC and SOP&PGTOP structures that are recommended for this scale that contains tritone intervals are presented in the Table 4.30.

Evidently, the Dorian pentatonic scale and Dorian pentatonic scale mode 3 is not performed with the SOP&PGTOP structures recommended for the major pentatonic scale. Dorian pentatonic scale mode 2, mode 4 and mode 5 can be played by using the SOP&PGTOP structures recommended for the major pentatonic scale.

Table 4.30 : Proposed PDCs and SOP&PGTOP structures for Dorian pentatonic scale and its modes.

Dorian Pentatonic Scale	Source Scale	Mode 2	Mode 3	Mode 4	Mode 5
Proposed PDC	${}_{0}(\Delta V)_{0}$	${}_{\ddagger}(\Delta V)_{0}$	${}_{-}(\Delta IV)_{0}$	${}_{+}(\Delta V)_{0}$	${}_{0}(\Delta IV)_{+}$
Proposed PGTOP& SOP	Ascending $\left\{\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_{P}^{s}$ Descending $\left\{\genfrac{}{}{0pt}{}{1}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L^{R}}\middle\vert\genfrac{}{}{0pt}{}{3}{L}\middle\vert\genfrac{}{}{0pt}{}{3}{R^{L}}\middle\vert\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{L^{L}}\right\}_{P}^{s}$	Same with Major Pentatonic	Ascending $\left\{\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_{P}^{s}$ Descending $\left\{\genfrac{}{}{0pt}{}{1}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{R^{R}}\middle\vert\genfrac{}{}{0pt}{}{1}{L^{R}}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{3}{L^{R}}\middle\vert\genfrac{}{}{0pt}{}{2}{L^{R}}\right\}_{P}^{s}$	Same with Major Pentatonic	Same with Major Pentatonic

However, these structures cause L(++) fingering in PDC of the Dorian pentatonic scale mode 2. Accordingly, the SOP&PGTOP structures that is previously presented as alternative SOP&PGTOPs for major pentatonic scale; $\left\{\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_{P}^{s}$ can be used for the ascending scale, and $\left\{\genfrac{}{}{0pt}{}{1}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L^{R}}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\middle\vert\genfrac{}{}{0pt}{}{2}{L^{R}}\middle\vert\genfrac{}{}{0pt}{}{2}{L^{L}}\right\}_{P}^{s}$ for the descending scale of Dorian pentatonic scale mode 2 without LH thumb as variation.

Another commonly used scale is the blues pentatonic scale that is played by diminishing the V. degree of the hexatonic blues scale. (Figure 4.34)

Figure 4.34 : Blues pentatonic Scale.

The PDC and SOP&PGTOP structures that are recommended for blues pentatonic scale are presented in the table (Table 4.34).

Table 4.31 : Proposed PDCs and SOP&PGTOP structures for blues pentatonic scale and its modes.

Dorian Pentatonic Scale	Source Scale	Mode 2	Mode 3	Mode 4	Mode 5
Proposed PDC	${}_{0}(\Delta IV)_{+}$	${}_{0}(\Delta V)_{0}$	${}_{0}(\Delta IV)_{0}$	${}_{-}(\Delta IV)_{0}$	${}_{0}(\Delta V)_{0}$
Proposed PGTOP& SOP	Same with Major Pentatonic	Same with Dorian Pentatonic Scale	Ascending $\left\{\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_{P}^{s}$ Descending $\left\{\genfrac{}{}{0pt}{}{1}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{R^{R}}\middle\vert\genfrac{}{}{0pt}{}{1}{L^{R}}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{3}{L^{R}}\middle\vert\genfrac{}{}{0pt}{}{2}{L^{R}}\right\}_{P}^{s}$	Same with Dorian Pentatonic Mode 3	Same with Major Pentatonic

4.4.1.6 Hexatonic scales

Hexatonic scales contain 6 notes in an octave. The whole tone scale that contains whole tones between all its degrees is a frequently used hexatonic scale (Figure 4.35).

Figure 4.35 : Whole tone Scale.

The PDC that is recommended for playing whole tone scale in PVT is ${}_{+}(\Delta IV)_0$, its PGTOP and SOP structure is derived from α. The 8th degree of the α SOP&PGTOP structure for playing heptatonic scales is not used, and this structure can be represented with $\left\{\begin{matrix}2\\L\end{matrix}\middle|\begin{matrix}2\\L\end{matrix}\middle|\begin{matrix}2\\R\end{matrix}\middle|\begin{matrix}3\\R\end{matrix}\middle|\begin{matrix}1\\L\end{matrix}\middle|\begin{matrix}1\\L\end{matrix}\middle|\begin{matrix}1\\R\end{matrix}\right\}_P^s$ for the ascending scale, and $\left\{\begin{matrix}1\\R\end{matrix}\middle|\begin{matrix}1\\L^R\end{matrix}\middle|\begin{matrix}1\\L^L\end{matrix}\middle|\begin{matrix}3\\R\end{matrix}\middle|\begin{matrix}2\\R\end{matrix}\middle|\begin{matrix}2\\L^R\end{matrix}\middle|\begin{matrix}2\\L^R\end{matrix}\right\}_P^s$ for the descending scale. The whole tone scale does not have modes due to it contains same interval units. Thus, the PDC and SOP&PGTOP structures of all its transformations are the same with the source scale.

Another commonly used hexatonic scale is the blues scale that is derived from the minor pentatonic scale (Figure 4.36).

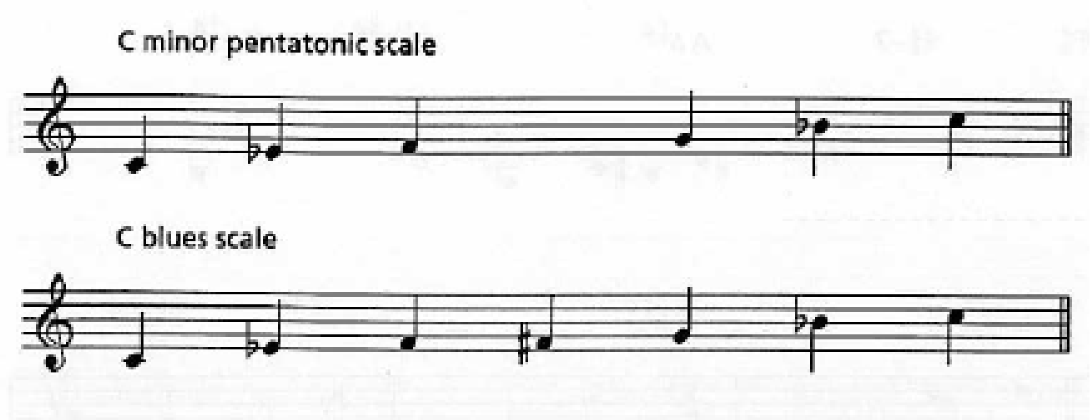


Figure 4.36 : Blues scale and its relation with minor pentatonic scale.

We mentioned in previous sections that the 4th degree, which is at the whole fifth position of the tonic note, can be played with $\begin{Bmatrix}3\\R\end{Bmatrix}_P^s$ instead of $\begin{Bmatrix}1\\L\end{Bmatrix}_P^s$ in the performance of major pentatonic modes. These two PGTOP & SOPs can be used simultaneously in the blues scale. The note added to the minor pentatonic scale can be played with

$\left\{\begin{matrix}3\\ R\end{matrix}\right\}_P^s$, while the 5th degree of the blues scale can be played with $\left\{\begin{matrix}1\\ L\end{matrix}\right\}_P^s$. Thus, the SOP&PGTOP structure used for the blues scale is the same with the WT scale SOP&PGTOP structure derived from α. The following table presents the PDC and SOP&PGTOP structures recommended for the blues scale (Table 4.32).

Table 4.32 : Proposed PDCs and SOP&PGTOP structures for blues scale.

Blues Scale	**Source Scale**	**Mode 2**	**Mode 3**	**Mode 4**	**Mode 5**	**Mode 6**
Proposed PDC	${}_0(\Delta IV)_+$	${}_0(\Delta V)_-$	${}_+(\Delta V)_0$	${}_\ddagger(\Delta IV)_0$	${}_0(\Delta III)_+$	${}_0(\Delta V)_0$
Proposed SOP&PGTOP (derived from)	α	β	β	α	$\alpha^{7\text{-}L}$	α

The Table 4.32 shows that the SOP&PGTOP structure used in the performance of the blues scale and the 4th and 6th mode of the blues scale are also derived from α. If the 8th degree of the α SOP&PGTOP structure for playing heptatonic scales is not used, this structure can be represented with $\left\{\begin{array}{c|c|c|c|c|c|c}2&2&2&3&1&1&1\\ L&L&R&R&L&L&R\end{array}\right\}_P^s$ for the ascending blues scale, and $\left\{\begin{array}{c|c|c|c|c|c|c}1&1&1&3&2&3&2\\ R&L^R&L^L&R&R&L^R&L^R\end{array}\right\}_P^s$ for the descending blues scale. The SOP&PGTOP structure for the 2nd and 3rd modes of the blues scale are derived from β. If the 8th degree of the β SOP&PGTOP structure for playing heptatonic scales is not used, this structure can be represented with $\left\{\begin{array}{c|c|c|c|c|c|c}2&2&2&2&3&1&1\\ L&L&L&R&R&L&R\end{array}\right\}_P^s$ for the ascending playing, and $\left\{\begin{array}{c|c|c|c|c|c|c}1&1&3&2&2&2&2\\ R&L^R&R&R&L^R&L^R&L^L\end{array}\right\}_P^s$ for the descending playing of blues scale mode 2 and mode 3. The SOP&PGTOP structure for the 5th modes of the blues scale are derived from $\alpha^{3\text{-}L}$. This structure is simply formed by removing $\left\{\begin{matrix}2\\ R\end{matrix}\right\}_P^s$, the SOP&PGTOP for the 3nd degree from the $\alpha^{7\text{-}L}$ SOP&PGTOP structure. This structure can be represented with $\left\{\begin{array}{c|c|c|c|c|c|c}2&2&3&1&1&1&1\\ L&L&R&L&L&L&R\end{array}\right\}_P^s$ for the ascending blues scale mode 5, and $\left\{\begin{array}{c|c|c|c|c|c|c}1&1&1&1&3&3&2\\ R&L^R&L^L&L^L&R&L^R&L\end{array}\right\}_P^s$ for the descending blues scale mode 5.

4.4.2 Modal expansion on scale playing

It is a common practice to relate scales and modal expansions to the fretboard on string instruments. Accordingly, all the pitches that a scale contains constitute a map that covers the scale and its modes on the fretboard. Knowing the map of a scale on the fretboard, and identifying the positions that emerge in this map are important in terms of noticing possibilities on the fretboard. Yeprem (2013) defined the modal map for the *classical guitar* as the area where the scale is played on all six strings without changing the LH position. Yeprem provides the view of the map of the Ionian scale on the *guitar* (Figure 4.37).

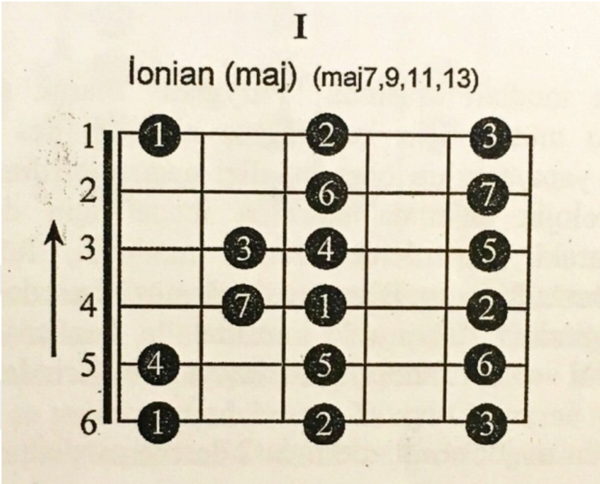


Figure 4.37 : Ionian map on the *guitar* (Yeprem, 2013).

These maps can be represented with PDC and SOP symbols in PVT. PDC and SOP sequences for a set of different modes can be obtained through these maps. This characteristic can be used in 3 different situations in scale playing:

- Open string use
- Use of higher octave pitches
- Scale playing within fretboard range with changes in position

4.4.2.1 Open string use in scale playing

Open strings can be played with one of these PGTs: 0^{L}, 0^{R} pull-offs, or one of 0^{LP}, left hand plucking techniques. While RH plucking is not a technique that is unique to PVT, it is sometimes used in combination with PVT. Thus, RH plucking technique can also be used for open strings. If there is no finger pressed on the fretboard it is often preferred.

In this manner, scales that begin with an open string note can be played by using RH plucking. Theoretically, since the LH will produce the 2nd sound of the scale when playing these scales. Accordingly, PDC structures have to be in PDCs in the neighbouring mode of the scale that is played, and the SOP&PGTOP structures for this mode have to be used after the first pitch on the open string.

For example the PDC that has to be used to play the ascending G Phrygian scale starting from the open middle string is the $_{+}(\Delta IV)_0$ that belongs to Ab Lydian, G Phrygian's neighbour mode. Since the proposed SOP&PGTOP structure for the Lydian is α, in this case the SOP&PGTOP structure to be used also has to be α (Figure 4.38).

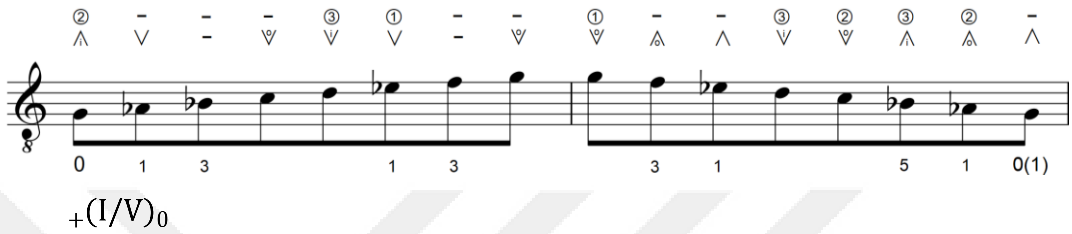


Figure 4.38 : Playing G Phrygian with open G string in PDC of A♭ Lydian.

The same approach can be used to scales with tonic notes on top open string (A), or bottom open string (D) (Figure 4.39).

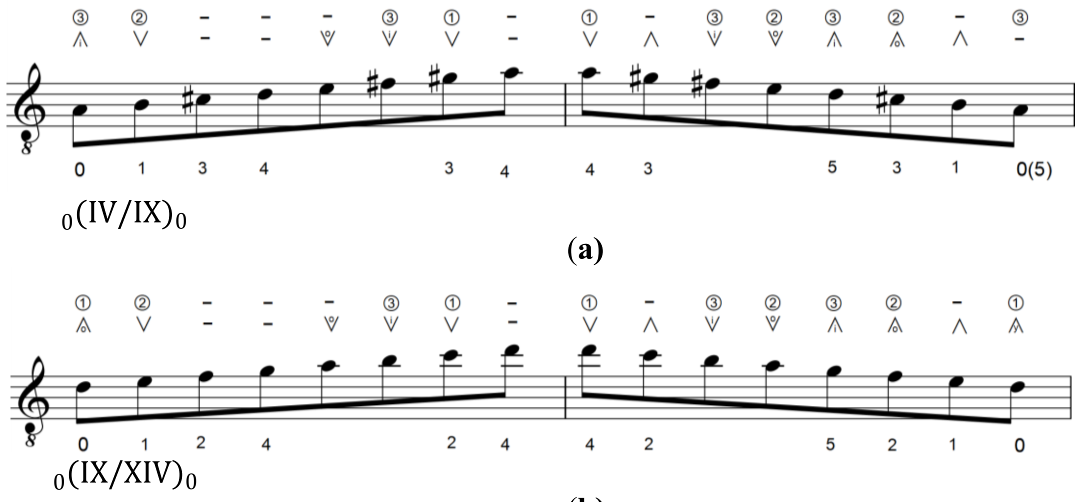


Figure 4.39 : Open string use on first degree in scale playing via β-type PDCs :
(a) Playing A Ionian with open A string in β-type PDC of B Dorian
(b) Playing D Dorian with open A string in β-type PDC of E Phrygian.

As shown in the figure, Dorian's PDC and SOP&PGTOP structures were preferred for the performance of A Ionian with an open string. Similarly, structures from E Phrygian are observed in D Dorian performance. When using these modal expansions on the scale, α structures (accordingly, PDCs that emerge in α structures) can be chosen instead of β structures. However the reverse is not true. The figure below shows the performance of the structures above with α structures (Figure 4.40).

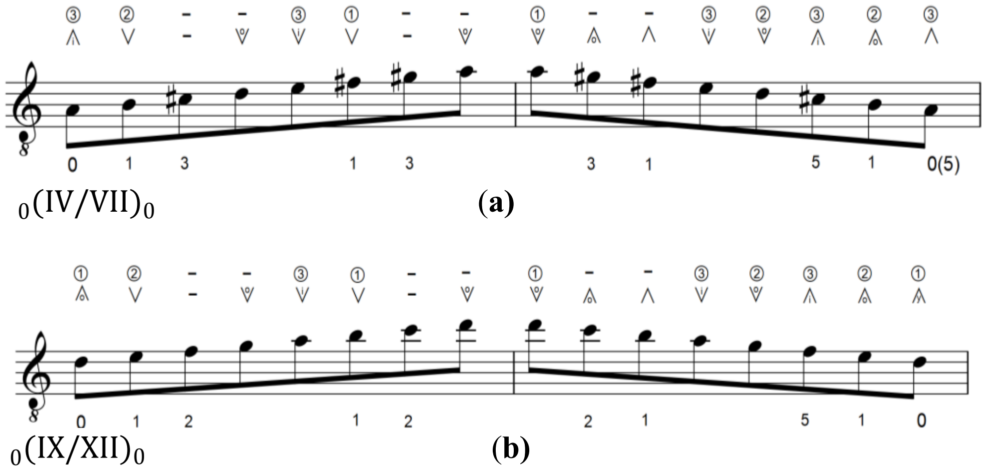


Figure 4.40 : Open string use on first degree in scale playing via α-type PDCs :
(a) Playing A Ionian with open A string in α-type PDC of B Dorian
(b) Playing D Dorian with open D string in α-type PDC of E Phrygian.

For scales with ♮2 in their second degrees on the G, the first two pitches can start with the middle open string and the top open string, respectively. In this case, LH and RH have to remain in the PDC that belong to the neighbouring mode of neighbouring mode of the scale. For example G Aeolian performed in this manner can be played with the $_+$(ΔIII)$_0$ PDC and α SOP&PGTOP structure of Bb Ionian. (Figure 4.41)

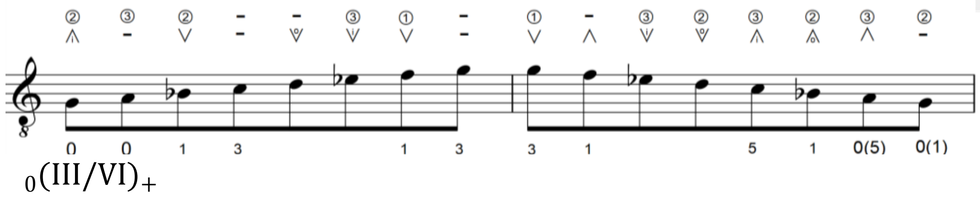


Figure 4.41 : Open string use on first and second degree in scale playing : Playing G Aeolian with open G and A strings in α-type PDC of B♭ Ionian.

When open strings are used in other degrees of the scale, the PDC remains the same with source scale even if the PGTOP changes. For example, playing C Ionian with the 2nd degree on the bottom open string does not change its PDC (Figure 4.42).

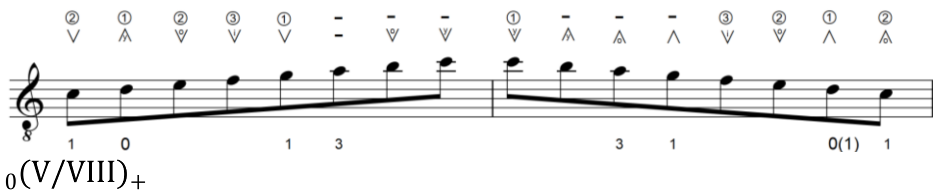


Figure 4.42 : Open string use on degrees other than tonic note : Playing C Ionian with open D string in its second degree.

All the characteristics of open string use above apply to the performance of all the scales in PVT. Even if pitches on the open string are outside the PDC position, open string notes make performance easier because it can be used with RH plucking. Additionally, open strings are frequently preferred by performers due to their rich sound. Open strings are particularly preferred as tonic notes in the adaptation of musical pieces with modal characters that require producing the pedal sound frequently. Scales that have 2 or 3 open strings note are preferred when adapting melodies to PVT. However, frequent plucking in PVT performance can make performance more difficult. This is why open strings are more frequently used in the melody with pull-off techniques.

4.4.2.2 Use of higher octave pitches in scale playing

Due to the *saz*'s limited fretboard (approximately 1.5 octaves for *saz model*), sometimes the frets that are in the lower pitches of the melody are replaced with their correspondents in the next higher octave in *saz* performance. This is commonly seen in the performance of the stereotypic melodies called *hayalleme* on the *saz*[111]. Another frequent use is inside PVT adaptations that are made in the urban culture[112].

The application range of the proposed PDCs, PGTOPs and SOPs in the previous section are between scales that have G♯3-G♯4 as the lowest pitch, and E4-E5 as the highest pitch. G3 scales can be played through scales that begin with the middle open string. Consequently, it is possible to state that all scales that can be played on the *saz model* are scales that begin in a chromatic tone between and including G3 and E4. Since pitches higher than E4 don't have higher-octave pitches on the *saz model*, the high pitch limits are scales that begin in this pitch.

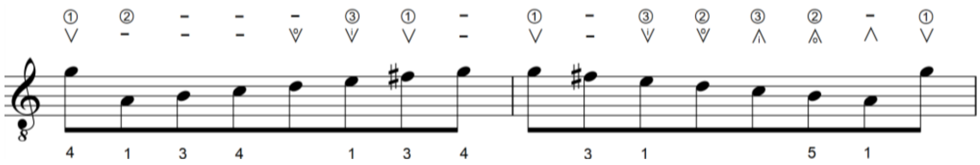
Playing other tones in PVT is possible by using the modal expansions of the scales. For example, when the lower pitches in the beginning of the scale are transferred to higher-octave pitches, modal expansions on the fretboard can be used to play the scale on the maps of neighbouring tones. PDCs that emerge in this situation will be the PDCs of the neighbouring modes of the scale. For example, when the first pitch of G Ionian scale is played in the higher octave on the bottom string instead of the

---

[111] For details, see Chapter 1.6.4.

[112] For details, see Chapter 2.2.2.

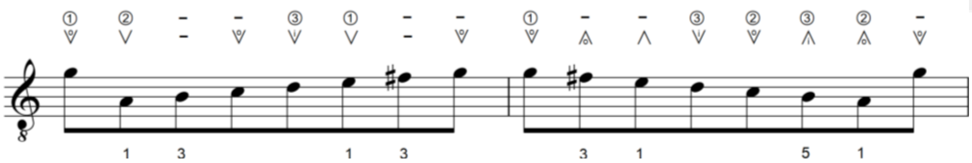
open string, the lowest pitch in performance will be the 2nd degree of the lowest pitch scale (Figure 4.43). This causes it to be played in the map of the neighbouring mode, just like when playing an open string.



$_0(\mathrm{II/VII})_0$

Figure 4.43 : Octave-up note use in scale playing : Playing G Ionian with octave-up G note in first degree in β-type PDC of A Dorian.

However, the β SOP&PGTOP structure that is recommended for A Dorian causes some problems here. The main reason is that the β SOP&PGTOP structure requires the first pitch to be played on the bottom string with the LH. This causes 4 successive $\boxed{\mathrm{L}}$ PGT categories, and complicates the performance. We recommend the uses that derive from the α SOP&PGTOP structure when playing scales with this type of octave-up. Thus, the PDC structure that emerges when the first note of G Ionian is played on the octave-up pitch has to be $_0(\Delta\mathrm{III})_0$ that emerges when playing Dorian in α (Figure 4.44).



$_0(\mathrm{II/V})_0$

Figure 4.44 : Playing G Ionian with octave up G note in first degree in α-type PDC of A Dorian.

When the first 2 pitches of G Ionian scale is played with octave-up note, it can be played with the map of the Phrygian, the neighbouring mode of the neighbouring mode. In this case, the SOP&PGTOP structure that is derived from the α SOP&PGTOP structure, and α-type PDCs have to be preferred again (Fig. 4.45).

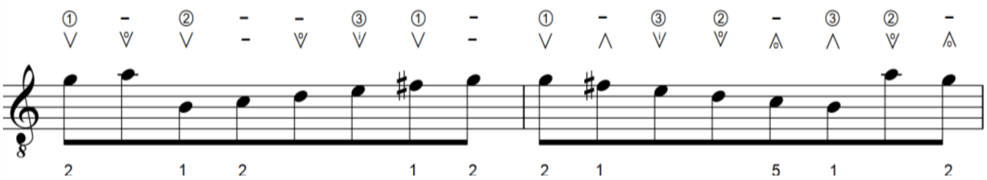


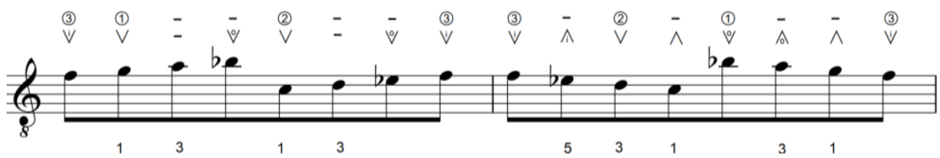
Figure 4.45 : Playing G Ionian with octave-up G note in first degree and octave-up A note in second degree in α-type PDC of B Phrygian

When the scope of this approach is expanded to include the maps of other modes and to other scales, we observe that all major scale and mode transformations are interrelated, and that this relationship arises according to the mode order of the major scale (See Table 4.33). Accordingly, a scale can be played on another map through the α-type PDCs in that map.

Table 4.33 : PDC types in scale playing with octave-up notes.

Scale Playing Style	**Ascending-Descending**	**The pitch of first degree is octaved up**	**The pitches of first two degrees are octaved up**	**The pitches of first three degrees are octaved up**	**The pitches of last three degrees are octaved down**	**The pitches of last two degrees are octaved down**	**The pitch of last degree is octaved down**
	α Ionian	α Dorian	α Phryg.	α Lydian	α Mixol.	α Aeol.	α Locr.
	β Dorian	α Phryg.	α Lydian	α Mixol.	α Aeol.	α Locr.	α Ionian
	β Phyrigian	α Lydian	α Mixol.	α Aeol.	α Locr.	α Ionian	α Dorian
PDCs of	α Lidyan	α Mixol.	α Aeol.	α Locr.	α Ionian	α Dorian	α Phryg.
	$\alpha^{7\text{-}L}$ Mixolydian	α Aeolian	α Locr.	α Ionian	α Dorian	α Phryg.	α Lydian
	β Aeolian	α Locrian	α Ionian	α Dorian	α Phryg.	α Lydian	α Mixol.
	β Locrian	α Ionian	α Dorian	α Phryg.	α Lydian	α Mixol.	α Aeol.

According to Table 4.33, for example the Dorian's α-type PDC "$_0(\Delta III)_0$" can be used to play the last 3 degrees of the Mixolydian scale with octave-downs (Figure 4.46)



$_0(V/VIII)_0$

Figure 4.46 : Playing F Mixolydian with three octave-down notes (C, D, E♭) in α-type PDC of C Dorian.

Thus, it is important for the performer to know all the modal expansions of a scale, and the PDC and SOP&PGTOPs that can be used in these expansions in order to play a scale in PVT. This is why even if the octave inversion of a scale does not constitute a "meaningful scale" in terms of tonal or modal melodic use; the PVT performer has to practice a scale in all possible maps on the fretboard.

4.4.2.3 Scale playing through the fretboard's range

The maps of the neighbouring mode can be used when playing a scale on a string instrument (Yeprem, 2013). For example, Yeprem (2013) shows the transition to the neighbouring mode's map in *classical guitar* performance as follows (Figure 4.47):

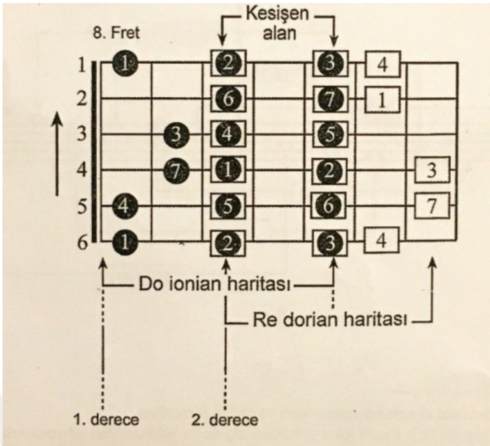


Figure 4.47 : Transition between Ionian and Dorian maps on *guitar* (Yeprem, 2013)[113].

This can be applied when playing the *saz* with a pick or with the TÇT, but is also possible through RH or LH glissandos in PVT (Figure 4.48).

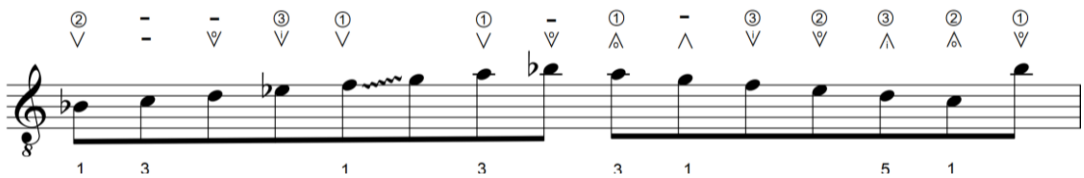
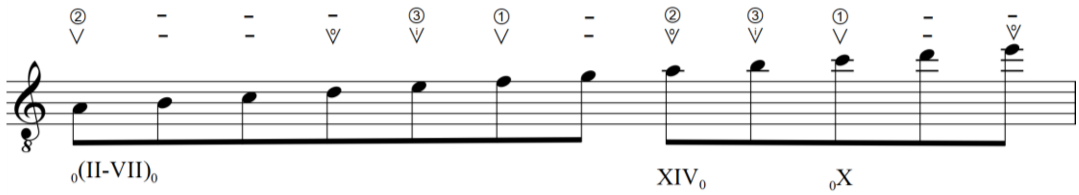


Figure 4.48 : Transition from Ionian to Dorian mode with glissando technique in PVT.

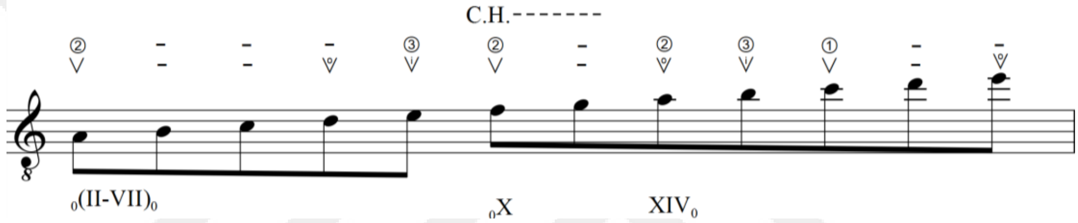
The performances of ascending or descending scales that are not possible to play in the maps of neighbouring modes without glissando, become possible when the performance transitions to the maps of distant modes. This situation requires transitions to distant positions and is performed by changing the position of one hand when the other is playing, then moving the first hand to the PDC position of the new map when the other is playing the notes in the new position.

[113] The meaning of Turkish words in this diagram :
Kesişen Alan : Intersecting area, Do Ionain Haritası : C Ionian map, Re Dorian Haritası : D Dorian map, 1. derece : First degree (of C Ionian), 2. derece : Second degree (of C Ionian)

The point at which the position will change depends on the performer's preferences. In *saz*s that don't have straps and require holding with the LH, this transition is usually played with the LH, while the RH can move to the new position (Figure 4.49-a). In *saz*s with straps, and hence don't have the *saz* holding problem, these transitions can be carried out in any manner. For example, the LH can be the hand that performs the first position change with a temporary cross-hands posture while the RH waits (Figure 4.49-b)



(a)



(b)

Figure 4.49 : Transition on A Ionian playing through the fretboard : (a) With common position (b) With cross-hands posture.

The table below shows the degrees of SOP&PGTOP patterns in which position changes are appropriate for heptatonic scales (Table 4.34).

Table 4.34 : Proposed position changing points for different SOP&PGTOP structures.

	Position changed hand	**α**	**$α^{7-L}$**	**$α^{3-L}$**	**β**	**$β^{3-3}$**
Proposed Position Changing Point	RH	After degree VI. or V.	After degree VII., VI or V.	After degree VI. or V.	After degree VII., VI or V.	After degree VII., VI or V.
	LH	After degree IV.or III.	After degree IV. or III.	After degree IV.	After degree V. or IV.	After degree V. or IV.

All these characteristics of position changes apply not only to the PVT performance of heptatonic scales, but all scales. The position changing point depends on the SOP&PGTOP structures used to play the scale. For example, in scales that contain many pitches in an octave such as the chromatic scale, position changing points are numerous since the same PGT categories are successively used, scales with fewer pitches such as pentatonic scales have fewer position changing points.

4.4.2.4 PDC trees of scales

All possible positions of a scale on the fretboard have to be known in order to map it on the fretboard. We already mentioned that knowing the PDC structures that emerge during the performance of a scale's modes is necessary. Another case that may arise in PVT is the placement of the left and right hands in map of neighbouring modes.

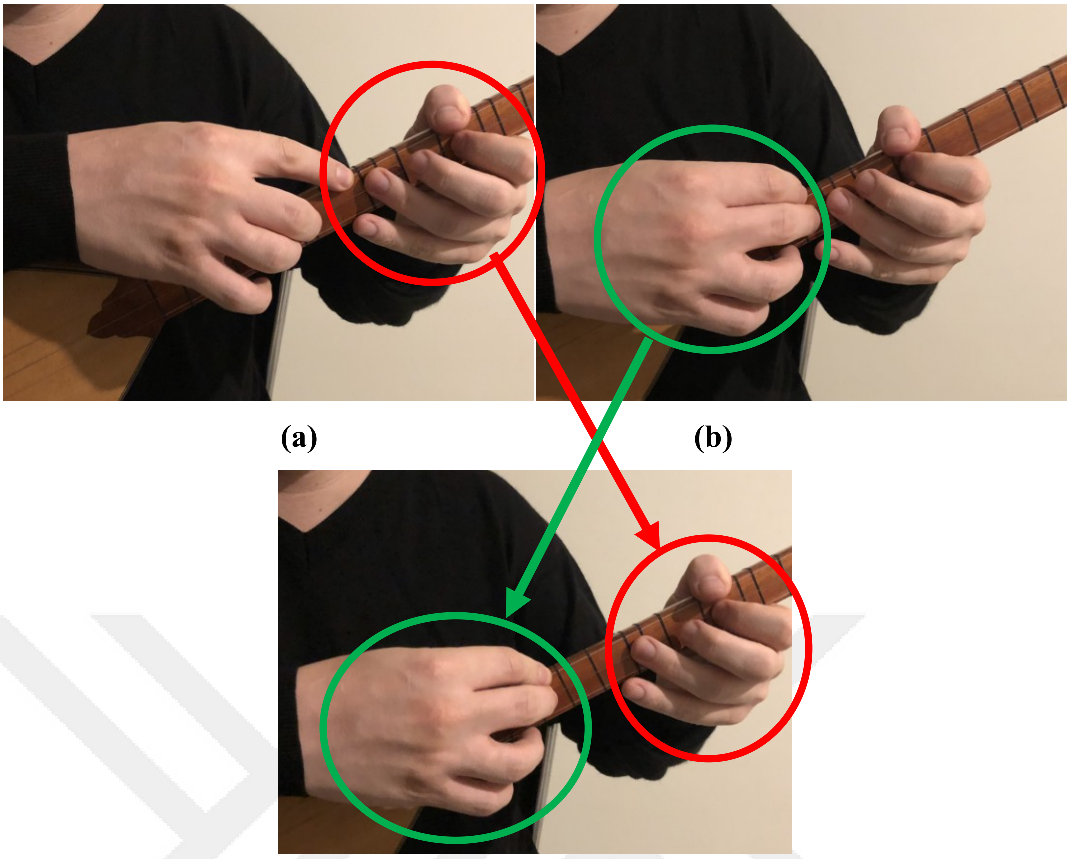
The PDC that emerges when the right hand and left hand are placed in positions of different modes of the scale becomes one of the PDC structures that emerge from the mapping of the scale and its modes on the fretboard. The whole of PDC structures that are formed by a scale and its modes on the fretboard will be called the PDC tree of that scale.

In Figure 4.50, The LH (Red circle in Figure 4.50-a) positioned in the α-type PDC to play C Ionian, and the RH (Green circle in Figure 4.50-b) positioned in the α-type PDC to play D Dorian constitute ${}_0(\Delta IV)_0$, a member of the PDC tree formed by major scales and their modes (See Figure 4.50-c).

This structure will be named α_1 because the distance between LH and RH structures is a distance of one neighbouring mode. As the right hand moves away from the left hand on the map, this structure will be transformed to structures such as $\alpha_2, \alpha_3, \alpha_4, \alpha_5$.

For example when the left hand is positioned in the α-type PDC structure to play C Ionian, if the right hand is in the α-type PDC structure of E Phrygian, they will have a "neighbour of neighbour mode" relationship, and this structure will be called α_2. The α_2-type PDC structure for the Ionian is ${}_0(\Delta VII)_0$ that is member of Ionian PDC tree. Thus, PDCs that can be played on the map established by the scale and its modes constitute that scale's PDC tree.

All melodic structures that can be performed with PVT on a scale are performed on this PDC tree.



(a) **(b)**

(c)

Figure 4.50 : Placement of hands on PDCs of different modes to build a PDC in PDC tree : (a) $_{+}(\Delta\mathrm{III})_{+}$: C Ionian α-PDC (b) $_{+}(\Delta\mathrm{III})_{0}$: D Dorian α-PDC, (c) $_{+}(\Delta\mathrm{IV})_{0}$: α_1-PDC of Ionian[114].

Table 4.35 presents the mapping of A Ionian, A Aeolian, and A Phrygian scales on α-type PDCs. The PDC tree can emerge in the positive or negative directions. For example in the performance of the A Phrygian in β in Table 4.35, the PDC that emerges when the right hand is positioned to play the 3th and 4th pitches of the Dorian scale can be called β_{-1}.

As the right hand comes near the left hand through the map and moves to a hands posture and moves farther away, these structures transform to β_{-2}, β_{-3}, β_{-4} , etc.

The position in which a melodic pattern will be played can be represented with the symbol of a PDC on the PDC tree such as α, α_1, α_{-1}, β_3, etc., instead of the PDC symbol. In this case, the encoding of the melodic pattern encompasses all the scales in which the structure can be played.

---

[114] Green circle shows right hand that is fixed on D Dorian α-type PDC and red circle shows left hand that is fixed on C Ionian α-type PDC.

Table 4.35 : The postures of PDC trees in different scales.

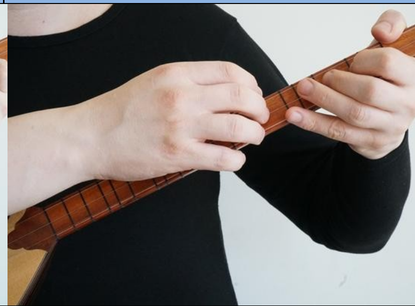
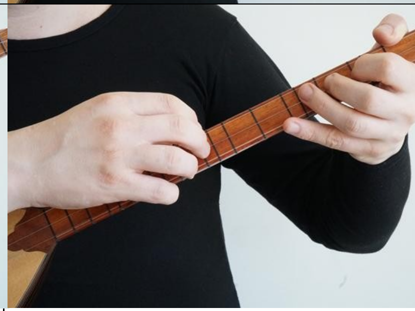
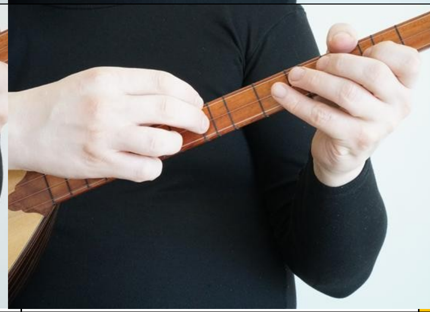
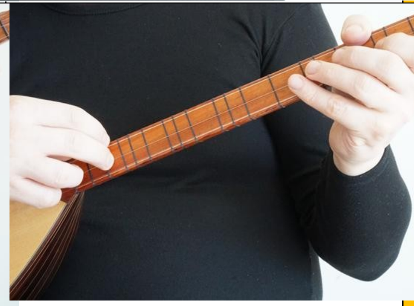
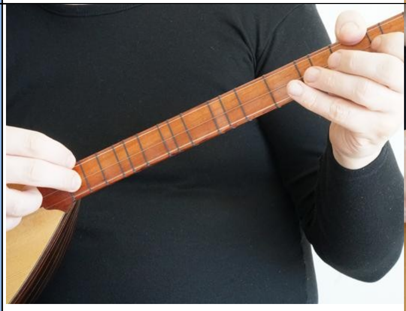
α PDC Trees	**A Ionian α**	**A Aeolian α**	**A Phrygian α**	**A Phrygian β**	**β** PDC Trees
α					**β_{-1}**
α_1					**β**
α_2					**β_1**

Table 4.35 (Cont.) : The postures of PDC trees in different scales.

α_3					β_2
α_4					β_3
α_5					β_4

For example, one of the performance styles of a DRMP expressed with the formula $[\Uparrow 1, \Downarrow 1, \Uparrow 3, (\Downarrow 4)] - [\Downarrow 1]$ can be represented with $\overbrace{\left\{ \begin{matrix} 1 \\ \mathrm{L} \end{matrix} \middle| \begin{matrix} 1 \\ \mathrm{L} \end{matrix} \middle| \begin{matrix} 1 \\ \mathrm{R} \end{matrix} \middle| \begin{matrix} 3 \\ \mathrm{R} \end{matrix} \right\}_{\mathrm{p}}^{\mathrm{s}}}^{\propto_1}$. Tables that show the scale degrees controlled by the LH and RH, and the possibilities of hammer-ons/pull-offs on the PDC tree of the structures α, $\alpha^{3\text{-}L}$,$\alpha^{7\text{-}L}$, β, $\beta^{3\text{-}3}$ are presented in Appendix J. All melodic performance alternatives in a scale are performed on these PDC structures.

4.4.3 *Complexity factor criteria* for TLMP

The melodic pattern is positioned in specific degrees of the scales and FTSs when applying TLMP. The degree differences between pitches are maintained when the pattern is transposed to a different degree. In non-symmetrical scales, degree differences create different intervals. Accordingly, PDC structures always changes. In conclusion, we can assume complexity factor of fingering use is more important than the first criterium of complexity factor of PGTOP selection when melodic pattern applied in different degrees of scales in TLMP[115].

The following table lists the intervals between the degrees of various heptatonic scales and FTSs (Table 4.36). For example when the ⇑ 3 movement, which is an ascending movement to the pitch in the third higher degree from any degree in a major scale, the resulting intervals are 5 or 6 semitones. Similarly, ⇓ 3 produces the same results. When this approach is applied to all the heptatonic scales and FTSs in the previous sections, different interval variations emerge. Possible degree step/skip/leaps for heptatonic scales and FTSs with the minimum and maximum interval between two degrees on any heptatonic scale or "fret tuning systems" for makams in our study can be determined with this approach.

The minimum and maximum intervals between two degrees of all the heptatonic scales and FTSs that are presented are listed in the last row of Table 4.36.

[115] Looped Melodic Patterns (LMPs) in TLMP presents an exception in this term.

Table 4.36 : Intervals between the degrees of heptatonic scales and FTSs[116].

	⇑1 or ⇓1	⇑2 or ⇓2	⇑3 or ⇓3	⇑4 or ⇓4	⇑5 or ⇓5	⇑6 or ⇓6	⇑7 or ⇓7
Major Scale	$1 \vee 2$	$3 \vee 4$	$5 \vee 6$	$6 \vee 7$	$8 \vee 9$	$10 \vee 11$	12
Melodic Minor	$1 \vee 2$	$3 \vee 4$	$4 \vee 5 \vee 6$	$6 \vee 7 \vee 8$	$8 \vee 9$	$10 \vee 11$	12
Harmonic Minor	$1 \vee 2 \vee 3$	$3 \vee 4$	$4 \vee 5 \vee 6$	$6 \vee 7 \vee 8$	$8 \vee 9$	$9 \vee 10 \vee 11$	12
Harmonic Major	$1 \vee 2 \vee 3$	$3 \vee 4$	$4 \vee 5 \vee 6$	$6 \vee 7 \vee 8$	$8 \vee 9$	$9 \vee 10 \vee 11$	12
Melodic Minor #4	$1 \vee 2 \vee 3$	$3 \vee 4$	$4 \vee 5 \vee 6$	$6 \vee 7 \vee 8$	$8 \vee 9$	$9 \vee 10 \vee 11$	12
FTS 1-a	$1,35 \vee 1,65 \vee 2$	$3 \vee 3,35 \vee 3,65 \vee 4$	$5 \vee 5,35 \vee 5,65$	$6 \vee 6,35 \vee 6,65$	$8 \vee 8,35 \vee 8,65 \vee 9$	$10 \vee 10,35 \vee 10,65$	12
FTS-1a$^{\natural 6}$	$1 \vee 1,35 \vee 1,65 \vee 2$	$3 \vee 3,35 \vee 3,65 \vee 4$	$5 \vee 5,35 \vee 5,65$	$6 \vee 6,35 \vee 6,65$	$8 \vee 8,35 \vee 8,65 \vee 9$	$10 \vee 10,35 \vee 10,65 \vee 11$	12
FTS 1-b	$1 \vee 1,35 \vee 1,65 \vee 2 \vee 3$	$2,35 \vee 3 \vee 3,65 \vee 4$	$4 \vee 5 \vee 5,35 \vee 5,65 \vee 6$	$6 \vee 6,35 \vee 6,65 \vee 7 \vee 8$	$8 \vee 8,35 \vee 9 \vee 9,65$	$9 \vee 10 \vee 10,35 \vee 10,65 \vee 11$	12
FTS-1b$^{\#6}$	$1 \vee 1,35 \vee 1,65 \vee 2 \vee 3$	$2,35 \vee 3 \vee 3,35 \vee 3,65 \vee 4 \vee 4,65$	$4 \vee 5 \vee 5,35 \vee 5,65 \vee 6$	$6 \vee 6,35 \vee 6,65 \vee 7 \vee 8$	$7,35 \vee 8 \vee 8,35 \vee 8,65 \vee 9 \vee 9,65$	$9 \vee 10 \vee 10,35 \vee 10,65 \vee 11$	12
FTS-1b$^{\flat 8}$	$1 \vee 1,35 \vee 1,65 \vee 2 \vee 3$	$2,35 \vee 2,65 \vee 3 \vee 4$	$4 \vee 4,65 \vee 5 \vee 5,35 \vee 6$	$5 \vee 5,65 \vee 6 \vee 6,35 \vee 7$	$8 \vee 8,35 \vee 9 \vee 9,65$	$9 \vee 10 \vee 10,35 \vee 10,65 \vee 11$	11
FTS 2-a	$1 \vee 2$	$3 \vee 4$	$5 \vee 6$	$6 \vee 7$	$8 \vee 9$	$10 \vee 11$	12
FTS-2a$^{\#6}$	$1 \vee 1,35 \vee 1,65 \vee 2$	$3 \vee 3,35 \vee 3,65 \vee 4$	$4,35 \vee 5 \vee 5,65 \vee 6$	$6 \vee 6,35 \vee 7 \vee 7,65$	$8 \vee 8,35 \vee 8,65 \vee 9$	$10 \vee 10,35 \vee 10,65 \vee 11$	12
FTS-2a$^{\flat 8}$	$1 \vee 2$	$2 \vee 3 \vee 4$	$4 \vee 5 \vee 6$	$5 \vee 6 \vee 7$	$8 \vee 9 \vee 10$	$9 \vee 10$	11
FTS 2-b	$1 \vee 2 \vee 3$	$2 \vee 3 \vee 4$	$4 \vee 5 \vee 6$	$6 \vee 7 \vee 8$	$8 \vee 9 \vee 10$	$9 \vee 10 \vee 11$	12
FTS 2-c	$1 \vee 1,35 \vee 1,65 \vee 2 \vee 3$	$2 \vee 3 \vee 3,35 \vee 3,65 \vee 4 \vee 4,35$	$4 \vee 4,65 \vee 5 \vee 5,35 \vee 5,65 \vee 6,35$	$5,65 \vee 6,35 \vee 6,65 \vee 7 \vee 7,35 \vee 8$	$7,65 \vee 8 \vee 8,35 \vee 8,65 \vee 9 \vee 10$	$9 \vee 10 \vee 10,35 \vee 10,65 \vee 11$	12
FTS 3a	$1 \vee 2 \vee 3$	$3 \vee 4$	$4 \vee 5 \vee 6$	$6 \vee 7 \vee 8$	$8 \vee 9$	$9 \vee 10 \vee 11$	12
FTS-3a$^{\#6}$	$1 \vee 1,35 \vee 1,65 \vee 2 \vee 3$	$3 \vee 3,35 \vee 3,65 \vee 4$	$4,35 \vee 4,65 \vee 5 \vee 6$	$6 \vee 7 \vee 7,35 \vee 7,65$	$8 \vee 8,35 \vee 8,65 \vee 9$	$9 \vee 10 \vee 10,35 \vee 10,65 \vee 11$	12
FTS-3a$^{\#6}$	$1 \vee 2 \vee 3$	$3 \vee 4$	$4 \vee 5 \vee 6$	$6 \vee 7 \vee 8$	$8 \vee 9$	$9 \vee 10 \vee 11$	12
FTS-3b	$1 \vee 2 \vee 3$	$2 \vee 3 \vee 4$	$4 \vee 5 \vee 6$	$6 \vee 7 \vee 8$	$8 \vee 9 \vee 10$	$9 \vee 10 \vee 11$	12
FTS-3c	$1 \vee 2 \vee 3$	$2 \vee 3 \vee 4$	$4 \vee 5 \vee 6$	$6 \vee 7 \vee 8$	$8 \vee 9 \vee 10$	$9 \vee 10 \vee 11$	12
All Scales	$1 \le x \le 3$	$2 \le x \le 4,35$	$4 \le x \le 6,35$	$5,65 \le x \le 8$	$7,65 \le x \le 10$	$9 \le x \le 11$	$11 \le x \le 12$

116 The symbol ∨ in the table is used for the term "or.". The values on last row presents all possible intervals on a certain degree steps/skips/leaps in all scales and FTSs that is listed. Values on every row represents not only possible amount of melodic leap of scales and FTSs also of their modes that carries same maximum/minimum interval relation with them.

As we mentioned before, the most restricted point in melodic movement of a SOP variation is hand span limitation that emerged in melodic movements of same PGT category (See Table 4.5). The information on last row of Table 4.36 can be used to calculate the SOP variations that can be applied to all heptatonic scales and FTSs based on intersection of range of x value with the range of hand span that we presented before in Table 4.7. The result of this process is presented in Table 4.37.

Table 4.37 : Maximum movements as degree steps/leaps in possible SOP&PGTOP variations in one PGT category[117].

LEFT HAND (L)				RIGHT HAND (R)			
PGTOP & SOP	**Max. Descend. Movement**	**Max. Ascend. Movement**	**Melodic Movement on Scale**	**PGTOP& SOP**	**Max. Descend. Movement**	**Max. Ascend. Movement**	**Melodic Movement on Scale**
$\begin{Bmatrix}2 & 3\\ L & L\end{Bmatrix}_{P}^{s}$	-2,35	6,35	0 ∨ ⇑ 1 ∨ ⇑ 2	$\begin{Bmatrix}2 & 3\\ R & R\end{Bmatrix}_{P}^{s}$	-1,35	3	0 ∨ ⇑ 1
$\begin{Bmatrix}3 & 2\\ L & L\end{Bmatrix}_{P}^{s}$	-6,35	2,35	0 ∨ ⇓ 1 ∨ ⇓ 2	$\begin{Bmatrix}3 & 2\\ R & R\end{Bmatrix}_{P}^{s}$	-3	1,35	0 ∨ ⇓ 1
$\begin{Bmatrix}3 & 1\\ L & L\end{Bmatrix}_{P}^{s}$	0,65	9,35	⇑ 1 ∨ ⇑ 2 ∨ ⇑ 3 ∨ ⇑ 4	$\begin{Bmatrix}3 & 1\\ R & R\end{Bmatrix}_{P}^{s}$	3,65	8,35	⇑ 3 ∨ ⇑ 4
$\begin{Bmatrix}1 & 3\\ L & L\end{Bmatrix}_{P}^{s}$	-9,35	-0,65	⇓ 1 ∨ ⇓ 2 ∨ ⇓ 3 ∨ ⇓ 4	$\begin{Bmatrix}1 & 3\\ R & R\end{Bmatrix}_{P}^{s}$	-8,35	-3,65	⇓ 3 ∨ ⇓ 4
$\begin{Bmatrix}2 & 1\\ L & L\end{Bmatrix}_{P}^{s}$	2,65	11,35	⇑ 3 ∨ ⇑ 4 ∨ ⇑ 5 ∨ ⇑ 6	$\begin{Bmatrix}2 & 1\\ R & R\end{Bmatrix}_{P}^{s}$	5,65	10,35	⇑ 4 ∨ ⇑ 5
$\begin{Bmatrix}1 & 2\\ L & L\end{Bmatrix}_{P}^{s}$	-11,35	-2,65	⇓ 3 ∨ ⇓ 4 ∨ ⇓ 5 ∨ ⇓ 6	$\begin{Bmatrix}1 & 2\\ R & R\end{Bmatrix}_{P}^{s}$	-10,35	-5,65	⇓ 4 ∨ ⇓ 5
$\begin{Bmatrix}1 & 1\\ L & L^{L}\end{Bmatrix}_{P}^{s}$ ∨ $\begin{Bmatrix}2 & 2\\ L & L^{L}\end{Bmatrix}_{P}^{s}$ ∨ $\begin{Bmatrix}3 & 3\\ L & L^{L}\end{Bmatrix}_{P}^{s}$	-4,35	-	⇓ 1 ∨ ⇓ 2	$\begin{Bmatrix}1 & 1\\ R & R^{R}\end{Bmatrix}_{P}^{s}$ ∨ $\begin{Bmatrix}2 & 2\\ R & R^{R}\end{Bmatrix}_{P}^{s}$ ∨ $\begin{Bmatrix}3 & 3\\ R & R^{R}\end{Bmatrix}_{P}^{s}$	-3,35	-	⇓ 1
$\begin{Bmatrix}1 & 1\\ L & L\end{Bmatrix}_{P}^{s}$ ∨ $\begin{Bmatrix}2 & 2\\ L & L\end{Bmatrix}_{P}^{s}$ ∨ $\begin{Bmatrix}3 & 3\\ L & L\end{Bmatrix}_{P}^{s}$	-	4,35	⇑ 1 ∨ ⇑ 2	$\begin{Bmatrix}1 & 1\\ R & R\end{Bmatrix}_{P}^{s}$ ∨ $\begin{Bmatrix}2 & 2\\ R & R\end{Bmatrix}_{P}^{s}$ ∨ $\begin{Bmatrix}3 & 3\\ R & R\end{Bmatrix}_{P}^{s}$	-	3,35	⇑ 1

[117] The symbol ∨ in the table is used for the term "or."

According to Table 4.37, the intervals that can be obtained when ascending with the $\left\{\begin{matrix}2\\ \mathrm{R}\end{matrix}\middle|\begin{matrix}1\\ \mathrm{R}\end{matrix}\right\}_{\mathrm{p}}^{\mathrm{s}}$ SOP&PGTOP structure are 10,35 semitones at maximum, and 5,65 semitones at minimum. Intervals for $\Uparrow 4$ in all the heptatonic scales in Table 4.39 are between 5,65 and 8 semitones, and 7,65 and 10 semitones for $\Uparrow 5$. These values are within the area covered by intervals that can be obtained when ascending with the $\left\{\begin{matrix}2\\ \mathrm{R}\end{matrix}\middle|\begin{matrix}1\\ \mathrm{R}\end{matrix}\right\}_{\mathrm{p}}^{\mathrm{s}}$ SOP&PGTOP structure. Accordingly, we can state that the $\left\{\begin{matrix}2\\ \mathrm{R}\end{matrix}\middle|\begin{matrix}1\\ \mathrm{R}\end{matrix}\right\}_{\mathrm{p}}^{\mathrm{s}}$ SOP&PGTOP structure can be used to perform $\Uparrow 4$ or $\Uparrow 5$ ascending melodic movements from any degree to any degree in all heptatonic scales and FTSs. The data in Table 4.37 is collected in this manner. As shown in Table 4.37, $\Uparrow 2$ or $\Downarrow 2$ melodic movements cannot be played with the right hand. Additionally, degree step/skip/leaps larger than 6 degrees cannot be performed with a single hand. Table 4.38 shows the fingering type combinations that will emerge in the LH and RH in different melodic movements in case the degree step/skip/leaps are performed with a single PGT category.

Table 4.38 : Fingering types of different melodic movements in TLMP.

PGTOP	SOPs on leap of steps of scales							Fingering Types
	0	$\Uparrow 1$	$\Uparrow 2$	$\Uparrow 3$	$\Uparrow 4$	$\Uparrow 5$	$\Uparrow 6$	
$\{\mathbf{L},\mathbf{L}\}_{\mathbf{p}}$	-	$\{\mathbf{1},\mathbf{1}\}^{\mathrm{s}}$ $\{\mathbf{2},\mathbf{2}\}^{\mathrm{s}}$	-	$\{\mathbf{2},\mathbf{1}\}^{\mathrm{s}}$	-	$\{\mathbf{2},\mathbf{1}\}^{\mathrm{s}}$	-	$\mathbf{L}(\mathbf{0})$
	-	$\{\mathbf{3},\mathbf{3}\}^{\mathrm{s}}$	-	-	$\{\mathbf{3},\mathbf{1}\}^{\mathrm{s}}$	-	-	$\mathbf{L}(\mathbf{i})$
	$\{\mathbf{2},\mathbf{3}\}^{\mathrm{s}}$ $\{\mathbf{3},\mathbf{2}\}^{\mathrm{s}}$	-	$\{\mathbf{3},\mathbf{1}\}^{\mathrm{s}}$	-	-	-	-	$\mathbf{L}(\mathbf{0}) \vee \mathbf{L}(\mathbf{i})$
	-	-	-	-	$\{\mathbf{2},\mathbf{1}\}^{\mathrm{s}}$	-	-	$\mathbf{L}(\mathbf{0}) \vee \mathbf{L}(\mathbf{ics})$
	-	$\{\mathbf{2},\mathbf{3}\}^{\mathrm{s}}$	$\{\mathbf{2},\mathbf{3}\}^{\mathrm{s}}$	$\{\mathbf{3},\mathbf{1}\}^{\mathrm{s}}$	-	-	-	$\mathbf{L}(\mathbf{i}) \vee \mathbf{L}(\mathbf{ics})$
	-	-	$\{\mathbf{1},\mathbf{1}\}^{\mathrm{s}}$ $\{\mathbf{2},\mathbf{2}\}^{\mathrm{s}}$	$\{\mathbf{2},\mathbf{3}\}^{\mathrm{s}}$	-	-	$\{\mathbf{2},\mathbf{1}\}^{\mathrm{s}}$	$\mathbf{L}(\mathbf{0}) \vee \mathbf{L}(\mathbf{ocs})$
	-	-	$\{\mathbf{3},\mathbf{3}\}^{\mathrm{s}}$		-	-	-	$\mathbf{L}(\mathbf{i}) \vee \mathbf{L}(\mathbf{ocs})$
$\{\mathbf{R},\mathbf{R}\}_{\mathbf{p}}$	-	$\{\mathbf{2},\mathbf{3}\}^{\mathrm{s}}$	-	$\{\mathbf{3},\mathbf{1}\}^{\mathrm{s}}$	$\{\mathbf{2},\mathbf{1}\}^{\mathrm{s}}$	-	-	$\mathbf{R}(\mathbf{0}) \vee \mathbf{R}(-) \vee \mathbf{R}(+)$
	$\{\mathbf{2},\mathbf{3}\}^{\mathrm{s}}$ $\{\mathbf{3},\mathbf{2}\}^{\mathrm{s}}$	-	-	-	$\{\mathbf{3},\mathbf{1}\}^{\mathrm{s}}$	$\{\mathbf{2},\mathbf{1}\}^{\mathrm{s}}$	-	$\mathbf{R}(+)$
	-	$\{\mathbf{1},\mathbf{1}\}^{\mathrm{s}}$ $\{\mathbf{2},\mathbf{2}\}^{\mathrm{s}}$ $\{\mathbf{3},\mathbf{3}\}^{\mathrm{s}}$	-	-	-	-	-	$\mathbf{R}(++)$

As shown in Table 4.38, melodic movements between degrees can be performed with multiple fingering types. At this point, we can build a table of priorities for fingering types that are established based on the *complexity factor criteria* in Chapter 4.2. Thus, we can determine the priority of fingering types for different degrees in TLMP. Based on Table 4.38, and the *complexity factor criteria* previously presented for TUMP, the *complexity factor criteria* of fingering use for TLMP in heptatonic scales and FTSs can be presented as follows (Table 4.39)

Table 4.39 : *Complexity factor criteria* of fingering use in degree step/skip/leaps of heptatonic scales and FTSs.

Step between degrees of scale	Priority of Left Hand Fingering Types	Priority of Right Hand Fingering Types
$\mathbf{0}$	$\mathrm{L(0)} \vee \mathrm{L(i)}$	$\mathrm{R(+)}$
$\Uparrow \mathbf{1} \vee \Downarrow \mathbf{1}$	$\mathrm{L(0)} > L(i) \vee L(ics)$	$\mathrm{R(0)} \vee \mathrm{R(+)} \vee \mathrm{R(-)} > R(++)$
$\Uparrow \mathbf{2} \vee \Downarrow \mathbf{2}$	$\mathrm{L(0)} \vee \mathrm{L(i)} > L(i) \vee L(ics) >$ $\mathrm{L(0)} \vee \mathrm{L(ocs)} > L(i) \vee L(ocs)$	-
$\Uparrow \mathbf{3} \vee \Downarrow \mathbf{3}$	$\mathrm{L(0)} > L(i) \vee L(ics) > L(0) \vee L(ocs)$	$\mathrm{R(0)} \vee \mathrm{R(+)} \vee \mathrm{R(-)}$
$\Uparrow \mathbf{4} \vee \Downarrow \mathbf{4}$	$\mathrm{L(0)} > L(0) \vee L(ics)$	$\mathrm{R(0)} \vee \mathrm{R(+)} \vee \mathrm{R(-)}$
$\Uparrow \mathbf{5} \vee \Downarrow \mathbf{5}$	$\mathrm{L(0)}$	$\mathrm{R(+)}$
$\Uparrow \mathbf{6} \vee \Downarrow \mathbf{6}$	$\mathrm{L(0)} \vee \mathrm{L(ocs)}$	-

For example, in a performance based on Table 4.39, when the melodic movements $\Uparrow 2 \vee \Downarrow 2$ are performed with the LH, $\{\mathbf{2}, \mathbf{3}\}^{\mathbf{s}}$ has to be preferred first, and the alternative $\{\mathbf{3}, \mathbf{1}\}^{\mathbf{s}}$ second. When this interval is performed with the LH on the same string, L(ocs) fingering types emerge between some degrees. In this case, the $\Uparrow 2 \vee \Downarrow 2$ movement on the same string is not preferred unless absolutely necessary. $\Uparrow 6 \vee \Downarrow 6$ movements are only possible in L(ocs), but are not preferred because it is difficult to produce sound in this fingering type using only hammer-ons.

In conclusion, the most suitable melodic movements for the LH fingering type in SOP&PGTOP structures in which successive $\boxed{\mathrm{L}}$ PGT categories are played are $0, \Uparrow 1, \Uparrow 2, \Uparrow 3, \Uparrow 4, \Uparrow 5$ and $0, \Downarrow 1, \Downarrow 2, \Downarrow 3, \Downarrow 4$ and $, \Downarrow 5$. Applying this to

SOP&PGTOP structures with successive $\boxed{R}$ PGT categories, the suitable melodic movements for the RH fingering type are $0, \Uparrow 1, \Uparrow 3, \Uparrow 4, \Uparrow 5$ and $0, \Downarrow 1, \Downarrow 3, \Downarrow 4, \Downarrow 5$. All the operations above are valid for heptatonic scales and FTSs. TLMP *complexity factor criteria* for pentatonic, hexatonic, and octatonic scales (which are outside the scope of this study) will be different than above. The operations specified above for these scales can be repeated to find their unique *complexity factor criteria* of fingering use.

4.4.4 *Looped melodic patterns* (LMP)

LMPs are commonly used in PVT to produce prolonging arpeggios, *ostinato*s and *riff*s. Figure 4.51 presents a possible LMP that can be produced with PVT.

Figure 4.51 : An example of LMP.

A looped melodic pattern can be played with a PDC on the PDC tree of its scale in PVT performance. Variations that can be played using a single PDC should be given priority among the emerging variations. The reason for this is that these variations don't require hand repositioning. However, the most important consideration in terms of LMP when selecting a variation is that variations that require pulling-off with the RH should be selected instead of hammering-on and silently lifting (silent pull-off) the pressing finger from the fretboard. This allows fluidity in the performance of looped melodic patterns. As a result, it can be assumed that the first criterium of *complexity factor criteria* for PGTOP selection is more prior than complexity factor of fingering use in LMP performance.

A performer can find a lot of methods to play the LMP in Figure 4.51. Some of these methods can be seen in Figure 4.52. Red circles that connected with a line in Figure 4.52 shows successive hammer-ons of one hand. The number of red line is equal to number of silent pull-offs.

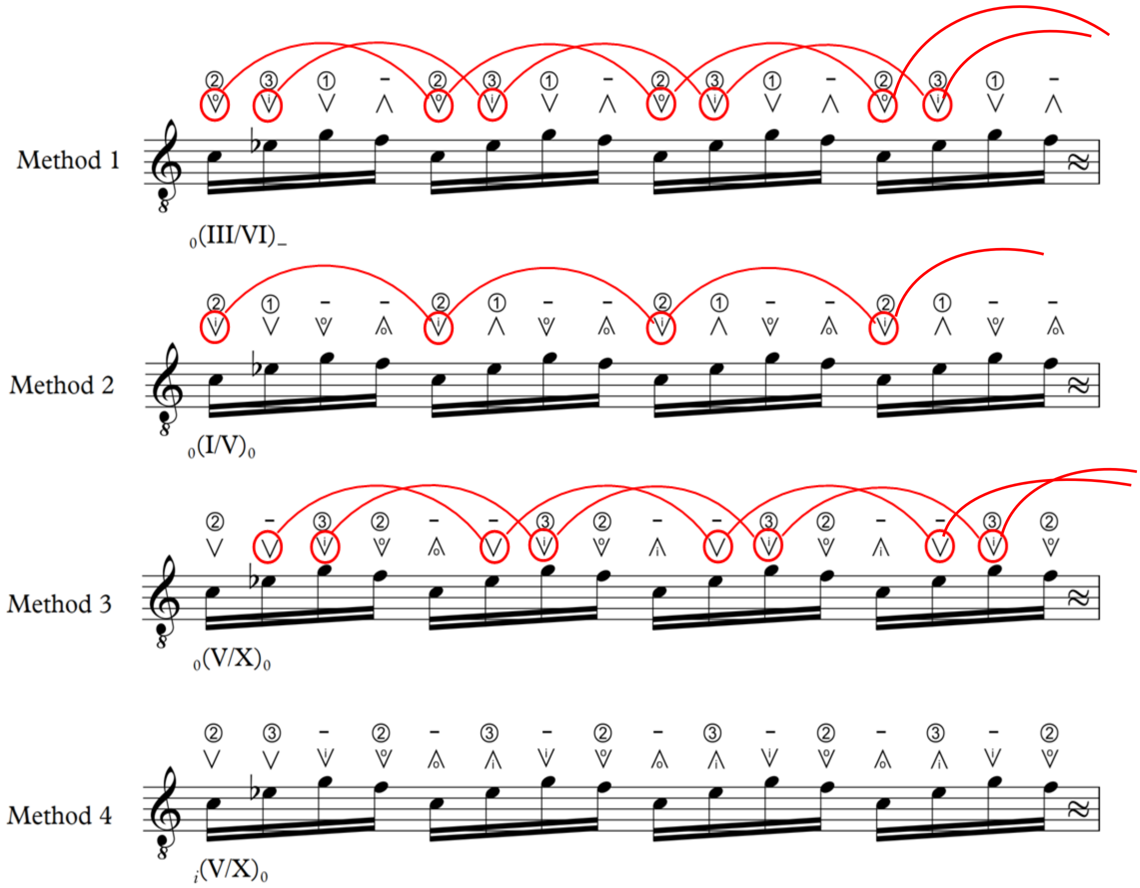


Figure 4.52 : Different methods that is used to play LMPs in Figure 4.51.

Table 4.40 presents SOP&PGTOP variations, PDCs and number of silent pull-offs that can be used to play the melodic pattern. When the *complexity factor criteria* of fingering use is applied here, methods can be ordered as "method 2 = method 3 > method 4 > method 1". So, method 2 and method 3 has best fingerings in terms of *complexity factor criteria* of fingering use. However, the best fluidity is obtained by applying method 4 although it contains L(i) fingering type. Accordingly, Method 4 has more advantage because of importance of fluidity in creating process of LMPs.

Table 4.40 : Properties of different methods in Figure 4.52.

Methods	SOP&PGTOP&PDC (for n loops)	PDC	Number of Silent pull-offs (for n loops)
Method 1	$n\,x\left\{\begin{matrix}2\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}3\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{L}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{L^L}\end{matrix}\right\}_{\mathrm{p}}^{\mathrm{s}}$	$_{\mathbf{0}}(\mathbf{\Delta III})_{-}$	$2\mathrm{x}(n-1)$
Method 2	$\left\{\begin{matrix}2\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{L}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{L^R}\end{matrix}\right\}_{\mathrm{p}}^{\mathrm{s}}+(n-1)x\left\{\begin{matrix}2\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{L^L}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{L^R}\end{matrix}\right\}_{\mathrm{p}}^{\mathrm{s}}$	$_{\mathbf{0}}(\mathbf{\Delta IV})_{\mathbf{0}}$	$(n-1)$
Method 3	$\left\{\begin{matrix}2\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{L}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{L^R}\end{matrix}\right\}_{\mathrm{p}}^{\mathrm{s}}+(n-1)x\left\{\begin{matrix}2\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{L^L}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}1\\ \mathrm{L^R}\end{matrix}\right\}_{\mathrm{p}}^{\mathrm{s}}$	$_{\mathbf{0}}(\mathbf{\Delta V})_{\mathbf{0}}$	$2\mathrm{x}(n-1)$
Method 4	$\left\{\begin{matrix}2\\ \mathrm{L}\end{matrix}\middle\vert\begin{matrix}3\\ \mathrm{L}\end{matrix}\middle\vert\begin{matrix}3\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}2\\ \mathrm{R}\end{matrix}\right\}_{\mathrm{p}}^{\mathrm{s}}+(n-1)x\left\{\begin{matrix}2\\ \mathrm{L^R}\end{matrix}\middle\vert\begin{matrix}3\\ \mathrm{L^R}\end{matrix}\middle\vert\begin{matrix}3\\ \mathrm{R}\end{matrix}\middle\vert\begin{matrix}2\\ \mathrm{R}\end{matrix}\right\}_{\mathrm{p}}^{\mathrm{s}}$	$_{i}(\mathbf{\Delta III})_{\mathbf{0}}$	0

4.4.5 *Directional melodic patterns* (DMPs)

As discussed in previous sections, scale playing is a kind of DMP. In this regard, the conditions that are specified in Chapter 4.4.2.3 for the performance of scale playing on the fretboard also apply to DMP performance. In other words, DMP's performance begins with a PDC in the PDC tree belonging to the scale that is played and moves along the fretboard using the modal expansions of this scale. Since the *saz*'s fretboard range is approximately one and a half octave, degree step/skip/leaps of more than two degrees are usually not suitable for DMP performance. Table 4.41 shows proposed PGTOP&SOPs for DMP in *saz* performance. These PGTOP&SOPs are proposed after applying *complexity factor criteria* of fingering use. So they are adaptable structures to all heptatonic scales and FTSs.

The table shows that α-type PDC that is suitable for all heptatonic scales can be used to play the DMP in its main scale. This structure can then be applied to a neighbouring mode of the main scale. This allows the pattern to be played along the fretboard. It is usually Mode 5 of scale which the α-type PDC is applied.

SOP&PGTOP structures for melodic patterns are shown in different colours in Table 4.41. The position change from the performance on the main scale's α-type PDC to the main scale's neighbouring mode happens after the same PGT category is played successively. The ordering of melodic patterns in Table 4.41 shows that this change can happen at the end of a certain melodic pattern, or in the middle of a melodic pattern.

LH fingering type in a-DMPs is L(0). LH thumb has to be used in d-DMPs that contain the second degree of the scale. Thus L(+) fingering type will emerge for ♭2, L(0) for ♮2, and L(-) for ♯2. However, the LH fingering type will be L(0) in d-DMP that doesn't contain the 2nd degree. Since the SOP&PGTOP structures in the table are of the α-type, the L(i) fingering type is not used.

Table 4.41 : Methods for *directional melodic patterns*.

a-DMPs	Proposed SOP&PGTOP Structures	d-DMPs	Proposed SOP&PGTOP Structures
[⇑1, (⇑2)]-[⇑3]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\L}+\substack{3\\R}\Big|\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{2\\R}\Big|\substack{3\\R}+\substack{1\\L}\Big|\substack{1\\R}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓1, (⇓2)]-[⇓3]	$\overbrace{\left\{\substack{1\\R}\Big|\substack{1\\L^R}+\substack{3\\R}\Big|\substack{2\\R}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}\Big|\substack{3\\R}+\substack{3\\L^R}\Big|\substack{2\\L}\right\}_p^s}^{\propto}$
[⇑2, (⇑1)]-[⇑3]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\R}+\substack{3\\R}\Big|\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{2\\R}\Big|\substack{1\\L}+\substack{1\\L}\Big|\substack{1\\R}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓2, (⇓1)]-[⇓3]	$\overbrace{\left\{\substack{1\\R}\Big|\substack{1\\L^R}+\substack{1\\L^L}\Big|\substack{2\\R}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}\Big|\substack{3\\R}+\substack{2\\R}\Big|\substack{2\\L^R}\right\}_p^s}^{\propto}$
[⇑2, (⇑2)]-[⇑4]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\R}+\substack{3\\R}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{2\\R}+\substack{1\\L}\Big|\substack{1\\R}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓2, (⇓2)]-[⇓4]	$\overbrace{\left\{\substack{1\\R}\Big|\substack{1\\L^R}+\substack{2\\R}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}+\substack{1\\R}\Big|\substack{1\\L^R}\right\}_p^s}^{\propto}$
[⇑2, ⇑1, (⇑1)]-[⇑4]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\R}\Big|\substack{3\\R}+\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{2\\R}\Big|\substack{3\\R}+\substack{1\\L}\Big|\substack{1\\R}\Big|\substack{1\\R}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓1, ⇓2, (⇓1)]-[⇓4]	$\overbrace{\left\{\substack{1\\R}\Big|\substack{1\\R^R}\Big|\substack{1\\R^R}+\substack{3\\R}\Big|\substack{2\\R}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}+\substack{3\\R}\Big|\substack{2\\R}\Big|\substack{2\\L}\right\}_p^s}^{\propto}$
[⇑1, ⇑2, (⇑1)]-[⇑4]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\L}\Big|\substack{3\\R}+\substack{1\\L}\Big|\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{3\\R}+\substack{1\\L}\Big|\substack{1\\L}\Big|\substack{1\\R}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓2, ⇓1, (⇓1)]-[⇓4]	$\overbrace{\left\{\substack{1\\R}\Big|\substack{1\\L^R}\Big|\substack{1\\L^R}+\substack{3\\R}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}\Big|\substack{1\\L^L}+\substack{3\\R}\Big|\substack{2\\L}\Big|\substack{2\\L^L}\right\}_p^s}^{\propto}$
[⇑1, ⇑1, (⇑2)]-[⇑4]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\L}\Big|\substack{2\\R}+\substack{1\\L}\Big|\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{3\\R}+\substack{1\\L}\Big|\substack{1\\L}\Big|\substack{1\\R}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓1, ⇓1, (⇓2)]-[⇓4]	$\overbrace{\left\{\substack{1\\R}\Big|\substack{1\\L^R}\Big|\substack{1\\L^R}+\substack{3\\R}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}\Big|\substack{1\\L^L}+\substack{2\\R}\Big|\substack{2\\L^R}\Big|\substack{2\\L^L}\right\}_p^s}^{\propto}$
[⇑1, ⇑1, ⇑2, (⇑1)]-[⇑5]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\L}\Big|\substack{2\\R}\Big|\substack{3\\R}+\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{2\\R}\Big|\substack{3\\R}\Big|\substack{1\\L}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓1, ⇓1, ⇓1, (⇓2)]-[⇓5]	$\overbrace{\left\{\substack{1\\R}\Big|\substack{3\\L^R}\Big|\substack{2\\L^L}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}+\substack{3\\R}\Big|\substack{2\\R}\Big|\substack{2\\L^R}\Big|\substack{2\\L^L}\right\}_p^s}^{\propto}$
[⇑2, ⇑1, ⇑1, (⇑1)]-[⇑5]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\R}\Big|\substack{3\\R}\Big|\substack{1\\L}+\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{3\\R}\Big|\substack{1\\L}\Big|\substack{1\\L}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓1, ⇓1, ⇓2, (⇓1)]-[⇓5]	$\overbrace{\left\{\substack{1\\L}\Big|\substack{1\\L^L}\Big|\substack{3\\R}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}+\substack{1\\L^L}\Big|\substack{3\\R}\Big|\substack{2\\R}\Big|\substack{2\\L^R}\right\}_p^s}^{\propto}$
[⇑1, ⇑2, ⇑1, (⇑1)]-[⇑5]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\L}\Big|\substack{3\\R}\Big|\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{2\\R}\Big|\substack{3\\R}\Big|\substack{1\\L}\Big|\substack{1\\R}\right\}_p^s}^{\propto@\text{Mode 4}}$	[⇓1, ⇓2, ⇓1, (⇓1)]-[⇓5]	$\overbrace{\left\{\substack{1\\R}\Big|\substack{1\\L^R}\Big|\substack{3\\R}\Big|\substack{2\\R}\right\}_p^s}^{\propto@\text{Mode 4}}+\overbrace{\left\{\substack{1\\L}\Big|\substack{3\\R}\Big|\substack{3\\L^R}\Big|\substack{2\\L}\right\}_p^s}^{\propto}$
[⇑1, ⇑1, ⇑2, (⇑1)]-[⇑5]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\L}\Big|\substack{1\\R}\Big|\substack{1\\L}+\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{2\\R}\Big|\substack{3\\R}\Big|\substack{1\\L}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓2, ⇓1, ⇓1, (⇓2)]-[⇓5]	$\overbrace{\left\{\substack{1\\L}\Big|\substack{3\\R}\Big|\substack{2\\R}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}+\substack{1\\L^L}\Big|\substack{3\\R}\Big|\substack{3\\L^R}\Big|\substack{2\\L}\right\}_p^s}^{\propto_{-1}}$
[⇑2, ⇑2, ⇑1, (⇑1)]-[⇑6]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\R}\Big|\substack{1\\L}\Big|\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{2\\R}\Big|\substack{1\\L}\Big|\substack{1\\R}\Big|\substack{1\\R}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓1, ⇓2, ⇓2, (⇓1)]-[⇓6]	$\overbrace{\left\{\substack{1\\R}\Big|\substack{1\\R^R}\Big|\substack{1\\L^R}\Big|\substack{2\\R}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}\Big|\substack{1\\L^L}\Big|\substack{2\\R}\Big|\substack{2\\L^R}\right\}_p^s}^{\propto}$
[⇑2, ⇑1, ⇑2, (⇑1)]-[⇑6]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\R}\Big|\substack{3\\R}\Big|\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{2\\R}\Big|\substack{1\\L}\Big|\substack{1\\L}\Big|\substack{1\\R}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓2, ⇓1, ⇓2, (⇓1)]-[⇓6]	$\overbrace{\left\{\substack{1\\R}\Big|\substack{1\\L^R}\Big|\substack{1\\L^L}\Big|\substack{2\\R}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}\Big|\substack{3\\R}\Big|\substack{2\\R}\Big|\substack{2\\L^R}\right\}_p^s}^{\propto}$
[⇑1, ⇑2, ⇑2, (⇑1)]-[⇑6]	$\overbrace{\left\{\substack{2\\L}\Big|\substack{2\\L}\Big|\substack{3\\R}\Big|\substack{1\\L}\right\}_p^s}^{\propto}+\overbrace{\left\{\substack{2\\R}\Big|\substack{3\\R}\Big|\substack{1\\L}\Big|\substack{1\\R}\right\}_p^s}^{\propto@\text{Mode 5}}$	[⇓2, ⇓2, ⇓1, (⇓1)]-[⇓6]	$\overbrace{\left\{\substack{1\\R}\Big|\substack{1\\L^R}\Big|\substack{3\\R}\Big|\substack{2\\R}\right\}_p^s}^{\propto@\text{Mode 5}}+\overbrace{\left\{\substack{1\\L}\Big|\substack{3\\R}\Big|\substack{3\\L^R}\Big|\substack{2\\L}\right\}_p^s}^{\propto}$

4.4.6 *Directional repeating melodic patterns* (DRMPs)

DRMPs can be performed using 2 different strategies.

1- Changing the PDC structures and maintaining the PGTOP&SOP structure

2- Changing the SOP&PGTOP structure and maintaining the PDC structure.

These two strategies can be used on their own, and the combination of two strategies can be used to generate many performance methods. Some of these methods with which some DRMPs that arise with different degree step/skip/leaps are presented in Appendix K.

4.4.6.1 Strategy 1 : Fixed SOP&PGTOP structures

According to this strategy, a SOP&PGTOP in which DRMP is performed with a *pattern interval* can be preserved and transferred to other degrees. In this case the SOP&PGTOP structure is fixed, however the PDC structures vary according to intervals between the scale's degrees.

Pattern units that are played with fixed SOP&PGTOP structures will be named RPU (Repeating Pattern Units) in this study. These structures move in a single direction (ascending or descending).

Repeating pattern unit **(RPU)**

Complexity factor criteria specified for TLMP in Chapter 4.4.4 have to be considered in the formation of RPUs. This is because a SOP&PGTOP structure designed based on these criteria will be suitable for all kinds of heptatonic scales. Accordingly, in case the same PGT category arises in succession in the SOP&PGTOP structure that is specified in the RPU's performance, these structures have to be performed preferably using the degree step/skip/leaps in Chapter 4.4.4.

For example, the first degree step/skip/leap for a RPU that is played with the PGTOP $\{L, L, R, R\}^p$ may be one of $\Uparrow \mathbf{1}, \Uparrow \mathbf{2}, \Uparrow \mathbf{3}, \Uparrow \mathbf{4}, \Uparrow \mathbf{5}$ or $\Downarrow \mathbf{1}, \Downarrow \mathbf{2}, \Downarrow \mathbf{3}, \Downarrow \mathbf{4}, \Downarrow \mathbf{5}$. The reason is that the first two pitches in the first degree step/skip/leap are performed with the $\boxed{L}$ PGT category. The PGT category changes during the second melodic movement. The third pitch of the pattern is performed with the $\boxed{R}$ PGT category. Thus, this movement can be performed with any degree step/skip/leap. The only factor limiting performance in this melodic movement is the melodic range of the *saz*. The PGT category does not change in the movement between the third and fourth pitches of the pattern. Both pitches are performed with the $\boxed{\mathrm{R}}$ PGT category. Thus, jumps that create suitable fingering types for the RH such as **⇑ 1, ⇑ 3, ⇑ 4, ⇑ 5** or **⇓ 1, ⇓ 3, ⇓ 4, ⇓ 5** degree step/skip/leaps should be preferred in this melodic movement. The fourth pitch and the first pitch of the RPU that is built upon the next degree are in different PGT categories. This is why the pattern interval can be any value within the *saz*'s melodic range for this PGTOP (Figure 4.53).

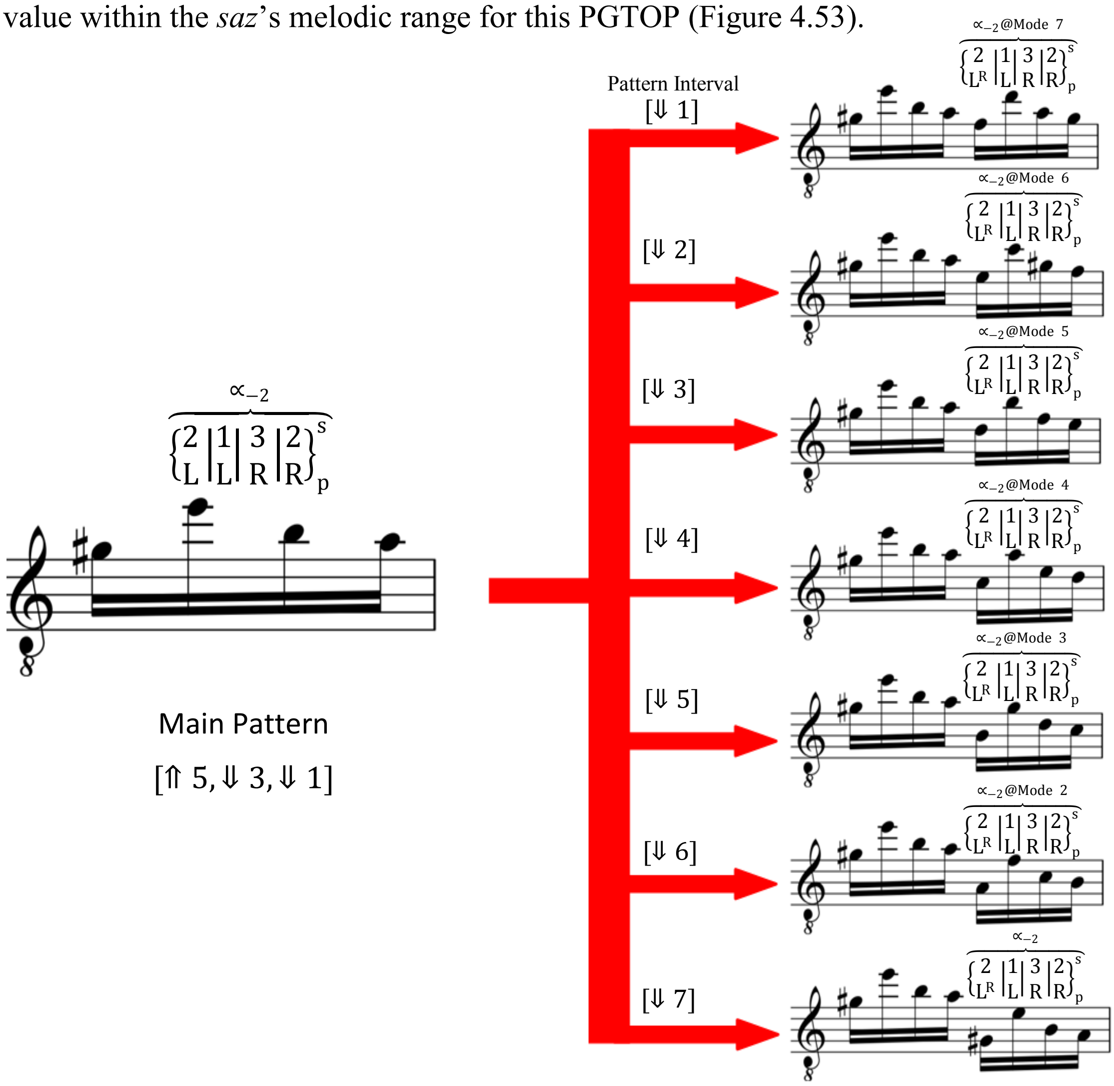


Figure 4.53 : [⇑ 5, ⇓ 3, ⇓ 1] Melodic pattern playing on G♯ altered harmonic Scale with different pattern interval values.

However, when performing a PGTOP such as $\{\mathrm{L,R,R,L}\}^p$, the *pattern interval* is performed with two PGTs in the $\boxed{\mathrm{L}}$ PGT category. Thus, *pattern interval* has to have degree step/skip/leaps that are suitable for the LH. Figure 4.54 shows successive playing in single PDC category of $\{\mathrm{L,R,R,L}\}^p$. These points create hand span limitation.

$$\{L, \overbrace{R, R}^{\boxed{R}}, \underbrace{L + L}_{\boxed{L}}, \overbrace{R, R}^{\boxed{R}}, \underbrace{L + L}_{\boxed{L}}, \overbrace{R, R}^{\boxed{R}}, \underbrace{L + L}_{\boxed{L}}, \overbrace{R, R}^{\boxed{R}}, \underbrace{L + L}_{\boxed{L}}, \overbrace{R, R}^{\boxed{R}}, L\}^{p}$$

Figure 4.54 : Movements with hand span limitation in $\{L, R, R, L\}^{p}$.

As seen in these examples, suitable RPU alternatives can be obtained for any DRMP for which the formulation is given. For example, in a DRMP represented with the formula $[\Downarrow \mathbf{2}, \Uparrow \mathbf{6}, \Downarrow \mathbf{5}\ (\Uparrow \mathbf{2})] - [\Uparrow \mathbf{1}]$, the melodic movements $\Uparrow \mathbf{2}$, $\Downarrow \mathbf{2}$ and $\Uparrow \mathbf{6}$ cannot be performed with the RH only. Additionally, the melodic movement $\Uparrow \mathbf{6}$ cannot be performed with the LH only. In this case, this movement requires a PGT category change. The melodic movements $\Uparrow \mathbf{2}$ and $\Downarrow \mathbf{2}$ are only performed with the LH, or the pitches in this degree step/skip/leap are played with different hands. According to the data, the potential RPU-SOP&PGTOP structures for the DRMP given above can be the following: $\left\{{1 \atop L}\middle|{3 \atop L}\middle|{1 \atop R}\middle|{2 \atop R}\right\}_p^s$, $\left\{{3 \atop L}\middle|{2 \atop L}\middle|{1 \atop R}\middle|{2 \atop R}\right\}_p^s$, $\left\{{3 \atop R}\middle|{3 \atop L}\middle|{1 \atop R}\middle|{3 \atop L}\right\}_p^s$, $\left\{{2 \atop R}\middle|{2 \atop L}\middle|{1 \atop R}\middle|{2 \atop L}\right\}_p^s$, $\left\{{2 \atop R}\middle|{2 \atop L}\middle|{1 \atop R}\middle|{3 \atop L}\right\}_p^s$. All of these structures are compatible with the elements above.

While it is not always possible to play RPU along the whole fretboard by using a single SOP&PGTOP structure, this is possible for some DRMPs. For example a melodic pattern formulated as [$\Uparrow \mathbf{2}$, $\Uparrow \mathbf{1}$, $\Uparrow \mathbf{3}$ ($\Downarrow \mathbf{4}$)]-[$\Uparrow \mathbf{1}$] can be played on the fretboard using the SOP&PGTOP&PDC structure $\overbrace{\left\{{2 \atop L}\middle|{3 \atop L}\middle|{3 \atop R}\middle|{1 \atop R}\right\}_p^s}^{\propto}$. In this structure, the hand position is placed over the α-PDC structure of the scale and its modes (Figure 4.55).

Figure 4.55 : Playing [$\Uparrow$ 2 , $\Uparrow$ 1, $\Uparrow$ 3 ($\Downarrow$ 4)]-[$\Uparrow$ 1] in A Phrygian via single RPU[118].

This playing method is formulated as $RPU \times n$ in this study. The number n represents the number of repetitions of the melodic pattern within the melodic range.

---

[118] Dotted line shows application range of the RPU.

It may vary depending on the type of the scale that is played, and the tone on which the scale is built. To play a melodic pattern with only one RPU is possible (See Appendix K: Table K.23, Method 1).

The PDC may change in the middle of the melodic pattern in some RPUs. For example, a melodic pattern with the formula $[\Uparrow \mathbf{3}, \Downarrow \mathbf{2}, \Uparrow \mathbf{7}\ (\Downarrow \mathbf{7})]$ **-**$[\Uparrow \mathbf{1}]$ can be played on the fretboard with the SOP&PGTOP structure $\left\{\overbrace{\begin{matrix}2\\ \mathrm{L}\end{matrix}\middle|\begin{matrix}3\\ \mathrm{R}\end{matrix}\middle|\begin{matrix}3\\ \mathrm{L^R}\end{matrix}}^{\propto}\middle|\overbrace{\begin{matrix}1\\ \mathrm{R}\end{matrix}}^{\propto_1}\right\}_{p}^{s}$. The following figure shows the application of this structure on FTS-3a on the stave (Figure 4.56). On $\Uparrow \mathbf{6}$, the 3rd melodic movement of the melodic pattern transforms from α to α_1. However, this applies to a single note in this example, and the PDC transforms to α when the other melodic pattern is played. This type of RPUs can be used in different performance methods for playing melodic patterns (See Appendix K: Table K.11 Method 4, Table K.13 Method 3, Table K.19, Method 2, Method 3, Method 4 and Method 5, Table K.21, Method 1 and Method 2; Table K.23, Method 1; Table K.25, Method 1 and Method 2; Table K.27, Method 1 and Method 2)

Figure 4.56 : Playing $[\Uparrow \mathbf{3}, \Downarrow \mathbf{2}, \Uparrow \mathbf{7}\ (\Downarrow \mathbf{7})]$ **-**$[\Uparrow \mathbf{1}]$ in A FTS-3a via single RPU[119].

In some cases a RPU can involve two or more melodic pattern (See Appendix K: Table K.8 RPU_4; Table K.10 RPU_2, Table K.26 RPU_3).

Initial pattern unit **(IPU)**

The first (initial) pattern that begins the performance frequently has different SOP&PGTOP structures than the RPU (See Appendix K: Table K.3 Method 4, Table K.13 Method 3, Table K.17 Method 1, Method 3 and Method 5, Table K.21 Method 1 and Method 2; Table K.23 Method 1; Table K.25 Method 1 and Method 2; Table

[119] Dotted line shows application range of the RPU.

K.27 Method 1 and Method 2, Table K.31 Method 1). In this case, playing the RPU after the *initial pattern unit* (IPU) is another performance method. Figure 4.57 shows the performance of [$\Uparrow \mathbf{6}, \Downarrow \mathbf{2}, \Downarrow \mathbf{2}$ ($\Downarrow \mathbf{1}$)]-[$\Uparrow \mathbf{1}$] on the Lydian scale.

$IPU = \overbrace{\left\{\begin{matrix}2\\L\end{matrix}\middle|\begin{matrix}1\\R\end{matrix}\middle|\begin{matrix}1\\L^R\end{matrix}\middle|\begin{matrix}2\\R\end{matrix}\right\}_p^s}^{\propto}$ $RPU = \overbrace{\left\{\begin{matrix}2\\L^R\end{matrix}\middle|\begin{matrix}1\\R\end{matrix}\middle|\begin{matrix}1\\L^R\end{matrix}\middle|\begin{matrix}2\\R\end{matrix}\right\}_p^s}^{\bar{\bar{\propto}}}$ ....

Figure 4.57 : Playing [$\Uparrow \mathbf{6}, \Downarrow \mathbf{2}, \Downarrow \mathbf{2}$ ($\Downarrow \mathbf{1}$)]-[$\Uparrow \mathbf{1}$] on the A Lydian scale with IPU and RPUs[120].

As observed in Figure 4.57, the PGTOP&SOP&PDC structure of the IPU that is applied is $\overbrace{\left\{\begin{matrix}2\\L\end{matrix}\middle|\begin{matrix}1\\R\end{matrix}\middle|\begin{matrix}1\\L^R\end{matrix}\middle|\begin{matrix}2\\R\end{matrix}\right\}_p^s}^{\propto}$. Since the Lydian $\propto$ PDC structure is $_{+}(\Delta\mathrm{IV})_0$, the performance begins with this PDC. The SOP&PGTOP structure for the RPU that comes after the IPU is $\overbrace{\left\{\begin{matrix}2\\L^R\end{matrix}\middle|\begin{matrix}1\\R\end{matrix}\middle|\begin{matrix}1\\L^R\end{matrix}\middle|\begin{matrix}2\\R\end{matrix}\right\}_p^s}^{\bar{\bar{\propto}}}$. Since the PGT category changes between each pitch in this structure, the PDCs are variable. This means that the LH and RH don't have to change positions in each pattern change. Instead, they can be placed in suitable degrees in the hand span. When the hand span limits are exceeded the position can be changed. Since these characteristics are the performer's initiative, the PDC symbol is represented as variable. This situation is showed with double-line over α-sign ($\bar{\bar{\alpha}}$). The $\bar{\bar{\alpha}}$ sign represents possible α-PDC tree variations on performance. An example performance for this SOP&PGTOP structure can be represented on the stave as follows (Figure 4.58).

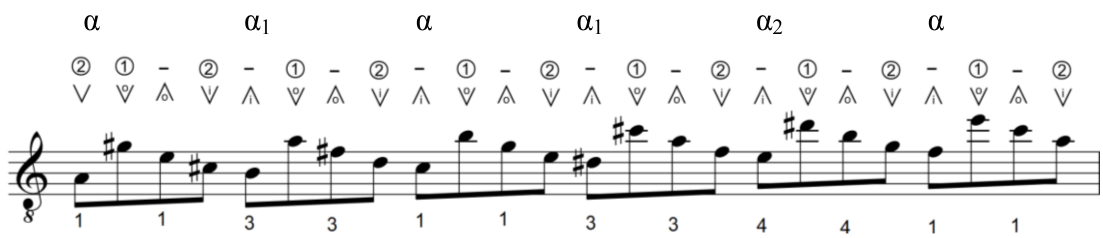


Figure 4.58 : Possible melodic pattern performance of $\bar{\bar{\alpha}}$-type PDC.

---

[120] Dotted line shows application range of RPU.

Final pattern unit (FPU)

Sometimes in DRMP performance, the last pattern can be different than the RPU. The main reason for this is the fact that the final pattern of the DRMP performance cannot be played with the RPU's SOP placement. Patterns that finalize this type of performance will be named *final pattern unit* (FPU) in this study.

One of the methods provided in Appendix K.5 for the DRMPs with the formula $[\Uparrow \mathbf{6}, \Downarrow \mathbf{2}, \Downarrow \mathbf{2}\ (\Downarrow \mathbf{1})]$-$[\Uparrow \mathbf{1}]$ in the above example is $RPU_2 \times n + FPU$. The performance on A Lydian with the structure $RPU_2 \times n + FPU$ can be represented on the stave and SOP&PGTOP structures for RPU_2 and FPU are as follows (Figure 4.59).

$$RPU_2 = \left\{ \begin{matrix}2\\R\end{matrix} \Big| \overbrace{\begin{matrix}1\\L\end{matrix} \Big| \begin{matrix}3\\L\end{matrix}}^{\propto_{-4}} \Big| \overbrace{\begin{matrix}3\\R^L\end{matrix}}^{\propto_{-3}} \right\}_p^s \qquad FPU = \overbrace{\left\{ \begin{matrix}2\\L\end{matrix} \Big| \begin{matrix}1\\R\end{matrix} \Big| \begin{matrix}1\\L^R\end{matrix} \Big| \begin{matrix}2\\R\end{matrix} \right\}}^{\propto}{}_p^s$$

Figure 4.59 : Playing $[\Uparrow \mathbf{6}, \Downarrow \mathbf{2}, \Downarrow \mathbf{2}\ (\Downarrow \mathbf{1})]$-$[\Uparrow \mathbf{1}]$ on the A Lydian scale with RPUs and FPU[121].

Since it is not possible to play two successive pitches on the top string in the performance of the DRMP's final pattern in the CH posture, a different SOP&PGTOP structure is used.

Successive playing of different RPUs

One method of DRMP performance is using two RPUs successively. Accordingly, after the first RPU (RPU_1) is repeated for a certain number of times, the second RPU (RPU_2) is played (See Appendix K: Table K.23 Method 2, Table K.25 Method 1 and Method 2, Table K.27 Method 1 and Method 2). Sometimes three RPU for a certain number of times can be played (See Appendix K: Table K.33 Method 2)

Figure 4.60 shows the notation of the performance of the melodic pattern that can be represented with the formula $[\Uparrow \mathbf{1}, \Uparrow \mathbf{2}, \Uparrow \mathbf{3}\ (\Downarrow \mathbf{5})]$-$[\Uparrow \mathbf{1}]$ on A harmonic minor mode 4. This shows that two RPUs were used in DRMP performance. The formula

---

[121] Dotted line shows application range of the RPU.

for this method is $RPU_1 \times n_1 + RPU_2 \times n_2$. The numbers n_1 and n_2 vary depending on the performer. The performance noted in the figure is but one of the performances with this method. Variation of performances with different n_1 and n_2 values are shown in the Figure 4.60. n_2 values can be maximum 2 in this example because of its SOP structure limits it with the range of first string.

$$\mathrm{RPU}_1 = \overbrace{\left\{\begin{array}{c|c|c|c}2&2&3&1\\ \mathrm{L}&\mathrm{L}&\mathrm{R}&\mathrm{R}\end{array}\right\}_{\mathrm{p}}^{s}}^{\propto-\text{type PDC}} \quad \mathrm{RPU}_2 = \overbrace{\left\{\begin{array}{c|c|c|c}1&1&3&1\\ \mathrm{L}&\mathrm{L}&\mathrm{R}&\mathrm{R}\end{array}\right\}_{\mathrm{p}}^{s}}^{\propto-\text{type PDC}}$$

Variant No.	**n_1**	**n_2**	**Formula**
V.1	5	1	$RPU_1 \times 5 + RPU_2 \times 1$
V.2	4	2	$RPU_1 \times 4 + RPU_2 \times 2$

V.1	RPU_1	RPU_1	RPU_1	RPU_1	RPU_1	RPU_2
V.2	RPU_1	RPU_1	RPU_1	RPU_1	RPU_2	RPU_2

Figure 4.60 : Playing [⇑ **1** , ⇑ **2**, ⇑ **3** (⇓ **5**)]-[⇑ **1**] on the A harmonic minor scale with $RPU_1 \times n_1 + RPU_2 \times n_2$ performance method variations.

Transitional pattern unit **(TPU)**

Transitional pattern unit (TPU) is generally used between two RPUs (See Appendix K: Table K.25 Method 1 and Method 2; Table K.27 Method 1 and Method 2, Table K.31 Method 1 and Method 2, Table K.33 Method 1). TPU helps performer to change position of hands between RPU's. So, its structure is mostly made of part of RPUs that it tied. It generally contain one pattern, but it is also possible to see a TPU with more than one pattern.

4.4.6.2 Strategy 2 : fixed PDC structure (f-PDC)

The second strategy that is used to perform a DRMP is playing with a PDC from the PDC tree of the DRMP's scale. SOP&PGTOP structures are changed in performance, while maintaining this PDC structure. Suitable SOP&PGTOP structures can be determined according to the *complexity factor criteria* defined for the TLMP. The

SOP&PGTOP structures that allow fixing the PDC during performance are represented with the label *f*-PDC.

An α-PDC that allows playing all heptatonic scales can play a maximum of 8 pitches of a scale. Thus, more than one PDC has to be used for the DRMP's performance with strategy-2 according to the position of the initial pitch on the keyboard, and the direction of the DRMP

For example, a DRMP represented with the formula [⇑ **3**, (⇓ **2**)]-**[⇑1]** in the A Phrygian scale is shown on the stave as follows (Figure 4.61).

Figure 4.61 : [⇑ **3**, (⇓ **2**)]-**[⇑1]** in the A Phrygian scale through fretboard range.

Methods that contain different strategies in which this DRMP can be played with *f*-PDC are shown in Appendix K. Table K.4. One of the methods that are shown prescribes playing the DRMP on the whole fretboard by using only the fixed PDC strategy The SOP&PGTOP structure for the *f*-PDC strategy specified here is as follows :

$$\textbf{\textit{f-PDC}}=\overbrace{\left\{\substack{2\\L}\Big|\substack{3\\R}+\substack{3\\L^R}\Big|\substack{1\\R}+\substack{2\\R}\Big|\substack{1\\L}+\substack{3\\R}\Big|\substack{1\\R}+\substack{1\\L^L}\Big|\substack{1\\R}\right\}_p^s}^{\propto}$$

Patterns in the *f*-PDC are shown in different colors. This colors accent different SOP&PGTOP structures in *f*-PDC and these structures can be represented with colored ordinal numbers. Accordingly, this shows that the DRMP above can be played a maximum of 5 times with the SOP&PGTOP that preserves the α-type PDC structure in any scale. However, the DRMP in the scale in Figure 4.62 is repeated 9 times.

The method suggested for [⇑ **3**, (⇓ **2**)]-**[⇑1]** in Appendix 2, Table K.3 Method 1 is as follows:

$$"\boldsymbol{fPDC}\ (1,2,3,4)+\boldsymbol{fPDC}\ (1,2,3,4,5)@\boldsymbol{Mode5}"$$

This method prescribes repeating the DRMP 4 times with first four patterns of *f*-PDC on the α-type PDC of the main scale, and then playing the DRMP 5 times with *f*-PDC on the α-type PDC of the 5th mode of the main scale (Figure 4.62).

$$f\text{-}PDC=\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L}\Big|\genfrac{}{}{0pt}{}{3}{R}+\genfrac{}{}{0pt}{}{3}{L^{R}}\Big|\genfrac{}{}{0pt}{}{1}{R}+\genfrac{}{}{0pt}{}{2}{R}\Big|\genfrac{}{}{0pt}{}{1}{L}+\genfrac{}{}{0pt}{}{3}{R}\Big|\genfrac{}{}{0pt}{}{1}{R}+\genfrac{}{}{0pt}{}{1}{L^{L}}\Big|\genfrac{}{}{0pt}{}{1}{R}\right\}_{p}^{s}}^{\propto}$$

Figure 4.62 : Playing [⇑ **3**, (⇓ **2**)]-[⇑**1**] in the A Phrygian scale with single $\boldsymbol{f-PDC}$.

The formula for this method is calculated based on the maximum repetitions of the DRMP on the *saz model*. The DRMP can be played until the limits of the fretboard are reached with the formula prescribed in the method in the formula, in cases when less DRMPs are played than the maximum number of DRMPs, using the SOP&PGTOP structures in the method. Based on this, it is possible to state that the tones that can be applied in performances that only use strategy-2 are limited. Other examples can be seen in Appendix K: Table K.3. Method 1; Table K.9. Method 1 and Method 2; Table K.15. Method 1; Table K.29. Method 1.

4.4.6.3 Combination of strategy 1 and strategy 2

Since playing only with the *f*-PDC strategy minimizes position changes, it is advantageous, but it is disadvantageous since the tones it applies to are limited. This is why using strategy 1 and strategy 2 in combination can allow performing DRMPs with a more suitable method.

As in the example of the figure 4.62, two *f*-PDCs played in a directly connected manner are rare. There is frequently a transitional pattern unit (TPU) between two *f*-PDCs. TPUs are most frequently used in situations when one of the hands changes position (See Appendix K: Table K.1 Method 1 and Method 2; Table K.3 Method 2; Table K.5 Method 1; Table K.7 Method 1; Table K.11 Method 1 and Method 2, Table K.13 Method 1; Table K.17 Method 1; Table K.19 Method 4, Table K.29 Method 3).

Figure 4.63 shows the notation of the performance of the melodic pattern that can be represented with the formula [⇑ **2**, (⇓ **1**)]-[⇑ **1**] on A Phrygian scale. As shown here, due to the TPU shown with a red line a transition can be made to the PDC structure of the second *f*-PDC.

$$f\text{-}PDC=\overbrace{\left\{\overset{2}{L}\Big|\overset{2}{R}+\overset{2}{L^R}\Big|\overset{3}{R}+\overset{2}{R}\Big|\overset{1}{L}+\overset{3}{R}\Big|\overset{1}{L}+\overset{1}{L^L}\Big|\overset{1}{R}+\overset{1}{L^R}\Big|\overset{1}{R}\right\}_p^s}^{\propto} \qquad TPU=\overbrace{\left\{\overset{1}{L^L}\Big|\overset{2}{R}\right\}}^{\propto_4}$$

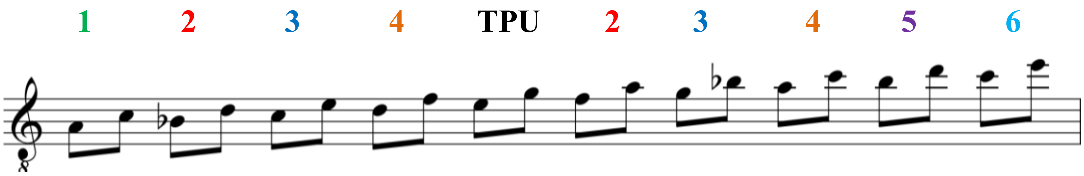


Figure 4.63 : Playing [⇑ **2**, (⇓ **1**)]-[⇑ **1**] on A Phrygian scale with f-PDCs and a TPU between f-PDCs.

In some case, *f*-PDC structure can use with RPUs (See Appendix K- Table K.1 Method 3 and Method 4, Table K.3 Method 3, Method 4 and Method 5, Table K.5 Method 2 and Method 4, Table K.11 Method 2, Method 3, Method 4 and Method 5, Table K.9 Method 3 and Method 4,Table K.11 Method 3 and Method 4 , Table K.13 Method 2 and Method 4 ,Table K.15 Method 2, Method 3 and Method 4, Table K.17 Method 2 and Method 4, Table K.19 Method 2 and Method 3, Table K.29 Method 2 and Method 3). Figure 4.64 represents A Phrygian Scale playing with using Appendix K. Table K.1 Method 3.

$$f\text{-}PDC=\overbrace{\left\{\overset{2}{L}\Big|\overset{2}{R}+\overset{2}{L^R}\Big|\overset{3}{R}+\overset{2}{R}\Big|\overset{1}{L}+\overset{3}{R}\Big|\overset{1}{L}+\overset{1}{L^L}\Big|\overset{1}{R}+\overset{1}{L^R}\Big|\overset{1}{R}\right\}_p^s}^{\propto} \qquad RPU=\overbrace{\left\{\overset{1}{L^R}\Big|\overset{1}{R}\right\}_p^s}^{\propto}$$

Figure 4.64 : Playing [⇑ **2**, (⇓ **1**)]-[⇑ **1**] on A Phrygian scale with f-PDCs and RPUs.

Moreover, in performances that use *f*-PDC structures, initial patterns (See Appendix-K : Table K.3 Method 4; Table K.5 Method 3; Table K.13 Method 3; Table K.17 Method 3 and Method 5; Table K.5 Method 2 and Method 4,) can be used.

5. CONCLUSION AND RECOMMENDATIONS

The technical details, observations and findings obtained through the theoretical, technical and performance aspects of the thesis study "Methods for Creating Melodic Patterns with *Parmak Vurma* Technique on the *Saz* (*Bağlama*)" led to the following conclusions.

- There are two main views on the origins of *bağlama*. "The origins of the *saz* reach to the Ancient Anatolian Civilizations" and "*Saz* arrived into Anatolia with the migration of the Turkish people from Central Asia." While there are many sources for these two views that are repeated in almost all thesis studies concerning the *saz*, this study emphasizes a synthesis that suggests that both views can be correct according to Lawergren's (2004) study based on historical facts.
- While the term *bağlama* is used in the urban environment and especially in the academia, the colloquial use for this instrument is more frequently *saz*.
- *Saz* culture in Turkey was affected by political, ideological, technological and commercial effects due to the socio-political conditions that arose after the declaration of Republic in Turkey. In this regard, the morphology, string order, string materials, fretting systems and performance styles of the *saz* changed over time. The main effect was the gradual replacement of pickless playing techniques with pick playing, and the increased use of picking patterns.
- The traditional fretting system of the *saz* went through various processes in time, and the number of frets on the *saz* changed in time and space. However, the contemporary *saz* fretting system with "seventeen non-equal intervals in an octave" was standardized.
- Institutional structures and the music market led to the emergence of new performance styles. In conclusion, today there are many different approaches to playing *saz*. While segregating terms and approaches such as "radioist," "marketist," "long-neckist," "short-neckist," "pickist," "tappist," "arabeskist"

"electricist," "deyişist" and "bozlakist" that were historically used are partly still in use among *saz* performers, another approach that considers all these approaches valuable (unless they further corrupt the culture) is gaining traction, particularly among musicians who perform music in terms of "Artistic Folk Music."

- *Saz* playing styles can be categorised as pickless and pick playing techniques. In pickless playing, there are 3 sub-categories: *pençe* (strumming) technique (PT), *tel çekme* (string pulling) (TÇT) technique, and *parmak vurma* (two-hand finger tapping) technique.
- *Parmak vurma* technique is a unique sound generation technique that is uniquely used when playing *boğaz havası* on the Teke Yörük Türkmen communities' traditional *saz*s called *üçtelli*. The tuning system of *üçtelli* is tuned to *bağlama düzeni* in PVT performance. The right hand always presses the fret corresponding to the perfect fifth higher of the open string in the traditional performance of the *parmak vurma* technique. Usually, the right hand's index and middle fingers are used.
- *Boğaz hava*sı are also frequently played with the *tel çekme* technique (TÇT). It is possible that PVT was born when the RH began to be used instead of the LH position that is used to play fourth and fifth intervals (which are frequently used) and causes the LH to spread wide (6 chromatic columns).
- The transfer of *parmak vurma* technique to the urban culture and its evolution in it accelerated recently. PVT attracted attention due to small examples provided by local artists who are familiar with the urban culture (Ahmet Yamacı, Hamit Çine, Talip Özkan), and spread out to wide audiences due to the interest of eastern *saz* masters who have an advanced *saz* culture, and who have a large following (Erol Parlak, Hasret Gültekin, Arif Sağ, Erdal Erzincan).
- In this period, Erol Parlak completed his proficiency in art thesis on pickless *saz* playing styles in Anatolia. This study revealed that pickless *saz* playing technique has had a deep root in tradition and it is the original and ancient technique of *saz*, how it has nearly forgotten, it is current situation of that time. In this study, Parlak investigated all pickless playing tecniques of Anatolia and Central Asia. In result, he developed a unique transcription

signage system to symbolize all of pickless playing techniques and he developed a unique polyphonic notation understanding for it.

- Parlak published 3 method works (2000, 2005, 2010) that focused only pickless playing techniques including PVT. New generation of performers including us learned the technique from these works.
- In artistic area, the technique was developed to an advanced state, and especially the "first generation" artists Erol Parlak and Erdal Erzincan's works were influential and definitive. Works outside the Teke Region's repertoire were adapted to PVT in this period. RH use was not limited to a single fret and widened to encompass all frets on the fretboard. As a result, a new melody arrangement approach that combined different approaches in the adaptation to PVT emerged. Moreover, the technique began to be used to produce harmonies such as arpeggios and chords, and this technique was used in *türkü* arrangements for arpeggios. These novel practices that developed in the urban music, combined with the "folk music that can produce its own polyphony on its own instruments" approach and the development of the "channel-based recording" technology (and its applications in album productions) caused a revolutionary step in folk music production. *Guitar* or *piano/keyboard* accompaniments were gradually replaced by pickless playing techniques in album recordings. The fact that PVT can effectively produce harmonic lines through arpeggios allowed it to play an important role in the process. As a result, simple accompaniments evolved to serious compositions, and almost all the colours of *saz* were used with a different logic in composition. Intros, hooks and bridges specific to *türkü*s were created, and vertical and horizontal harmonies began to be used in türkü arrangements. PVT was used for harmonic lines, in addition to melodic lines in this process. As a result of its compositional use allowed the development of new timbres that were non-existent in the traditional use of *saz*, and the instrument reached a new level. Training methods on the technique and the fact that first private training centres and then conservatories taught the technique allowed continuity, and a new generation that learned the technique from sources emerged. The approach of rendering tunes polyphonic through PVT that was developed by the first generation was also adopted by the next generations.

- "Second generation" artists mostly taught by the "first generation" arose and the technique was further developed in this period. This period saw the use of harmonies with the melody, performance of other musical pieces apart from the *türkü* repertoire, the usage of unconventional tones in PVT performance, the use of different tuning systems, using both fretboards on double-necked *saz*s, or the development of new techniques such as percussive techniques, and improvisation on twelve tones.
- *Saz* bands such as Erol Parlak *Bağlama* Quintet, Bengi *Bağlama* Group Dörttelli *Bağlama* Group, Erdal Erzincan *Bağlama* Orchestra, and Bandura used PVT in their arrangements.
- Some transcription systems were developed for the notation of PVT. Additionally, different performers adopted different notational approaches.
- Specially levelled *saz*s called *şelpe sazı* were manufactured to effectively play PVT.
- One of the major problems encountered by performers after PVT was applied to larger *saz*s is the "*saz* holding problem." The body of the *saz* in pick-playing is fixed between the inside of the right forearm and the belly of the performer. Thus, the LH doesn't have to hold the neck during position changes and remains comfortable. However in PVT, the RH doesn't hold the *saz*, and the fretboard is carried completely by the LH. While this is not a problem in the performance of *boğaz havası*s performed on the small-sized üçtelli *bağlama* where RH fingers only tap on one fret, it is a serious problem for performers who use larger *saz*s and need a more advanced level of performance.
- We designed different double-necked *saz*s that combine *bam saz* with 3 *bam* strings and *şelpe saz* to create a wider range for especially pickless *saz* playing techniques with different luthiers (Aslan Türkmen, Hacı Akpınar, Süleyman Aslan). These instruments are actively used today by us and other *saz* performers. These instruments has a back of body similar to a *guitar* body and this allowed the neck-strap and playing the while standing up. This improvement solved "*saz* holding problem" for PVT performance.
- To specify the position of left hand and right-hand fingers precisely, a high-resolution "Position& Fingering Symbolization System" had to be developed.

Symbols in this system specify the frets that can be potentially pressed by RH and LH fingers, and thus the melodic opportunities of the position.

- The reference finger that is necessary for the position symbol should be the index finger, which has anatomic and positional advantages compared to other fingers. This applies to both the right and the left hand. Position is defined as chromatic column number that reference fingers are pressed or aligned.
- Contemporary *saz* fretting contains two type chromatic columns as divided (D) and undivided (U). Divided chromatic columns contain a microtonal fret.
- "Short Necked *Saz*" contains 14 chromatic columns. PVT performers generally use "short necked *saz*" with order of chromatic columns in one octave of one string as following order from lowest fret to highest one: UDUDUUDUDUDU.
- There are 14 different positions for 14 chromatic columns. There are also 3 negative positions for left hand, theoretically. One of negative position is actively used while others are hypothetic. In result, a *saz* with 14 chromatic columns can be played in 15 position.
- The terminology that describes fretboard range can be used with chromatic column numbers. It will bring precise definition instead of some traditional unscientific terms.
- Based on this approach, the term "14 *saz* (14'lük *saz* in Turkish)," short for "with 14 chromatic columns" instead of the term "short-necked *saz*," Accordingly, the terms "14-*saz*," "12-*saz*," and "15-*saz*" will be used to refer to short-necked *saz* variations "C-cut *saz*," "D-cut *saz*," and "B-cut *saz*," respectively. Thus, the *saz* type known as "long-necked *saz*" has to be identified with "17-*saz*." Since these terms are used to refer to the neck length, the names of the members of the *saz* family and their body dimensions can be used in conjunction. For example, terms such as "40 body 15-tanbura," "45 body 17-divan *saz*," "30 body 14-cura" can be generated using this terminology.
- Arrowed accidentals can be used for microtonal frets instead of with the approach of "indicating the amount of *koma* with numbers above the

accidentals". This allows a better connection between these frets and equally-tempered frets.

- Microtonal frets are moveable and it is generally used by PVT performers between 30-40 cents lower than equally tempered fret in contemporary *saz* fretting system.
- The left hand and right hand are positioned differently in PVT. The left hand grips the fretboard from below with a supination movement, while the LH thumb wraps it from above. This allows the fingers to be placed on different frets. Unlike the left hand, the right hand is positioned in its mid-range position. In conclusion, the LH fingers are positioned horizontally on the fretboard, while RH fingers are positioned vertically in PVT performance. This situation allows both hands to have different performance characteristics, and different capacities for different conditions during the performance
- In traditional and contemporary PVT, the LH generally controls the left side of the fretboard, while the RH generally controls the right side. Although sometimes the LH fingers press the same frets as the RH fingers, the basic position is maintained. The abilities of LH and RH on performance are different because of their natural positions. This is why a cross-hands posture, in which the LH and RH substitute places in PVT performance, is sometimes seen in some performances. In cross-hands posture, LH is responsible for upper notes of strings.
- In the neutral posture of the left hand, fingers are placed on the fretboard in a manner that covers 4 chromatic columns. This fingering type is named as L(0) and the middle finger and the thumb are placed on the same chromatic column. Cases in which these two fingers are positioned over different columns are shown with different symbols.
- Left hand fingers perform abduction and adduction movements and create many different fingering types. These fingering types that can be individually symbolized are classified in two groups. These include fingering types that widen the hand span and allow reaching frets that are farther away [L(ocs)], and fingering types that emerge when a finger moves to chromatic columns that it doesn't control during the performance for any reason [L(ics)].

- 12 different scores are examined to detect proportion of use of fingering types in pickless playing techniques. The average using rates of fingering types in PVT is similar with the average using rates of fingering types in all scores is similar values. PVT fingerings don't show tidy deviation.
- The most frequently used fingering types in PVT performances are the L(0) and R(0) fingering types that emerge when the left and right hands are in their characteristic postures.
- The left hand fingering types in PVT parts of 12 scores are L(0), L(i), L(+), L(-). Also some of L(ics) fingering types are seen in PVT performance. These are L(i)&L(-4), L(+)&L(-4), L(-)&L(-1), L(+)&L(+2m), L(i)&L(+2m) L(+)&L(-1,-4). L(ics) fingering types with LH thumb are used with combination of different thumb variations. They are not used in their L(0) thumb variation. The passages played with L(ics) fingering types actually can be played by L(0), L(i), L(+) or L(-) fingering, however performers prefers L(ics) fingering types to obtain more comfortable performance.
- Fingering types that are created through abduction only is not observed among the PVT pieces written for L(ocs) fingering that we examined. It is evident that these relatively difficult fingering types are not preferred by performers. We believe that this is mainly due to the diminished pressure force of the hand that is spread in L(ocs) fingering types, since the pressure force is especially important in PVT, which is based on generating sound by tapping and pulling the strings with fingers.
- The examination of the existing PVT notes reveals that characteristic RH fingering R(0) is the most frequently used fingering type in PVT. R(+) fingering type is seen secondary fingering type for RH. R(-) and R(++) fingering types are rarely seen. R(++) fingering types are generally used during applying hammer-on and pull-off in one string, respectively or vice versa.
- The Position & Fingering Symbolization System in this study can be used for PVT notation. This system allows the performer to decode the notation without using the left hand finger numbers in the notation. It also provides a connection between hand shapes and melodic palette for performers, which is very important factor for improvisation.

- Sound generating techniques that are used in the *parmak vurma* technique, and that are abbreviated as PGT in this study, consist of RH hammer-on, LH hammer-on, RH pull-off, LH pull-off, Glissando and LH plucking. Additionally, techniques that don't belong to PVT such as RH plucking, *pençe* techniques, percussive techniques, etc. can be used in combination with PVT. PGTs can be categorized in 3 groups (L, R and 0), according to the sound generation source (LH, RH or Open String). Limitations that emerge when the PGT category changes or remains the same when performing the melody differ. This is why the order in which a category will be used in performance is important. Limitations that emerge based on whether the PGT category changes or remains the same in melody performance are determined.
- 3 different structures emerge in the PVT performance of melodic patterns. One category of structure is the *Position difference class* (PDC) structures that specify the position difference between the right and left hands, and the LH and RH fingering positions. A performance that doesn't have open strings (in a closed system) can be transferred to all tones on the fretboard using PDC structures. Another structure that emerges in the PVT performance of melodic patterns is pattern that is formed by a successive sequence of different PGTs. A special coding system was developed in this study in order to represent the structures that are labelled with the PGTOP (*Pitch generation technique order pattern*) abbreviation. The final structure is the SOP (*String order pattern*) that represents the pattern formed by the order of strings that are vibrated during the performance of the melodic pattern. A coding system was developed for these structures. The PGTOP and SOP structures that are frequently expressed together can be represented together. PDC symbolization can also be added to this coding system.
- The most important quality of a melodic pattern is its repeatability. We examined melodic patterns in two categories according to the patterning method: Tonally Unconnected Melodic Patterning (TUMP) and Tonally Linked Melodic Patterning (TLMP). Repeating melodic patterns are of 3 behavioural types. These are melodic patterns that repeat the same pitches [LMP (Looped Melodic Pattern)], melodic patterns that move in a direction without moving in the opposite direction [DMP (Directional Melodic Pattern)], and patterns that move in a certain direction between patterns but

contains movements in the opposite direction within the pattern itself [DRMP (Directional Returning Melodic Pattern)]. All these melodic patterns can be expressed mathematically with a coding system that is developed in this study.

- There are many possibilities in order to execute a melodic movement between two pitches. Thus, different PGTOP, SOP or PDC alternatives may be used to perform a melodic pattern in PVT. The less complex structures can be selected in two different ways: Less complex fingerings, less complex PGTOP structures.
- Less complex fingerings are selected from grip strength values of different fingering types and proportion of use in PVT parts of 12 scores in Appendix F. In conclusion, the following fingerings should be selected for melodic movements. These orders can be assume as *complexity factor criteria* of fingering use of PDC selection.
    - The order of preference for LH fingering should be L(0) > L(i) > L(+) > L(-) > L(++) > L(ics) variations> L(i) and L(ics) > L(ocs).[122]
    - The order of preference for RH fingering type should be R(0) > R(+) > R(-) > R(++). Melodic movements in which the index and middle fingers of the RH are used should be preferred, regardless of fingering type.
- Hence, the following PGTOP preferences should be selected for melodic movements. These orders can be assume as *complexity factor criteria* of PGTOP selection.
    - When a finger has to be lifted off the fretboard in successive melodic movements, PGTOP variations that allow it to be lifted while generating sound through pull-offs should be preferred, if possible. This will allow producing more sound with less movement.
    - In cases where the fingers of the LH are pressing the fretboard, the amplitude of the sound generated by the left hand hammer-on is

[122] ">" sign used to express the priority order. In this priority order, place of L(ics) and L(i)&L(ics) fingering types is thought for situations that it can't be played using any fingerings except L(ics) and L(i)&L(ics) fingering types. The situations other than this L(ics) fingering types can be preffered as alternative of L(0) fingering types.

reduced. Thus, 4 successive LH hammer-ons should not be performed if not performing a chromatic passage. Apart from L(ocs) fingering types, a maximum of 3 LH hammer-ons can be executed successively. In L(ocs) fingering types, maximum of 2 successive LH hammer-ons is suitable.

  - For the right hand, 3 successive RH hammer-ons should not be performed if not performing a chromatic passage. A maximum of 2 successive RH hammer-ons can be performed.

- Repetition of the same pitch is rarer in PVT than other *saz* techniques. The main reason for this is that hammer-on/pull-off based PVT has restrictions that make it difficult to produce the same pitch. Left hand plucking is a technique used to repeat pitches not only in PVT, but in general *saz* performance, and is frequently used in PVT.
- Melodic patterns that are generated with TUMP in PVT can be played by keeping the PDC; PGTOP and SOP structures fixed. A melodic pattern can be played with different PDC & SOP&PGTOP structures. In order to identify the less complex combinations in performance in terms of fingering use and PGTOP selection. Melodic patterns that are suitable in terms of these criteria have to be preferred. Performers should choose optimum method that contains less complex structures in terms of fingering use and PGTOP selection. Hence, "timbre integrity," "performer's conformational preferences," etc. factors may lead to the selection of different fingering types. Performer can combine different PDC&SOP&PGTOP structures to be able to perform the melodic pattern through the fretboard.
- The frets of *saz* are tunable/movable. In general, microtonal frets are moved/tuned.
- The fretting system of *saz model* represents tendency of PVT performers in present. In makam performance, performers can choose different amount of microtonality than *saz model* allows. However, these fret tuning choices will be in same chromatic columns with performance in *saz model.* Accordingly, all findings in this study are valid with different fret tuning choices in terms of PDC and SOP&PGTOP structures in maqam playing.

- The pitch/frets/notes of makams can be defined with structures called *düzen*, in which certain pitches are tuned with fret movements. A *düzen* is a collection of multiple makams. The *düzen*s on the *saz model* that is defined as "fret tuning system" in this study. "Fret tuning systems" are one octave span instersection variations of *düzen*s in *saz model. "*Fret tuning systems" are identified with the letters and numbers added to the FTS abbreviation.
- The most frequently used FTS in *saz* performance is the FTS-1a *düzen*, in which makams such as *Hüseyni, Uşşak, Rast* and *Muhayyer* are played. When FTS-1a is performed, fingering types apart from the natural position of the left hand are also used.
- TLMP is performed considering the scale, mode or FTS degrees. This is why a model for playing these scales, modes and FTSs with PVT has to be built. To this purpose, the PDC structures that emerge in all SOPs of scale playing were examined. The SOP alternative that allows playing all heptatonic scales, and the PGTOP structure that arises on this SOP were determined, and this structure was named "α." α-type PGTOP occurs on α-type SOP, and this can be performed by positioning the hands in the α-type PDC.
- The other structure is the "β" structure that is more suitable for scales with ♭3 in their third degrees. β-type PGTOP occurs on β-type SOP, and this can be performed by positioning the hands in the β-type PDC.
- In some scales, performance is more suitable when a PGT on α or β-type PGTOP structures or α or β-type SOP types are changed. These structures are named after the structure from which they are derived such as $\alpha^{3\text{-}L}$, $\alpha^{7\text{-}L}$, $\beta^{3\text{-}3}$.
- $\alpha^{7\text{-}L}$ SOP&PGTOP and PDC structure is recommended for scales with ♭3 on the third degree and ♭7 on the seventh degree, $\alpha^{3\text{-}L}$ for scales with ♭3 in the third and ♮7 in the seventh degrees, and $\beta^{3\text{-}3}$ for scales with an augmented second between the second and third degrees.
- LH thumb is not used for the performance of ascending scales in PVT. In descending performance, the 2nd degree of the scale is played with α-type PGTOP, and the 3rd degree is played with the β-type PGTOP. Ascending and descending sequences in the $\beta^{3\text{-}3}$ PGTOP are the same, and don't use the LH thumb.

- The study suggests PGTOP, SOP and PDC structures for frequently used heptatonic, chromatic, octatonic, pentatonic scales and "fret tuning systems" for makams.
- Neighbouring modes of a scale can be played using the PGTOP, SOP and PDC recommended for that scale through modal expansions. If the scale is played beginning or ending with an open string, the PGTOP, SOP and PDC structures of the neighbouring mode are used in performance. A scale can be played on the fretboard by using 2 PDC structures: the PDC of the scale, and the PDC of one of its neighbouring modes. The transition between PDCs is made at the time when two PGTs in the same PGT category are played.
- Melodic patterns that occur on a scale are played using PDC structures that can perform the "map" that the scale and its modes create on the fretboard. The sum of all PDC possibilities that can play the melodic pattern alternatives of a scale constitute that scale's PDC tree.
- In this study, we re-identified *complexity factor criteria* for TLMP performance in terms of heptatonic scales and FTSs. The melodic pattern creation methods based on the *complexity factor criteria* are suitable for all heptatonic scales. Thus, a performer who practices these methods can transfer any melodic pattern to all tones.
- The first criterion of *complexity factor criteria* of PGTOP selection is more prior than complexity factor of fingering use in LMP performance.
- The *complexity factor criteria* of fingering use (PDC selection) are more prior than complexity factor of fingering use in DMP and DRMP performance.
- Certain methods can be proposed for DMP performance. All directional melodic patterns in *saz* performance are listed in Table 4.44.
- DRMPs can be performed using 2 different strategies.
    - Strategy-1 : Changing the PDC structures and maintaining the PGTOP&SOP structure
    - Strategy-2 : Changing the SOP&PGTOP structure and maintaining the PDC structure.
- The structures can be defined according to their tasks in PVT performance. These PDC&SOP&PGTOP structures are detected and named in DRMP performance as RPU: Repeating Pattern Unit, IPU: Initial Pattern Unit, FPU:

Final Pattern Unit, TPU: Transitional Pattern Unit and *f*-PDC: fixed PDC structures.

- These two strategies can be combined. The units that mention above can be used in different combinations.
- Some performance methods that are obtained with complexity factors for fingering use proposed for DRMP are listed in tables in Appendix K. These methods have ability to all heptatonic scales and FTSs that mentioned in this study.
- Performance of DRMPs that start from any chromatic tones and on any heptatonic scales&FTSs are possible to use strategy-1 or hybrid strategy (strategy-1&strategy-2).

The following are some suggestions for musicians, researchers, *saz* performers and *saz* instructors based on the results of this study:

- The Position & Fingering Symbolization system in this study is a high-resolution system that determines the spatial positions of the fingers on the chromatic columns. This system can also be applied to all necked string instruments in addition to the *saz*. The proper playing positions of chord patterns can be represented with this symbolization. Additionally, it has the potential of being a suitable representation system for all fretless and microtonal string instruments by using virtual chromatic columns.
- The hand's mechanical and anatomical characteristics have to be considered when authoring *saz* training methods.
- *Saz* training has to begin with exercises in scales that can be played in the natural position of the hand. Today, training in many institutions and *saz* training methods begins with the FTSs called as "*Hüseynî* makam scale," part of FTS-1a. Thus, students are introduced to the *saz* with fingering types other than the natural LH fingering type. We think that instead of this relatively difficult fingering type, exercises in the *Kürdi* or *Buselik* makams, parts of FTS-2a that can be played completely with natural fingering types in the second position.
- *Saz* training has to progress in three paths based on anatomical, cultural and musical principles. The current exercise books that are written based on mostly musical principles (picking practices, scale practices, et(c) have to be

rewritten in a manner that will cover these three paths. In this regard, the existence of an exercise book that is based on fingering types, that allows the development of the anatomical capabilities of fingers with an anatomical perspective, and an exercise book that is written based on motifs and ornaments in the traditional *saz* repertoire is crucial.

- A certain level has to be achieved in scale playing before starting melodic pattern exercises with PVT.
- Practicing α-type structures and their variations in this study that adapt to scale playing in each tone will positively contribute to performance. Melodic pattern practices advance over the α-SOP&PGTOP structure that is suitable for playing heptatonic scales, and the PDC structures in the α-type PDC tree that is derived from them. This is why it is important to know the performance of all heptatonic scales with α-type PDC and α-type SOP&PGTOP structures, whether or not a proposed SOP&PGTOP exists.
- Scale playing practice in scales suitable for β-type structures and their variations will also positively contribute. PVT training has to include scale playing with SOP&PGTOP structures in scales that are recommended for β.
- The performance of melodic patterns and variations derived from α and β have to be taught later in the training.
- This thesis' methods allow determining the intervals within the hand span limits of the *saz* in different tuning systems. Thus, the suitable structures for the performance of melodic patterns in different tuning systems can be determined.
- The *complexity factor criteria* that are determined for heptatonic scales and FTSs in this study can be adapted to 5, 6 and 8 pitch scales. Suitable methods for the melodic patterns in these scales can be determined based on these results.

REFERENCES

A.S.S.H. (1990). *The Hand: Examination and Diagnosis, 3e*. London: Churchill Livingstone.

Açın, C. (1998). Tanbur'umuzda ve Musikimizdeki Kargaşa. In In Balıkesir 1. Türk Müziği Sempozyumu, *Balıkesir 1. Türk Müziği Sempozyumu 19-20-21 Aralık 1997,* Balıkesir: Balıkesir Belediyesi.

Akdağ, A.K. (2012a). *Bağlama Düzenler ve Tezene Tavırları.* İstanbul: Pan Yayıncılık.

Akdağ, A.K. (2012b). *Bağlama Metodu -I-.* İstanbul: Aks akademi.

Akdağ, A.K and Derin U.Y. (2012c). *Güzel Sanatlar ve Spor Liseleri Bağlama Ders Kitabı,* 9.sınıf (3rd. Ed). Ankara: Milli Eğitim Bakanlığı Yayınları.

Akdağ, A.K and Derin U.Y. (2012d). *Güzel Sanatlar ve Spor Liseleri Bağlama Ders Kitabı,* 10.sınıf (2nd. Ed). Ankara: Milli Eğitim Bakanlığı Yayınları,

Akdağ, A.K and Derin U.Y. (2012e). *Güzel Sanatlar ve Spor Liseleri Bağlama Ders Kitabı,* 11.sınıf (2nd. Ed). Ankara: Milli Eğitim Bakanlığı Yayınları.

Akdağ, A.K., Yamalak, M.(2013). *Derûn,* [Performed by Ali Kazım Akdağ and others; Casette, CD]. İstanbul :Akkiraz Müzik.

Akdağ, A.K and Derin U.Y. (2013). *Güzel Sanatlar ve Spor Liseleri Bağlama Ders Kitabı,* 12.sınıf, Ankara: Milli Eğitim Bakanlığı Yayınları.

Akdağ, A. K. (2013b). *Bağlama Çalgısında Pozisyon Yaklaşımları ve Kromatik Pozisyon Yaklaşımının Bağlama ve Bozuk Düzeninde İncelenmesi* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 344747)

Akdağ, A.K. (2018). Personal Communication. 5 March , İstanbul.

Akıncı, D. (2014). *Bam Telinin Bağlama İcrasına Katkısı* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 375235)

Alim Y. K., Aydın, M. (2004). *Pozisyonlarla Bağlama Metodu.* İstanbul: Aktüel Müzik.

Altınay, R. (1993). *Muzaffer Sarısözen'in Hayatı ve Türk Halk Müziğine Katkıları* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 26510)

Alpyıldız, E. (2012). Yerelden Ulusula Taşınan Müzik Belleği ve Yurttan Sesler. *Milli Folklor Dergisi, 12*(96), 84-93.

Armağan, A.L. (1997). XVI. Yüzyılda Teke Sancağı'ndaki Konar-Göçerlerin Demografik durumu üzerine bir araştırma, *A.Ü.D.T.C.F. Tarih Bölümü*

Tarih Araştırmaları Dergisi, *19*(30), 1-35, Retrieved from http://dergiler.ankara.edu.tr/dergiler/18/27/159.pdf

Ayyıldız, S., Deli, S. Dautovski D., Tsitsanis, V., Brahms, J. (2009). *Pangea* [Performed by Etni-ka; CD]. İstanbul : Artvizyon.

Ayyıldız, S. (2013).*Teke Yöresi Yörük Türkmen Müzik Kültüründe Yerel Çok Seslilik Özellikleri* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 331913)

Ayyıldız, S., Baysal A.O. (2017). Matrix System: A New Analytical Approach for Adapting the Use of Chords into Performing Techniques of the *Bağlama* without Plectrum, *Proceedings of the 4st International Conference on New Music Concepts (ICNMC 2017),* 87-92, Treviso, Italy: Academia Musicale "Studio Musica".

Ayyıldız, S., Parlak, E. (2018). The Origin Of Parmak Vurma (Two-Hand Tapping) Technique Of Saz (Bağlama). *Uluslararası Sosyal Araştırmalar Dergisi*, *11*(57), 889-894. doi:10.17719/jisr.2018.2498

Ayyıldız, S. (2018).*Sinan Ayyıldız Şelpe Tekniği Eğitimi Müfredatı,* Retrieved from http://www.sinanayyildiz.com/tr/q/selpe-egitimi-mufredati

Bardakçı, M. (1986). *Maragalı Abdulkadir,* İstanbul: Pan Yayıncılık.

Baysal, A. O. (2013). *Performing Traditions Of The Teke Region's Üçtelli and Bağlama without Plectrum: The Musical Change in BağlamaMusic of Turkey Since The 1990s* (Unpublished M.A. Thesis). Istanbul Technical University, Social Science Institute, Music Department, Music Programme, İstanbul.

Benli, Y. (2016).*Bağlama Resitali, Bağlama'da İleri İcra Niteliğinin, Alevi Müziği ve Kültürünün Yaygınlaşmasına Etkisi* (Proficiency in Arts Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 425043)

Benward B., Saker, M. (2008). *Music in Theory and Practice* (8th. Ed). New York, NY: Mc Graw-Hill

Berle, A. (2010). *Mel Bay's Encyclopedia of Scales and Melodic Patterns.* Pacific, MO: Mel Bay Publications.

Bilgin, Ü. B. (2013) *Türk Halk Ezgilerinin Yapısal Özellikleri* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 356658)

Brand, P.W., Beach, R.B., and Thompson, D.E., (1981). Relative tension and potential excursion of muscles in the forearm and hand, *Journal of Hand Surgery, 6*(3), 209–219. doi:10.1016/S0363-5023(81)80072-X

Bredice, V. (2010). *Mel Bay's Deluxe Jazz & Rock Bass Method.* Pacific, MO: Mel Bay Publications.

Burdurlu, İ. H. (2016), *Hector Berlioz Fantastik Senfoni'nin (Op.14) Bölümlerinden Seçilen Belirli Sahnelerin Orkestral Yorumlama Açısından Müzikal Karakter Analizi* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 425321)

Can, M.C. (n.d.). *Geleneksel Türk Sanat Müziğinde Makam ve Seyir*, Retrieved Apr 20, 2018, from http://www.arsiv2007.musikidergisi.net/?p=54

Cangal, N. (2008). *Armoni* (4th Ed.). Ankara: Arkadaş Yayınevi.

Chapman, R. (1993). *Bütün Yönleriyle Gitarlar* (C. Karul Çev.). Ankara: Dost Kitabevi.

Cochrane, R. (2012). *Beyond Slonimsky : Melodic Patterns for Guitar*, London: Big Noise Publishing.

Coker, J., Casale, J., Campbell, G. Greene, J. (1970). *Patterns for Jazz A Theory Text for Jazz Composition and Improvisation.* Los Angeles: Alfred Music Publishing.

Costalonga, L. (2009), *Biomechanical Modelling of Musical Performance : A Case study of the Guitar* (Doctoral Dissertation). Retrieved from https://pearl.plymouth.ac.uk/handle/10026.1/616

Çoşkun, A. G. (2018). Personal Communication. 9 January, Ankara.

Çelik, A. (2009). *Bir Yörük Çocuğunun Gözüyle Yörüklerin Dünyası.* Isparta: Kardelen Sanat Yayınları.

Çine H. (1981).*Üçtelli Bağlama Metodu*, İzmir: Özel Basım.

Çoğulu T. (2010). *Adaptation of Bağlama Techniques into Classical Guitar Performance* (Doctoral Dissertation). Retrieved from https://tez.yok.gov.tr/ (Tez No. 264417)

Çoğulu, T. (2017). Personal Communication. 24 November, İstanbul.

Deschênes, B. (2005) The Interest of Westerners in Non-Western Music, *Journal of New Music Research*, *47*(3), 5–29.

Drabkin, W.(2001a) "Motif" Grove Music Online. Edited by Deane Root. Accessed 14 March, 2018. http://www.oxfordmusiconline.com.

Drabkin, W.(2001b) "Scale" Grove Music Online. Edited by Deane Root. Accessed 14 March, 2018. http://www.oxfordmusiconline.com.

Drake, R.L., Vogl, A.W. and Mitchell A.W.M. (2015). *Gray's Anatomy for Students* (3rd. Ed.). Philadelphia: Churchill Livingstone.

Duygulu, M. (1998), Album writing, in *Asya İçlerinden Balkanlara Saz,* Kalan Müzik, İstanbul.

Duygulu, M.(2014). *Türk Halk Müziği Sözlüğü,* İstanbul: Pan Yayıncılık.

Eke, M. (2010). Geçmişte Yapılan Aşık Atışmalarının Günümüzdeki Görünümü. *Acta Turcica: Kültür Tarihimizde Yarış*, *2* (1), 75-84.

Ekici, S. (1993). *Ramazan Güngör ve Üç Telli Kopuzu*, Ankara: Kültür Bakanlığı, Halk Kültürlerini Araştırma ve Geliştirme Müdürlüğü Yayınları.

Ekici, S. (2009). Türk Halk Müziğinin Melodik Yapısının Adlandırılması Konusunda Düşünceler (Ayak, Makam ve Dizi Kavramları), *Akademik İncelemeler Dergisi*, *4*(1), 21-33.

Erdemir, K. B. (2013). *Tanburacı Osman Pehlivan'ın Hayatı, İcracılığı ve Eserleri.* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 359955)

Ergen, T. (2012). *Yayınlanmış Bağlama Metotlarında Kurgu Notasyon ve Simge Kritikleri* (Unpublished Bachelor's Thesis). İstanbul Teknik Üniversitesi, T.M.D.K. Müzikoloji Bölümü Müzikoloji Anabilim Dalı, İstanbul.

Ergun, L. (2004). *Yörüklerde Boğaz Çalma* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 480065)

Eroğlu,S. (2011): *Arguvan Yöresinde İcra Edilen Semahların Müzikal Analizi,* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 286603)

Eroğlu, S. C. (2011): *Kopuzdan Altıtelli Kopuza Uzanan Süreçte Fiziksel ve İcra Teknikleri Bakımından Meydana Gelen Değişim ve Gelişimeler* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 286620)

Ersoy, İ. (2007).Türkiye'de Uluslaşma Sürecinde Bir Simge Olarak : Bağlama, *Halk Müziğinde Çalgılar Uluslararası Sempozyumu Bildirileri,* Kocaeli: Motif Vakfı Yayınları.

Ersoy, İ. (2014). Türk Halk Müziğinin Yeniden Üretimi/İnşası: Ulusal Kaynaştırma Projesi Olarak "Yurttan Sesler" Topluluğu. *International Journal of Human Sciences, 11*(2), 931-947.

Erzincan E., (1998): *Parmak vurma Tekniğinin Bağlamada Uygulanış Ve Notasyonu* (Unpublished Bachelor's Thesis). İstanbul Teknik Üniversitesi, T.M.D.K. Temel Bilimler Bölümü Türk Halk Müziği Anasanat Dalı, İstanbul.

Erzincan, E., (2000). *Anadolu* [Performed by Erdal Erzincan, Casette, CD]. İstanbul :ASM Müzik Üretim.

Erzincan, E., Ertaş, M. (2013). *Erdal Erzincan Bağlama Orkestrası* [Performed by Erdal Erzincan *Bağlama* Orkestrası; CD]. İstanbul : Kalan Müzik Üretim.

Feldman,W. (1996): *Music of Ottoman Court: Makam, Composition and the Early Ottoman Instrumental Repertoire,* Berlin: Verlag für Wissenschaft und Bildung,

Forest, W.J. (1980). Concepts of Melodic Pattern in Contemporary Solonese Gamelan Music, *Asian Music*, *11*(2):53–127.

Freivalds A. (2011). *Biomechanics of the Upper Limbs*, Florida: CRC Press.

Garett, C. H., Hopkins, C. (2013). "Notation", The Grove Dictionary of American Music, Edited by Garett, C. H., Accessed 14 March, 2018. http://www.oxfordreference.com.

Gazimihal M.R. (2001). *Ülkemizde Kopuz ve Tezeneli Sazlarımız* (2nd Ed.). Ankara: Kültür Bakanlığı Yayınları.

Gomez, E., Klapuri, A. and Meudic B. (2003). Melody Description and Extraction in the Context of Music Content Processing, *Journal of New Music Research, 32*(1):23–40.

Grozman, V. Norman, C. (2013). *An Algorithm for Optimal Guitar Playing* (Term Project), KTH Royal Institute of Technology, School of Electrical Engineering and Computer Science, Stockholm, Sweden. Retrievedafrom *http://www.csc.kth.se/utbildning/kth/kurser/DD143X/dkand13/Group7Anders/final/Vladimir.Grozman.Christopher.Norman.report.pdf,*

Gülten, S. (2009).Yörük adına dair bazı düşünceler, *Ekev Akademi Dergisi*, *39*, 1-11.

Güleryüz, R. (2014). *Minimalizm ve Steve Reich'ın 'Klavyeli Vurma Çalgılar' için yazılmış yapıtlarının biçim analizi* (Proficiency in Art Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 374707)

Güngör, R. (1997) *Fethiyeli Ramazan Güngör ve Üçtelli Bağlaması,* Editors : Urum Ulaş Özdemir, Salih Nazım Peker, Director : Melih Duygulu, Kalan Müzik, İstanbul

Gürenç, C. (2007). *Türk Halk Müziğinin çeşitli ayaklarindan icralarin bilgisayarla frekans analizi* (Bachelor's Thesis, Yıldız Technical University). Retrieved from http://akademi1.itu.edu.tr/karaosmanoglum/Tezler/LisansBitirmeOdev

Hacıoğlu, M. E. (2017). Personal Communication. 23 November, İstanbul

Hanning, B. R. (2010). *Concise History of Western Music.* (4th. Edition)*,* New York, NY: W.W.Norton.

Heijink, H. and Meulenbroek, R.G.J. (2002). On the Complexity of Classical Guitar Playing: Functional Adaptations to Task Constraints*, Journal of Motor Behavior, 34*(4), 339-351. doi:10.1080/00222890209601952

Hidayetoğlu, N. (1999). *Müzik Teorisi.* (2nd. Ed.). Trabzon: Karadeniz Gazetesi Matbaacılık.

Hornbostel, E. M. and Sachs, C. (1914) Systematik der Musikinstrumante ,*Zeitschrift für Etnologie, 46*, pp. 553-590.

Jones, G.T. (1974).*Music Theory,* New York, NY: Harper Perennial.

Jordan, S. (1984), Getting Started with the Touch Technique*, Guitar Player Magazine*,aJulya1984aretrievedafrom http://www.stanleyjordan.com/Technique/starting.html.

Jordania J. (2006). *Who Asked First Question- The Origins of Human Choral Singing, Inteligence, Language and Speech* , Tiflis: Logos.

Kaplan, E. (2017). *Caz doğaçlamasında melodi sazlarının zamansal ve dokusal kurgu ve davranış modellerinden hareketle vokal doğaçlama olanaklarının genişletilmesi Geleneksel uygulamalar ve yeni yöntemler* (Master's Thesis), Retrieved from https://tez.yok.gov.tr/ (Tez No. 467568)

Karadeniz, E. (2013), *Türk Mûsıkîsinin Nazariye ve Esasları*, İstanbul: İş Bankası Kültür Yayınları.

Karaduman, İ. (2014). Geleneksel Türk Halk Müziğinde Makâm Kavramının Kullanılmasına Edvâr Geleneği Açısından Bir Yaklaşım, *Turkish Studies-International Periodical for the Languages, Literature and History of Turkish or Turkic, 9* (8), 587-601.

Karaosmanoğlu, M.K. and Gürenç C. (2017). Arel - Ezgi - Uzdilek Ses Sistemi ile Âşık Veysel'in Perde Anlayışı Arasındaki Örtüşme, Oral Presentation, *Hüseyin Saadettin Arel ve Türk Müziği Sempozyumu,* İstanbul: İ.Ü. Türkiyat Araştırmaları Enstütüsü&Atatürk Kültür Merkezi

Kaya, D. (2009). *Johann Sebastıan Bach'ın "Füg Formları"nın ve "Füg Sanatı" Adlı Eserinin Barok Dönem Müzik Anlayışına Göre İncelenmesi* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 241469)

Ketchum, I.D., Thompson, D., Pocock, G., and Wallingford, D. (1978). A clinical study of forces generated by the intrinsic muscles of the index finger and the extrinsic flexor and extensor muscles of the hand, *Journal of Hand Surgery*, 3, 571–578.

Kınık, M. (2010). *Güzel Sanatlar Fakülteleri Müzik Bölümlerinde Bağlama Dersi Başlangıç Düzeyine Yönelik Öğretim Programı Önerisi* (Doctoral Dissertation). Retrieved from https://tez.yok.gov.tr/ (Tez No. 278539)

Kızıler, G. (2007). *Bağlamadaki "şelpe" tekniği yeni uygulamalarının armonik ve melodik yönden analizi* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 191889)

Kong, Y.K. (2001). Optimum Design of Handle Shape through Biomechanical Modeling of Hand Tendon Forces (Unpublished Doctoral Dissertation) University Park, PA: Pennsylvania State University.

Kong, Y.K. and Freivalds, A. (2003). Evaluation of meat-hook handle shapes, *International Journal of Industrial Ergonomics*, 32, 12–23.

Koç, A. (2016). Teknolojik Gelişmeler ve Sosyokültürel Değişimler Sarmalında Günümüzde *Bağlama* İcracılığı, Koç A. (Editor), *Nida Tüfekçi Uluslararası Bağlama Sempozyumu,* (pp. 111-123). İstanbul: İ.T.Ü. Türk Musikisi Devlet Konservatuarı Yayınları.

Koçak, H. (2003), *Türk Halk Müziği Terminolojisi* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 146478)

Kol, M. (2018), Unpublished score : *Karcığar Improvisation*.

Koruk, Ç. (2009). *Teke Yöresiden Telli ve Yaylı Çalgılar* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 239362)

Kurt, İ. (1989). *Bağlamada Düzen ve Pozisyon*. İstanbul: Pan Yayıncılık.

Kurt, N. (2016). Alevi-Bektaşi Cemlerinde "Deste *Bağlama*" Geleneği ve "*Bağlama*" Adının Kaynağı, *EÜ Konservatuarı Dergisi, 8*, 43-62

Kutluğ, F., Y. (2000). *Türk Musikisinde Makamlar*. İstanbul: Yapı Kredi Yayınları.

Lawergren, B. (2004). Eski Tunç Çağı Anadolu çalgıları. In F. Bayram and A. Özme, Eds., *1. Uluslararası Tarihte Anadolu Müziği ve Çalgıları Sempozyumu* ,(pp. 7-15) Ankara: T.C. Kültür ve Turizm Bakanlığı Kültür Varlıkları ve Müzeler Genel Müdürlüğü.

Lateef, Y.A. (1981). *Repository of Scales and Melodic Patterns*. Amherst, MA: Fana Music.

Leavitt, W. (1986), *A Modern Method for Guitar - Volume 1,* Boston: Berklee Press Publications.

Levine, M. (1995). *Jazz Theory*, Sher Music Company, Petaluma, CA: Sher Music Company

Limbasiya, R.D., Ramalingam, T., Savaliya, D., Jakir, A., Nilam, P., Tailor N. (2016). Effect Of Elbow And Wrist Joint Position On Grip Strength, *IOSR Journal of Dental and Medical Sciences, 15*(4), 73-77. doi: 10.9790/0853-1504127377

Mann, A. (1987). *The Study of Fugue*, (Dover Edition), New York, NY: Dover Publications.

Markoff, I. (1990). The Ideology of Musical Practice and the Professional Turkish Folk Musician: Tempering the Creative Impulse, *Asian Music, 22*(1), 129-145. doi:10.2307/834293

Markoff, I. (1986).*Musical Theory, Performance and the Contemporary Bağlama Specialist in Turkey*, (Doctoral Dissertation). University of Washington, UMI Publishing, USA.

Miller, R. (1996a). *Modal Jazz Composition&Harmony Vol. 1*, Rottenburg: Advance Music.

Miller, R. (1996b). *Modal Jazz Composition&Harmony Vol. 2,* Rottenburg: Advance Music.

Mimaroğlu, İ.K. (1970). *Musiki Tarihi* (2nd. Ed.). İstanbul: Varlık Yayınları.

Mottola, L. (2018) *Calculating the Fret Position.* Retrieved from http://www.liutaiomottola.com/formulae/fret.htm

Namlı Z.Ç. (2006). *La Lune/Köy* [Performed by Zeki Çağlar Namlı; CD, Album]. İstanbul : Akkiraz Müzik Üretim.

Namlı Z.Ç., Piazza, D.D. (2011). *Face to Face/ Yüzyüze* [Performed by Zeki Çağlar Namlı and Dominique Di Piazza; CD, Album]. İstanbul : Lir Müzik ve Film Prodüksiyon.

Namlı, Z.Ç. (2016). *Bağlama : Bir Müzik Enstrumanı 1 / as a Musical Instrument 1.* İstanbul: Vizyon Yayıncılık.

Napier, J.R. (1956).The Prehensile Movements of the Human Hand, *Journal of Bone & Joint Surgery*, *38-B*(4), 902-913. doi:10.1302/0301-620X.38B4.902

Nettl, B. (1964). *Theory and Method in Ethnomusicology*. New York, NY: Schirmer books

Özdemir E. (2013). *Türkiye Örneğinde Aşıklarda Müzik* (Doctoral Dissertation). Retrieved from https://tez.yok.gov.tr/ (Tez No. 333703)

Özkan, İ.H. (1998). *Türk Musikisi Nazariyatı ve Usulleri*. İstanbul: Özener Matbaası.

Öztürk, O.M. (2000). [Liner Notes], On *Coşkun Güla : Bağlamada Tezene Tavırları* [Casette, CD, Album],, Kalan Müzik, İstanbul.

Öztürk, O. M. (2002). Türkiye'de Yaşanan Modernleşme Süreci ve Anadolu Yerel Müzikleri *21. Yy. Başında Türkiye'de Müzik Sempozyumu Bildiriler Kitabı,* (pp. 195-210). Ankara: SCA MV Yayınları.

Öztürk, O.M. (2005). Geleneksel Müziklerin "Westernizasyon"u : Binilen Dalın Kesilmesi. *Uluslararası Halk Müziğinde Çalgılar Sempozyumu,* Van: Van Yüzüncü Yıl Üniversitesi. Retrieved from https://www.yyu.edu.tr/images/files/IUlusalM%C3%BCzikEgitimiSempozyumu/Belgeler/OkanMuratOzturk.pdf

Öztürk, O.M. (2007). Onyedi'den Yirmidört'e: Bağlama Ailesi Çalgılar ve Geleneksel Perde Sistemi. *Halk Müziğinde Çalgılar Uluslararası Sempozyumu,* Kocaeli: Motif Vakfı Yayınları.

Öztürk, O.M. (2014). *Makam Müziğinde Ezgi ve Makam İlişkisininAnalizi ve Yorumlanması Açısından Yeni Bir Yaklaşım: Perde Düzenleri ve Makamsal Ezgi Çekirdekleri* (Doctoral Dissertation). Retrieved from https://tez.yok.gov.tr/ (Tez No. 381924)

Öztürk, O.M., Beşiroğlu Ş.Ş. & Bayraktarkatal, M. E. (2014). Makamı Anlamak: Makam Nazariye Tarihinde Başlıca Modeller, *Porte Akademik*, *1*(10), 9-36.

Öztürk, O.M. (2015). Halk mûsikîsi repertuar incelemelerinin makam nazariyesi araştırmalarına yapabileceği katkılar. *EÜ Devlet Türk Musikisi Konservatuvarı Dergisi, 7*, 1-27.

Öztürk, O.M. (2018). The concept of Makam-based melody and its problematic in musical analysis. In R. Sultanova & M. Rancier (Eds.), *Turkic Soundscapes : From Shamanic Voices to Hip-Hop (*pp. 19-40). London: Taylor&Francis.

Parlak, E., Sağ, A. (1998). *Göç Yolları* [Performed by Erol Parlak; Casette, CD]. İstanbul : ASM Müzik Üretim.

Parlak, E. (2000). *Türkiye'de El ile (Şelpe) Bağlama Çalma Geleneği ve Çalış Teknikleri.* Ankara: Kültür Bakanlığı.

Parlak, E. (2001). *El ile Bağlama Çalma (Şelpe) Tekniği Metodu 1.* İstanbul: Ekin Yayınları.

Parlak, E., Erol Parlak *Bağlama* Quintet, Kurbani, A., Aykut, V. (Dertli Divani) and Mozart, W. A. (2003). *Eşik,* [Performed by Erol Parlak *Bağlama* Beşlisi; Casette, CD]. İstanbul :Akkiraz Müzik.

Parlak, E. (2005). *El ile Bağlama Çalma (Şelpe) Tekniği Metodu 2.* Bursa: Aktüel Yayınları.

Parlak, E. (2010). *Bağlama (Saz) Okulu : Schule Method,* Wilhelmshaven: Acoustic Music Books.

Parlak, E. (2016). Cumhuriyetten Günümüze *Bağlama* İcrası Ekseninde Gelişen Yöntemler, Yaklaşımlar ve Eğitim, In Koç A. (Editor), *Nida Tüfekçi Uluslararası Bağlama Sempozyumu* (pp. 210-236)., İstanbul: İ.T.Ü. Türk Musikisi Devlet Konservatuarı Yayınları, İstanbul.

Parlak, E. (2017). Personal Communication. 12 August, Astana.

Pennanen, R. P. (1997). The development of chordal harmony in Greek rebetika and laika music, 1930s to 1960s. *British Journal of Ethnomusicology*, *6*(1), 65-116.

Phillips, S. (1984). *Hot Licks for Bluegrass fiddle.* London: Oak Publications.

Picken L. (1975). *Folk Music Instruments of Turkey,* London: Oxford University Press.

Platzer, W. (2004). *Color Atlas of Human Anatomy : Locomotor System* (Vol. 1.). New York, NY: Thieme Medical Publishers.

Radicioni, D. and Lombardo, V. (2005), Guitar Fingering For Music Performance, *In Proceedings of the International Computer Music Conference*, pp. 527–530. International Computer Music Association

Ricker, R. (1976). *Pentatonic Scales for Jazz Improvisation (The Ramon Ricker Jazz Improvisation).* Miami, FL: Studi0 224 CPP/Belwin, Inc.

Ricker, W. (1994). *Mastering Blues Guitar,* Los Angeles, CA: Alfred Music Publishing.

Richards, L.G., Olson B., Palmiter-Thomas, P. (1996). How Forearm Position Affects Grip Strength**.** *American Journal of Occupational Therapy*, *50* (2), 133-138.

Rowe, R. (2001). *Machine Musicianship*. Cambridge, MA: MIT Press.

Sağ, A., Parlak, E., Erzincan, E., Divani, D., and Özdemir, C. (1998). *Concerto for Baglama* [Recorded by Arif Sağ Trio and Istanbul State Symphonic Orchestra; conducted by Betin Güneş; Casette, CD]. İstanbul :ASM Müzik Üretim.

Sağ, A. and Erzincan, E. (2009). *Bağlama Metodu,* İstanbul: Pan Yayıncılık.

Say, A. (2002). *Müzik Sözlüğü.* Ankara: Müzik Ansiklopedisi Yayınları.

Sarı G. Ç., (2009). Türk Müziği Ses Sistemi"ndeki Ana Dizi, Tanini Aralık - Oktavın Bölünmesi ve Makam Sınıflaması Sorunlarına Genel Bir Bakış Ve Çözüm Önerileri, *Orkestra*, 409, 24-45.

Sarı, K. B. (2016). Unpublished score.

Schoenberg, A. (1970). *Fundamentals of Musical Composition* (Ed. by Strang G. and Stein L.). London: Faber and Faber.

Sevsay, E. (2015). *Orkestrasyon - Çalgılama ve Orkestralama Sanatı.* İstanbul: Yapı Kredi Yayınları.

Slonimsky, N. (1947). *Thesaurus of Scales and Melodic Patterns*. New York, NY, Coleman-Ross.

Soydaş, M.E. (2007). *Osmanlı Sarayında Çalgılar* (Doctoral Dissertation). Retrieved from https://tez.yok.gov.tr/ (Tez No. 208752)

Stone, K. (1980). *Music Notation in the Twentieth Century: A Practical Guidebook.* New York, NY: W.W.Norton.

Sümbüllü, H.T. (2006). *Türkiyede Ayak Kavramının Geleneksel Türk Halk Müziği. Kaynağında Ne Ölçüde Kullanıldığının İncelenmesi* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 187653)

Şenel, S. (1992) *Kastamonu Yöresi Aşık Musikisi Tür ve Biçimleri* (Unpublished Master's Thesis) İstanbul Teknik Üniversitesi, Sosyal Bilimler Enstitüsü.

Şenel S. (1997) Türk Halk Müziğinde "Beste", "Makam" ve " Ayak" Terimleri Hakkında, *V.Milletlerarası Türk Halk Kültürü Kongresi Halk Müziği,* *Oyun, Tiyatro, Eğlence Seksiyon Bildirileri* (pp.372-396). Ankara: Kültür Bakanlığı Yayınları.

Şenel, S. (2009). *Kastamonu'da Âşık Fasılları: Türler/ Çeşitler/ Çeşitlemeleri.* Kastamonu: Kastamonu Valiliği.

Tan, N. (2003). *Folklor (Halk Bilimi) Genel Bilgiler* (6th. Ed.). İstanbul: Kitap Matbaacılık.

Tanrıkorur, C. (2003). *Osmanlı Dönemi Türk Musikisi*, İstanbul: Dergâh Yayınları.

Taylor, B. (2000), *The Art of Improvisation : Creating real-time music through jazz improvisation*, Taylor and James Publications. Retrieved from https://noty.propovednik.com/Public/_Учебники/Инструментовка%20-%20Аранжировка/The%20art%20of%20improvisation-Bob%20Taylor.pdf

Taylor, C.L. and Schwarz, R.J. (1955). The Anatomy and Mechanics of the Human Hand, *Artificial Limbs, 2*(2), 22-35.

Tekin, E. (2007). *Safedi'nin Müzik Teorisinin İncelenmesi* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 206884)

Terell, R. and Purswell, J.L. (1976). The Influence Of Forearm And Wrist Orientation on Static Grip, *Proceedings of the 20th Annual Meeting of the Human Factors and Ergonomics Society* (pp. 28-32). Santa Monica, California: Human Factors and Ergonomics Society.

Tızlak, F. (2008). *Teke Türkmenleri ve Osmanlı Devleti*, Antalya: Antalya Kent Müzesi Projesi Yayınları.

Tohumcu, A. (2013). Türk Müziğinde XIII-XV. Yüzyıl Ses Sistemi ve Makam Teorisi Çalışmalarının Geçmişten Günümüze Uzanan Etkileri. *Musiki Dergisi*, Retrieved September 20, 2017, from http: //www. musikidergisi. net/?p=2583

Torun, M. (2000). *Ud Metodu: Gelenekle Geleceğe*, İstanbul: Çağlar Yayınları.

Tosunoğlu, A. (2017). Personal Communication. 18 November, İzmit.

Tura, Y., (1988).Türk Musikisinin Mes'eleleri, İstanbul: Pan Yayınları.

Turnbull, H. (1972). The Origin of the Long-Necked Lute. *The Galphin Society Journal, 25*, 58-66. doi:10.2307/841337

Tülek K. (2015). *How To Develop The Process Of Adaptation From A Conventional Plectrum Played Piece Into The Şelpe Technique* (Bachelor's Thesis, Codarts-Rotterdam). Retrieved from https://www.academia.edu/31534935/

Tülek K. (2018). *Bağlama spielen/ Die Şelpe-Technik.* Mainz: Schott Music.

Türkmen, G. (2017). Personal Communication. 18 July, İstanbul.

Url-1 : http://www.tdk.gov.tr <TDK Online Current Turkish Dictionary>

Url-2 : https://www.youtube.com/watch?v=CSuVs23QetU

Url-3 : https://www.youtube.com/watch?v=Qw0wnVfpa48

Url-4: http://ssb.sis.itu.edu.tr:9000/pls/PROD/itu_icerik.p_download?file=CAB407 retrieved at. 18.07.2018

Url-5 : http://www.braceaccess.com/shoulder-joint-simplified/ retrieved at. 30.10.2017

Url-6 : https://www.youtube.com/watch?v=4zcSXdkqnGc

Url-7 : http://www.getmededu.com/movements-of-the-thumb-fingers-and-toes.html

Uslu, R. (2012). Müzik Terimlerindeki Karmaşanın Akademik Çalışmalara Yansıması: Orijinal, Nazire, Çeşitleme, Varyant, Aranjman, Cover, İcra. *İdil Sanat ve Dil Dergisi* 2:144-165. doi:10.7816/idil-01-02-09

Uz, K. (1964), Musiki Istılâhatı, Ankara: Küğ Yayını.

Wang L., Meydan T. and Williams P.I. (2017). A Two-Axis Goniometric Sensor for Tracking Finger Motion, *Sensors*, *17*(4), 770. doi:10.3390/s17040770

Werner, K. (1996). *Effortless Mastery: Liberating the Master Musician*. New Albany, IN: Jamey Aebersold Jazz, Inc..

Widdess, R. (2001), "Raga" Grove Music Online. Edited by Deane Root. Accessed 14 March, 2018. http://www.oxfordmusiconline.com.

Wilson, D. (1989). The Role Of Patterning in Music. *Leonardo, 22*(1), 101-106.

Yanık, G., (1998). *Bağlama'da Yapılan Değişiklikler.* (Bachelor's Thesis), İstanbul Teknik Üniversitesi, T.M.D.K. Çalgı Bölümü Mızraplı *Saz*lar Anasanat Dalı, İstanbul.

Yavuzoğlu, N. (2016), *Uygulamalı Müzik Teorisi-1*. İstanbul: İnkılap Yayınları.

Yekta, R. (1986). *Türk Musikisi* (Nasuhioğlu, O., Çev.). İstanbul: Pan Yayıncılık.

Yener, A. (2018). Personal Communication. 16 July, İzmit.

Yeprem, M. S. (2013), *Gitarda Modal Açılımlar ve Akor Yapıları,* İstanbul: Bemol Müzik Kitabevi.

Yılmaz, Z. (2013). *Yörüklerde Boğaz Çalmanın Anlamı ve Tekniklerinin Analizi* (Master's Thesis). Retrieved from https://tez.yok.gov.tr/ (Tez No. 359956)

APPENDICES

APPENDIX A: BO LAWERGREN'S GRAPH

APPENDIX B: SİNAN AYYILDIZ'S CIRRUCULUM FOR EDUCATION OF PICKLESS SAZ PLAYING TECHNIQUE

APPENDIX C: EROL PARLAK'S TRANSCRIPTION SIGNS FOR PICKLESS *SAZ* PLAYING TECHNIQUE

APPENDIX D: ARİF SAĞ &ERDAL ERZİNCAN'S TRANSCRIPTION SIGNS FOR PICKLESS *SAZ* PLAYING TECHNIQUE

APPENDIX E: FINGERING TYPES OF LEFT HAND

APPENDIX F: SCORES OF ARRANGEMENTS AND COMPOSITIONS WITH POSITION&FINGERING SYMBOLIZATION SYSTEM SIGNS FOR PICKLESS *SAZ* PLAYING TECHNIQUE

APPENDIX G: PROPORTION OF USE OF FINGERING TYPES IN THE SCORES IN APPENDIX F

APPENDIX H: NOTATION OF ASCENDING-DESCENDING IONIAN PLAYING WITH DIFFERENT SOP ALTERNATIVES THAT DON'T USE LH THUMB ON TABLE 4.11

APPENDIX I: NOTATION OF ASCENDING DESCENDING PLAYING OF HEPTATONIC SCALE WITH DIFFERENT SOP ALTERNATIVES THAT IS USED LH THUMB ON TABLE 4.12

APPENDIX J: HAMMER -ON AND PULL OFF POSSIBILITIES OF PDC-TREES

APPENDIX K: SOME PROPOSED METHODS FOR CREATING DRMP

APPENDIX L: GLOSSARY

APPENDIX M: VIDEOS (in CD-Rom)

APPENDIX A: BO LAWERGREN'S SCHEME

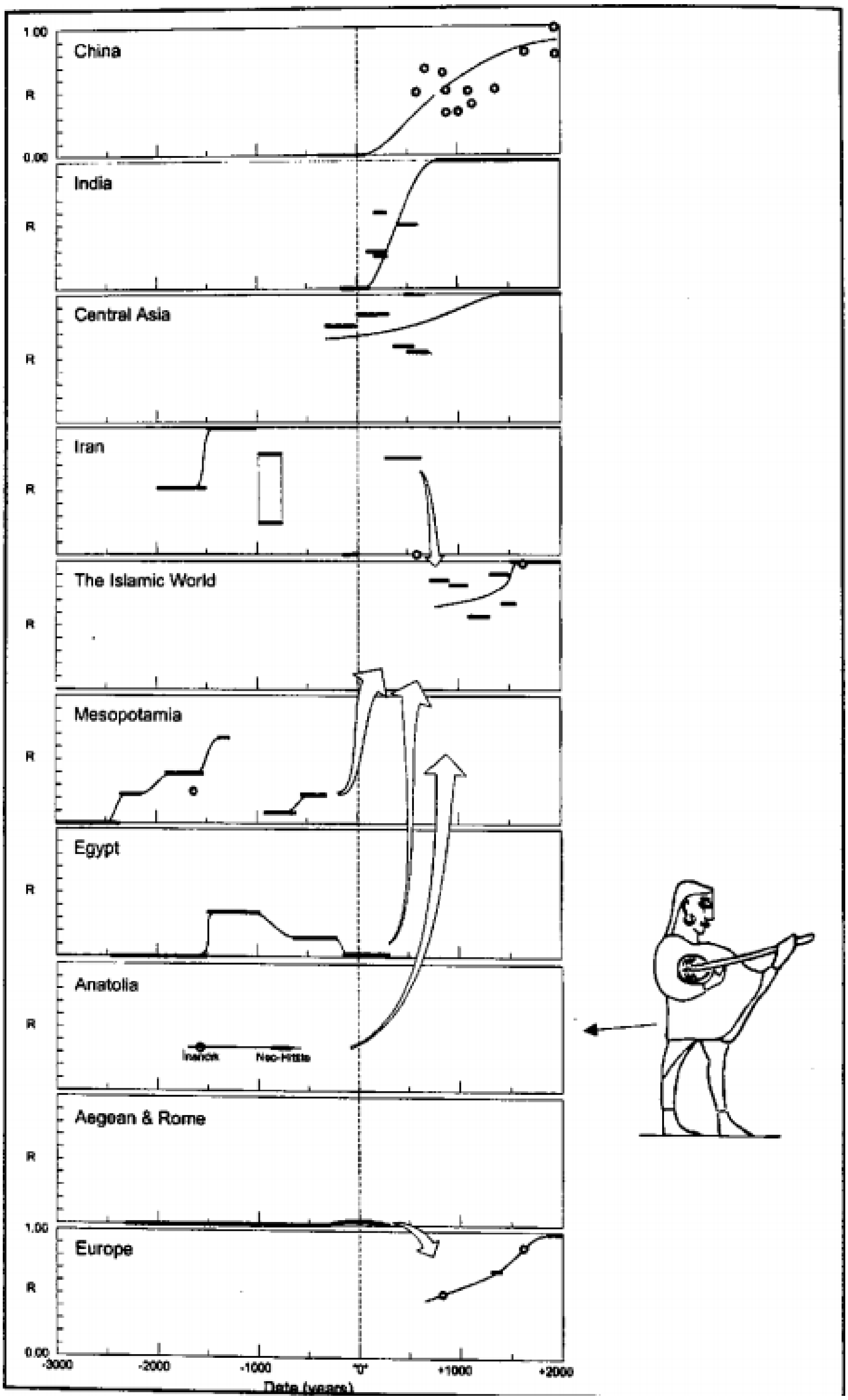


Figure A.1 : The Appearance of Long Necked Lutes in Historical Documents (Lawergren,2004).

APPENDIX B: SİNAN AYYILDIZ'S CURRICULUM FOR EDUCATION OF PICKLESS *SAZ* PLAYING TECHNIQUE

Table B.1 : Sinan Ayyıldız's Curriculum for education of pickless playing *saz* technique (Ayyıldız, 2018)

Basic Information about topic
History and origin of *şelpe* technique (pickless playing technique) **Transcription signs of *şelpe* technique (Erol Parlak transcription signs)** **The Basics of sub-techniques of *Şelpe* technique :** ***Pençe* technique (Strumming technique variations)** ***Parmak vurma* technique (Two-hand tapping technique variations)** ***Tel çekme* technique (Plucking technique variations)**
UNIT I
1. Level ***Pençe* technique : To strike strings together, use of one finger, two-finger stroke** Sample song : Seherde bir bağa girdim Sample song : Gel Efendim Gel (Music : Arif Sağ) ***Parmak Vurma* technique:** **Symmetrical motion in the fingers of the left hand, Asymmetrical motion in the fingers of the left hand, symmetrical motion in the fingers of the right hand, asymmetrical motion in the fingers of the left hand, consecutive right and left hand hammer-ons and pull-offs, use of right hand middle finger.** Sample song : Deriko (Arrangement: Erdal Erzincan)
2. Level ***Parmak vurma* Technique: Simultaneous use of right hand fingers** Sample song : Saray Yolu (Arrangement: Erol Parlak) Sample song : Azeri (Music - Arrangement: Arif Sağ)

Table B.1 (continued) : Sinan Ayyıldız's curriculum for education of pickless *saz* playing technique (Ayyıldız, 2018)

***Pençe* Technique: Rhythmic Patterns on *Pençe* technique**

Sample song : Efsaneyim (*Pençe* Part)

Sample song : Yayla Yolları (*Pençe* Part)

3. Level

***Tel çekme* technique : Melody playing with *tel çekme* technique**

Use of thumb, ındex, middle and ring fingers of right hand in *tel çekme* technique, left hand techniques (single direction bending, vibrato)

Sample song : Kızım Sana Fistan Aldım (Arrangement: Erol Parlak)

Sample song : Şu Dağların Yükseğine Erseler (Arrangement: Erdal Erzincan)

4. Level

***Parmak vurma* technique: Use of right hand ring finger**

Sample song : Abum Abum Kız Abum (Arrangement: Sinan Ayyıldız)

Sample song : Serenler Zeybeği (Arif Sağ - Erol Parlak - Erdal Erzincan)

Sample song : Yayla Yolları (Tüm Eser)(Arrangement: Erol Parlak)

***Pençe* Technique: complex strikes on *pençe* technique, strumming, trill, rubbing fingers against strings, other complex strikes**

Sample song : Sallama (Arrangement : Sinan Ayyıldız)

5. Level

Simultaneously use of three sub-techniques of *şelpe*

Sample song : Daşlı Darla Ayrıklı (Arrangement: Erdal Erzincan)

Sample song : Boğaz Havası (Arrangement: Erol Parlak)

Sample song : Alim de Gitme Pazara (Arrangement : Erdal Erzincan)

Sample song : Elmas Oyun Havası (Arrangement: Erdal Erzincan)

Sample song : Habudiyar (Arrangement: Erol Parlak)

Sample song : Kıyılı Halayı (Arrangement : Erdal Erzincan)

Sample song : Be Felek Senin Elinden (Music, Arrangement : Erdal Erzincan)

Table B.1 (continued) : Sinan Ayyıldız's curriculum for education of pickless *saz* playing technique (Ayyıldız, 2018).

6. Level

Harmony on *parmak vurma* technique

Sample song : Naz Barı (Arrangement: Erol Parlak)

Sample song : Yâr'e (Composition: Sinan Ayyıldız)

Sample song : Mevlana Oyun Havası (Arrangement: Sinan Ayyıldız)

Sample song : Elmas Oyun Havası (Arrangement: Sinan Ayyıldız)

Sample song : Aşk Olsun (Composition: Sinan Ayyıldız)

Harmony on *pençe* technique

Sample song : Duaz-ı İmam (Arrangement: Erol Parlak)

Sample song : Sinsin Halayı (Arrangement : Erdal Erzincan)

<u>Unit 1 Songs:</u>

Bağlama Üvertürü (Music, Arrangement: Erdal Erzincan)

Göç Yolları (Arrangement: Erol Parlak)

Şenlik Raksı (Arrangement: Erol Parlak)

Sarı Zeybek (Arrangement: Erdal Erzincan)

Kaytağı (Arrangement: Erdal Erzincan)

Kolhoz Barı (Arrangement : Sinan Ayyıldız)

UNIT 2:

1. Level

Melody arrangement with *şelpe* technique

Sample song : Efsaneyim (Tüm Eser) (Arif Sağ - Erol Parlak - Erdal Erzincan)

2. Level

Harmony

Arpeggio Techniques on *parmak vurma* technique

Sample song : Daldalan Barı (Arrangement: Sinan Ayyıldız

Table B.1 (continued) : Sinan Ayyıldız's curriculum for education of pickless *saz* playing technique. (Ayyıldız, 2018).

3. Level
Arpeggio on different rhythmic patterns
Sample song : Memberi (Arrangement: Ali Kazım Akdağ)
Sample song : Ay Laçin (Arrangement: Sinan Ayyıldız)
Sample song : Grodovsko Horo (Arrangement: Sinan Ayyıldız)
4. Level
Playing unmetered songs with *şelpe* technique
Sample song : Ağıt (Arrangement: Erol Parlak)
Sample song : Doğaçlama (Arrangement: Erol Parlak)
Sample song : Barak Havası (Arrangement : Sinan Ayyıldız)
Sample song : Karakoyun (Arrangement : Erdal Erzincan)
Sample song : Delidervіş (Traditional, Source: Haydar Acar)
5. Level
Authentic use of *şelpe* technique in southwestern anatolia (*Üçtelli* Songs)
Sample song : Avşar Beyleri (Source: Ramazan Güngör)
Sample song : Ağır Zeybek (Source:: Ramazan Güngör)
Sample song : Boğaz Havası (Source: : Ramazan Güngör)
6. Level
Advanced Harmony - 7th Chords and Arpeggio Exercises in 12 tone.
Unit 2 Songs:
Sample song : Topal Oyun Havası (Arrangement: Erol Parlak)
Sample song : Ezgi Akşamı (Music: Sinan Çelik) (Arrangement: Erol Parlak)
Sample song : Nihavend Longa (Arrangement: Erkan Çanakçı)
Sample song : Şehnaz Longa (Arrangement: Sinan Ayyıldız)
Sample song : Giriftar (Music, Arrangement : Erdal Erzincan)
Sample song : Hançer Barı (Arrangement Erdal Erzincan)

Table B.1 (continued) : Sinan Ayyıldız's curriculum for education of pickless *saz* playing technique. (Ayyıldız, 2018).

UNIT 3 :

1. Level

Accompaniment

Sample song : Evleri Görünüyor (Arrangement: Sinan Ayyıldız)

2. Level

Playing options for 9th 11th 13th Chords

Accompaniment exercises on different rhythmic patterns

Use of *şelpe* technique in *bağlama* ensemble (Duo,Trio,etc...)

Sample songs for five *bağlama*s

Sample song : Zile Semahı (Arrangement: Sinan Ayyıldız)

Sample song : Daldalan Barı (Arrangement: Sinan Ayyıldız)

3. Level

What is transcription and how can we apply it on the *şelpe* technique?

Sample song : Yağcılar Zeybeği (Arrangement : Sinan Ayyıldız)

Sample song : Ela Ela Leose (Arrangement : Sinan Ayyıldız)

Sample song : Rast *Saz* Semaisi (Music : Cemal Beşir) (Arrangement : Sinan Ayyıldız)

Unit 3 Songs:

Sample song : İstanbul Türküsü (Arrangement: Erol Parlak)

Sample song : Kürdilihicazkar Longa (Arrangement: Güven Türkmen)

Sample song : Çay Zeybeği (Arrangement: Sinan Ayyıldız)

Sample song : Basgali (Music : Aftandil İsrafilov) (Arrangement: Merih çeliktopuz-Sinan Ayyıldız)

Sample song : Çeke Çeke (Arrangement: Erdal Erzincan)

Sample song : Anadolu (Music, Arrangement: Erdal Erzincan)

Table B.1 (continued) : Sinan Ayyıldız's curriculum for education of pickless *saz* playing technique. (Ayyıldız, 2018).

Sample song : Haydar Haydar (Music : Ali Ekber Çiçek) (Arrangement: Adem Tosunoğlu)

Sample song : Efsaneyim (Erol Parlak)

Sample song for five *bağlamas* : Sultaniyegah Sirto (Arrangement: Sinan Ayyıldız)

UNIT 4

1. Level

Transposition, Modulation

Sample song : Tahtacı Semahı (Arrangement : Erdal Erzincan)

Sample song : Evvel Bahar (Music, Arrangement : Erdal Erzincan)

2. Level

Songs Played with Different Tunings on the Baglama

Sample song : Nene Torun Havası (Anonymous)

Sample song : Kocaoğlan Zeybeği (Anonymous)

Sample song : Tahtacı Semahı (Music,Arrangement: Erol Parlak)

Sample song : Kalenin Bedenleri (Arrangement: Adem Tosunoğlu)

Sample song : Kalenin Dibinde (Arrangement: Adem Tosunoğlu)

3. Level : *Pençe* Techniques of Central Asian and Iranian Instruments

Sample song : Sekine (Anonim - İran) (Tenbur)

Sample song : Karagöz (Abdurahim Hamidov - Özbek) Dutar

Sample song : Aday (Anonim - Kazak) (Dombra)

Sample song : Umud (Abdurahim Heyit - Uygur) Dutar

4. Level

Songs from Repertoire of Western Classical and Jazz Music

Sample song : Fur Elise (Music: L. V. Beethoven) (Transcription: Sinan Ayyıldız)

Table B.1 (continued) : Sinan Ayyıldız's curriculum for education of pickless *saz* playing technique. (Ayyıldız, 2018).

Sample song : Paganini Caprice 24 (Music: N. Paganini) (Transcription: Gökhan Kimverdi)

Sample song : Alla Turca - Türk Marşı (Music: W. A. Mozart) (Arrangement: Erol Parlak)

Sample song : Holiday Blessing (Music: Aziza Mustafazadeh) (Arrangement: Sinan Ayyıldız)

Sample song : Boomerang (Music: Aziza Mustafazadeh) (Arrangement: Sinan Ayyıldız)

Sample song for Five Baglamas :

Sample song : Alla Turca - Türk Marşı (Music: W. A. Mozart) (Arrangement: Erol Parlak)

5. Level

Improvisation on Şelpe Technique

Exercises on Modal Structures

Advance Arpeggio Studies

Unit 4 Songs

Karadeniz Rapsodisi (Music-Arrangement: Sinan Ayyıldız)

Aman Avcı (Arrangement : Sinan Ayyıldız)

Gankino Horo (Bulgar Horonu) (Arrangement: Sinan Ayyıldız)

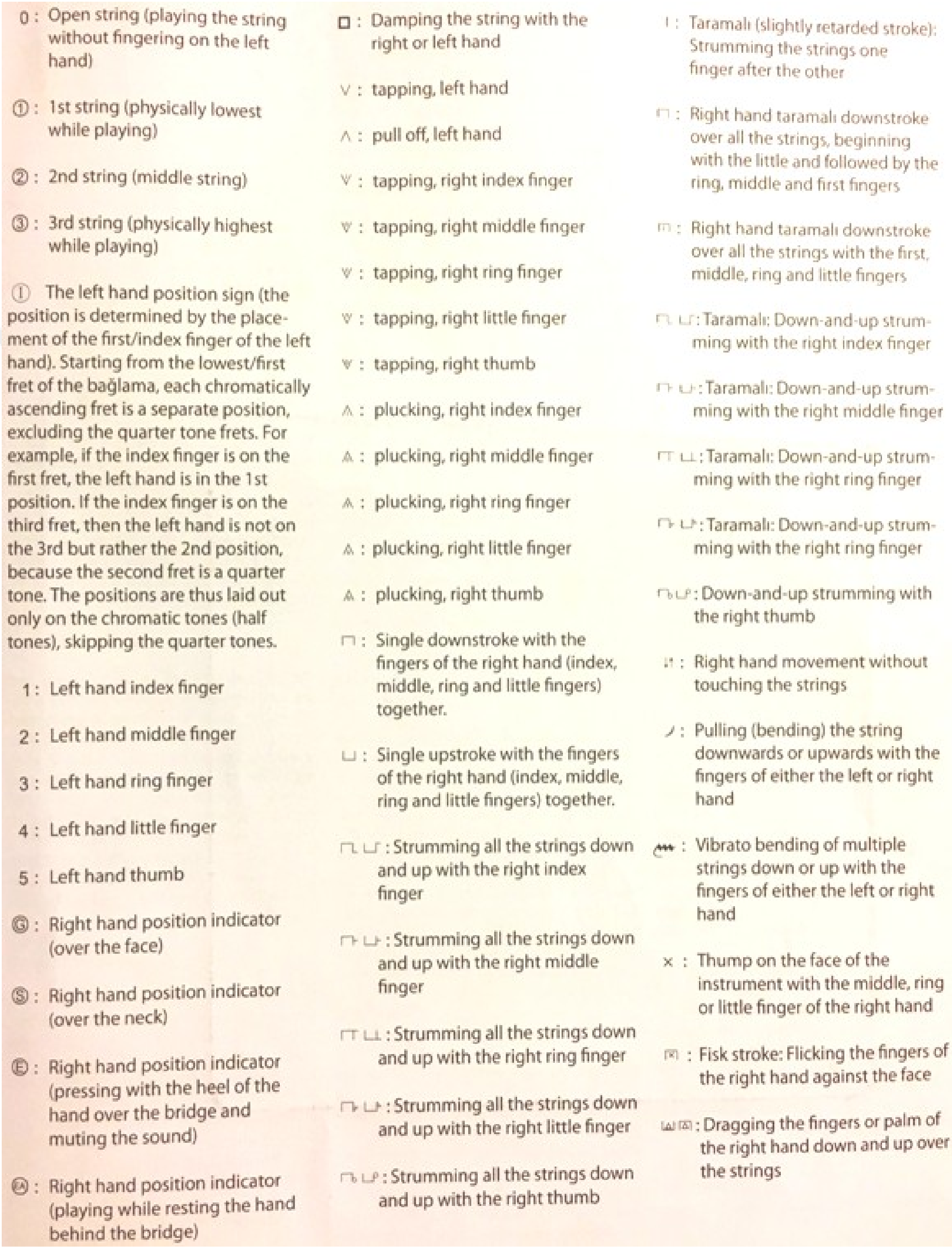
Badinerie: (Music: J. S. Bach) (Arrangement: Dinçer Serin - Sinan Ayyıldız)

Moonlight Sonata (Ay Işığı Sonatı) (Music: L. V. Beethoven) (Arrangement: Sinan Ayyıldız)

Table B.1. (continued) : Sinan Ayyıldız's curriculum for education of pickless playing technique. (Ayyıldız, 2018).

Sample songs for five *bağlama*s : Gül Türküsü (Arrangement: Erol Parlak *Bağlama* Beşlisi) Macar Dansı (Music: J. Brahms) (Arrangement: Sinan Ayyıldız) Fur Elise (Music: L. V. Beethoven) (Arrangement: Sinan Ayyıldız) İndim Koçbabayı Tavaf Eyledim (Arrangement: Sinan Ayyıldız) İstanbul Türküsü (Arrangement: Erol Parlak *Bağlama* Beşlisi) Moonlight Sonata (Music: L. V. Beethoven) (Arrangement: Sinan Ayyıldız)

APPENDIX C: EROL PARLAK'S TRANSCRIPTION SIGNS FOR PICKLESS *SAZ* PLAYING TECHNIQUE



0 : Open string (playing the string without fingering on the left hand)

① : 1st string (physically lowest while playing)

② : 2nd string (middle string)

③ : 3rd string (physically highest while playing)

Ⓘ The left hand position sign (the position is determined by the placement of the first/index finger of the left hand). Starting from the lowest/first fret of the bağlama, each chromatically ascending fret is a separate position, excluding the quarter tone frets. For example, if the index finger is on the first fret, the left hand is in the 1st position. If the index finger is on the third fret, then the left hand is not on the 3rd but rather the 2nd position, because the second fret is a quarter tone. The positions are thus laid out only on the chromatic tones (half tones), skipping the quarter tones.

1 : Left hand index finger

2 : Left hand middle finger

3 : Left hand ring finger

4 : Left hand little finger

5 : Left hand thumb

Ⓖ : Right hand position indicator (over the face)

Ⓢ : Right hand position indicator (over the neck)

Ⓔ : Right hand position indicator (pressing with the heel of the hand over the bridge and muting the sound)

Ⓐ : Right hand position indicator (playing while resting the hand behind the bridge)

□ : Damping the string with the right or left hand

V : tapping, left hand

Λ : pull off, left hand

V : tapping, right index finger

V : tapping, right middle finger

V : tapping, right ring finger

V : tapping, right little finger

V : tapping, right thumb

Λ : plucking, right index finger

Λ : plucking, right middle finger

Λ : plucking, right ring finger

Λ : plucking, right little finger

Λ : plucking, right thumb

⊓ : Single downstroke with the fingers of the right hand (index, middle, ring and little fingers) together.

⊔ : Single upstroke with the fingers of the right hand (index, middle, ring and little fingers) together.

⊓ ⊔ : Strumming all the strings down and up with the right index finger

⊓ ⊔ : Strumming all the strings down and up with the right middle finger

⊓ ⊔ : Strumming all the strings down and up with the right ring finger

⊓ ⊔ : Strumming all the strings down and up with the right little finger

⊓ ⊔ : Strumming all the strings down and up with the right thumb

I : Taramalı (slightly retarded stroke): Strumming the strings one finger after the other

⊓ : Right hand taramalı downstroke over all the strings, beginning with the little and followed by the ring, middle and first fingers

⊓ : Right hand taramalı downstroke over all the strings with the first, middle, ring and little fingers

⊓ ⊔ : Taramalı: Down-and-up strumming with the right index finger

⊓ ⊔ : Taramalı: Down-and-up strumming with the right middle finger

⊓ ⊔ : Taramalı: Down-and-up strumming with the right ring finger

⊓ ⊔ : Taramalı: Down-and-up strumming with the right ring finger

⊓ ⊔ : Down-and-up strumming with the right thumb

↕ : Right hand movement without touching the strings

↗ : Pulling (bending) the string downwards or upwards with the fingers of either the left or right hand

~ : Vibrato bending of multiple strings down or up with the fingers of either the left or right hand

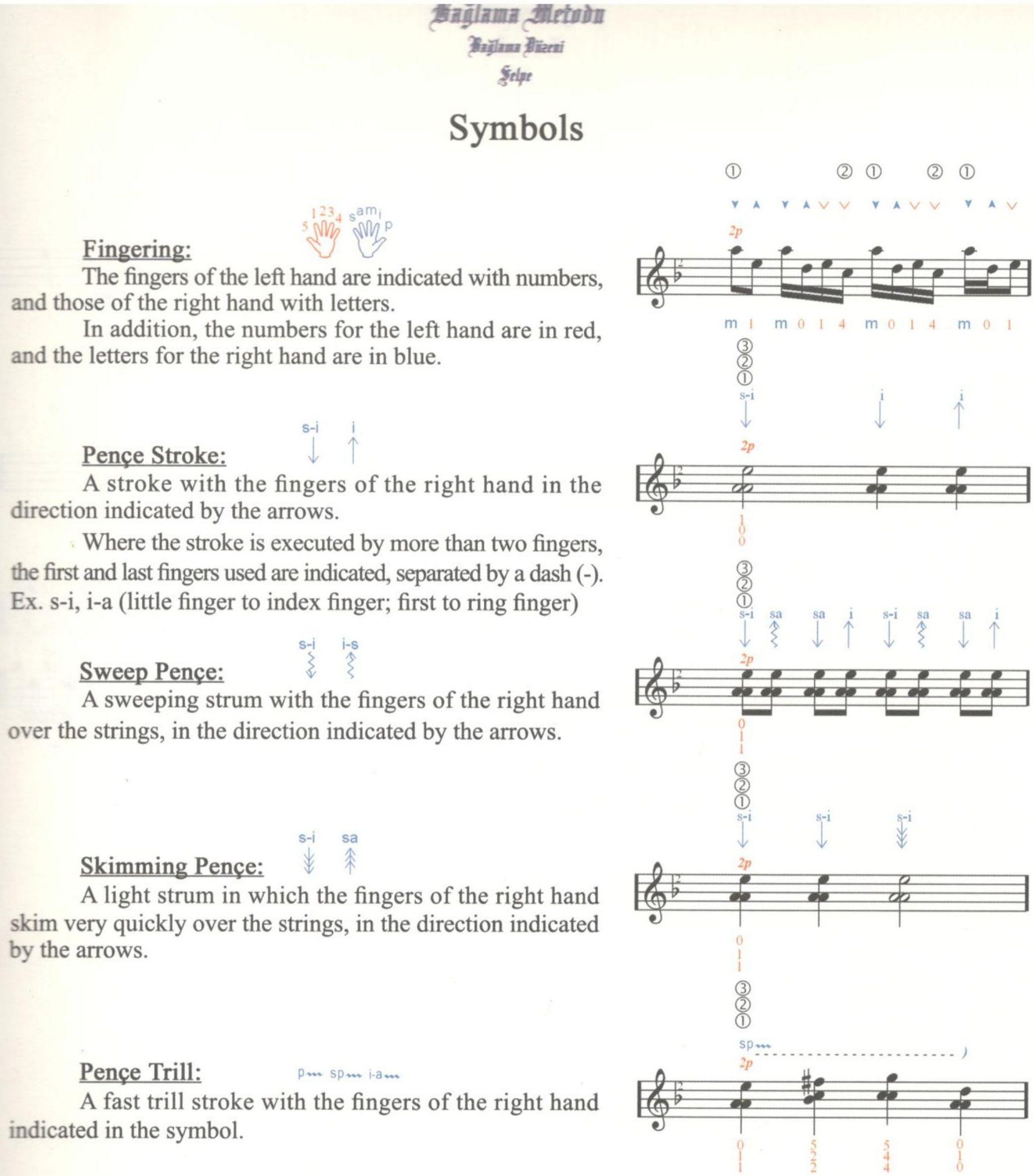
× : Thump on the face of the instrument with the middle, ring or little finger of the right hand

⊠ : Fisk stroke: Flicking the fingers of the right hand against the face

⊔ ⊠ : Dragging the fingers or palm of the right hand down and up over the strings

Figure C.1 : Erol Parlak's Transcription Signs and Explanations (Parlak, 2010).

APPENDIX D: ARİF SAĞ &ERDAL ERZİNCAN'S TRANSCRIPTION SIGNS FOR PICKLESS *SAZ* PLAYING TECHNIQUE


Bağlama Metodu

Bağlama Düzeni

Selpe

Symbols

Fingering:

The fingers of the left hand are indicated with numbers, and those of the right hand with letters.

In addition, the numbers for the left hand are in red, and the letters for the right hand are in blue.

Pençe Stroke:

A stroke with the fingers of the right hand in the direction indicated by the arrows.

Where the stroke is executed by more than two fingers, the first and last fingers used are indicated, separated by a dash (-). Ex. s-i, i-a (little finger to index finger; first to ring finger)

Sweep Pençe:

A sweeping strum with the fingers of the right hand over the strings, in the direction indicated by the arrows.

Skimming Pençe:

A light strum in which the fingers of the right hand skim very quickly over the strings, in the direction indicated by the arrows.

Pençe Trill:

A fast trill stroke with the fingers of the right hand indicated in the symbol.

Figure D.1 : Arif Sağ & Erdal Erzincan transcription signs and explanations (Sağ and Erzincan, 2009).

Hammer-Pulloff (Tapping) (rigth hand):

Vurma Çekme 1 Çekme 2

Hammer: A note executed by striking the indicated fret with the fingers of the right hand.

Pulloff: A note obtained by pulling a finger of the right hand off of the string already stopped on the fret indicated.

Pulloff 2: A note obtained by pulling a finger of the right hand off a string independently of any previously stopped fret.

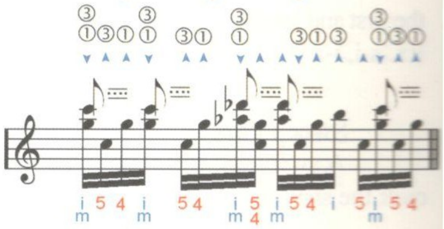
Plucking: p - i - m - a - s

Plucking the strings with the fingers of the right hand indicated above the staff.

Flick: x.

Flicking the fingers of the right hand outwards to strike the face of the instrument as the strings are sounded.

Hold Symbol:



This indicates that the note obtained when fingering any given fret should be held for the indicated time.

Straight broken lines in three rows indicate the sounds of the 3rd, 2nd and 1st strings (3rd being the uppermost string and I being the lowermost).

The straight line or lines here indicate the string on which the held note is to be played.

Figure D.1 (continued) : Arif Sağ & Erdal Erzincan transcription signs and explanations (Sağ and Erzincan, 2009)**.**

APPENDIX E: FINGERING TYPES OF LEFT HAND

L(0) Fingering Type (Position Symbol : $_{0}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2	3	4
2nd st.	1	2	3	4
3rd st.		5	3	4

$_{0}\mathbf{V}$

(b) **(c)**

Figure E.1 : L(0) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) Fingering Type (Position Symbol : $_{i}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2	3	4
2nd st.	1	2	3	4
3rd st.	1	5	3	4

$_{i}\mathbf{V}$

(b) **(c)**

Figure E.2 : L(i) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) Fingering Type (Position Symbol : +P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2	3	4
2nd st.	1	2	3	4
3rd st.	5	1	3	4

(b) (c)

Figure E.3 : L(+) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(++) Fingering Type (Position Symbol : ‡P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2	3	4
2nd st.	1	2	3	4
3rd st.	5	1	3	4

(b) (c)

Figure E.4 : L(++) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) Fingering Type (Position Symbol : _P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2	3	4
2nd st.	1	2	3	4
3rd st.			5	4

(b) (c)

Figure E.5 : L(-) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(f) Fingering Type (Position Symbol : $_f$P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2	3	4
2nd st.		5	3	4
3rd st.		5	3	4

(b) (c)

Figure E.6 : L(f) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(f) Fingering Type (Position Symbol : $+_{f}$P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2	3	4
2nd st.	5	2	3	4
3rd st	5	2	3	4

(b) (c)

Figure E.7 : L(+)&L(f) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(++) & L(f) Fingering Type (Position Symbol : ‡$_{f}$P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.		1	2	3	4
2nd st.	5	1	2	3	4
3rd st	5	1	2	3	4

(b) (c)

Figure E.8 : L(++)&L(f) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(f) Fingering Type (Position Symbol : $_{-f}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2	3	4
2nd st.			5	4
3rd st.			5	4

(b)

(c)

Figure E.9 : L(-)&L(f) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+1) Fingering Type (Position Symbol : $^{1}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1		2	3	4
2nd st.	1		2	3	4
3rd st			5	3	4

(b)

(c)

Figure E.10 : L(+1) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(+1) Fingering Type (Position Symbol : $^{1}_{i}$P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1		2	3	4
2nd st.	1		2	3	4
3rd st	1		2	3	4

(b)

(c)

Figure E.11 : L(i)&L(+1) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(+1) Fingering Type (Position Symbol : $^{1}_{+}$P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1		2	3	4
2nd st.	1		2	3	4
3rd st	1	5	2	3	4

(b)

(c)

Figure E.12 : L(+)&L(+1) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(++) & L(+1) Fingering Type (Position Symbol : $\overset{1}{\ddagger}$P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1		2	3	4
2nd st.	1		2	3	4
3rd st	5		2	3	4

(b) **(c)**

Figure E.13 :L(++)&L(+1) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+3,+4) Fingering Type (Position Symbol : ^{3,4}P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1	2		3	4
2nd st.	1	2		3	4
3rd st		5		3	4

(b) **(c)**

Figure E.14 : L(+3,+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(+3,+4) Fingering Type (Position Symbol : ${}^{3,4}_{i}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1	2		3	4
2nd st.	1	2		3	4
3rd st	1	2		3	4

(b) **(c)**

Figure E.15 : L(i)&L(+3,+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(+3,+4) Fingering Type (Position Symbol : ${}^{3,4}_{+}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1	2		3	4
2nd st.	1	2		3	4
3rd st	5	2		3	4

(b) **(c)**

Figure E.16 : L(+)&L(+3,+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(+3,+4) Fingering Type (Position Symbol : $^{3,\underline{4}}$**P**)

(a)

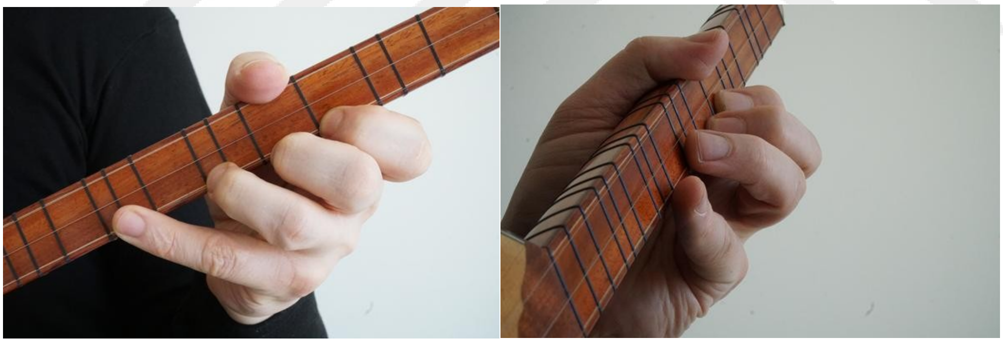
	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1	2		3	4
2nd st.	1	2		3	4
3rd st			5	3	4

(b) **(c)**

Figure E.17 : L(-)&L(+3,+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation

---

L(+4) Fingering Type (Position Symbol : ^{4}**P**).



(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1	2	3		4
2nd st.	1	2	3		4
3rd st		5	3		4

(b) **(c)**

Figure E.18 : L(+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(+4) Fingering Type (Position Symbol : $^{4}_{i}$P)

(a)

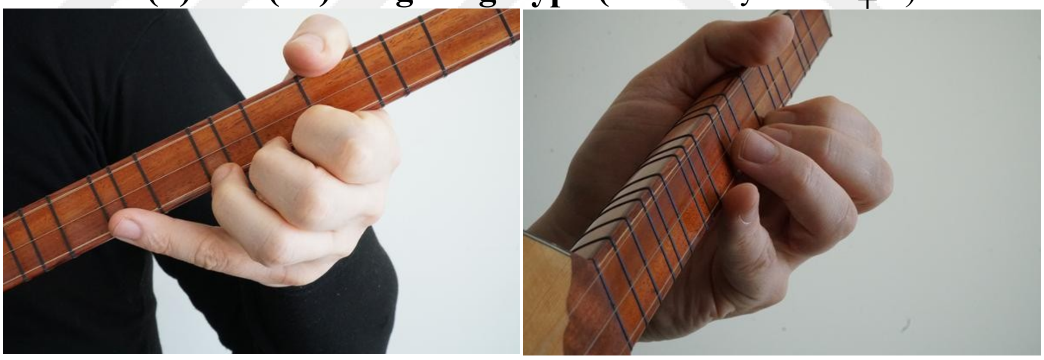
	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1	2	3		4
2nd st.	1	2	3		4
3rd st	1	2	3		4

(b)

(c)

Figure E.19 : L(i)&L(+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(+4) Fingering Type (Position Symbol : $^{4}_{+}$P)



(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1	2	3		4
2nd st.	1	2	3		4
3rd st	5	2	3		4

(b)

(c)

Figure E.20 : L(+)&L(+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(+4) Fingering Type (Position Symbol : $^{\underline{4}}$P)

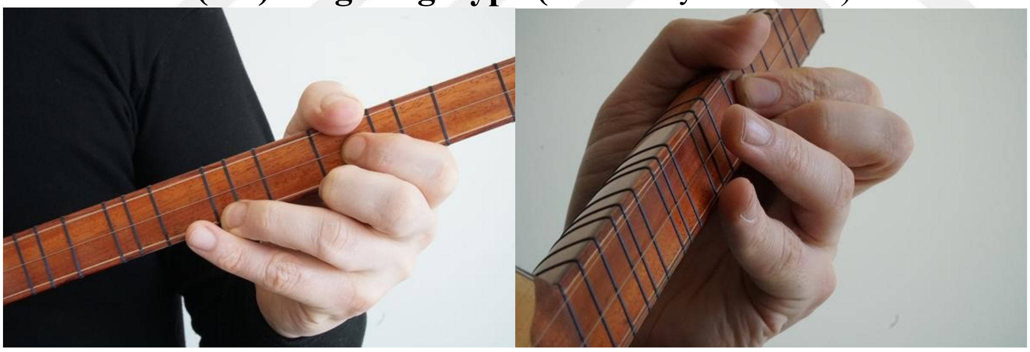
(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1	2	3		4
2nd st.	1	2	3		4
3rd st			5		4

(b) **(c)**

Figure E.21 : L(-)&L(+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+2l) Fingering Type (Position Symbol : ^{2}P)



(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1,2		3	4
2nd st.	1,2		3	4
3rd st	5		3	4

(b) **(c)**

Figure E.22 : L(+2l) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(+2l) Fingering Type (Position Symbol : ${}_{i}^{2}\mathbf{P}$)

(a)

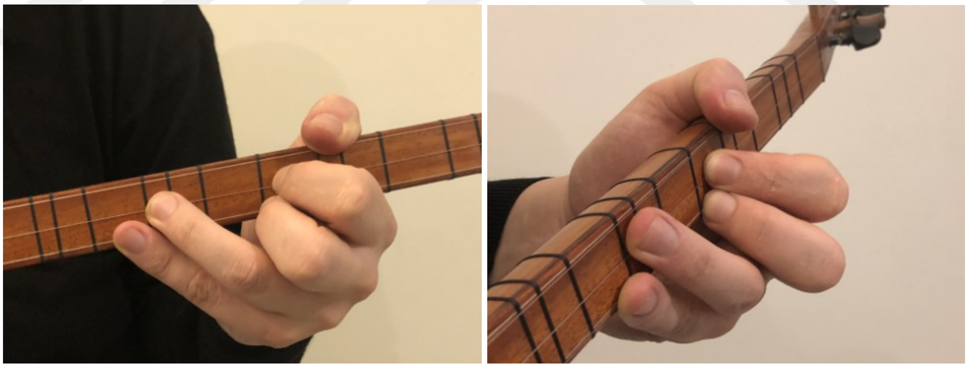
	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1,2		3	4
2nd st.	1,2		3	4
3rd st	1,2		3	4

(b)

(c)

Figure E.23 : L(i)&L(+2l) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(+2l) Fingering Type (Position Symbol : ${}_{+}^{2}\mathbf{P}$)



(a)

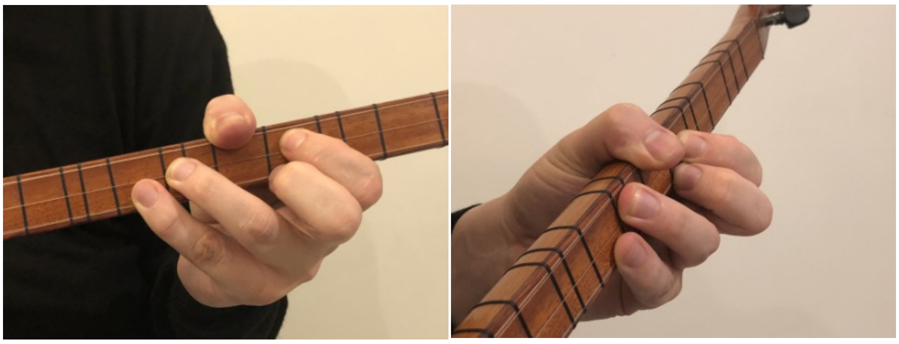
	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.		1,2		3	4
2nd st.		1,2		3	4
3rd st.	5	1,2		3	4

(b)

(c)

Figure E.24 : L(+)&L(+2l) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(+2l) Fingering Type (Position Symbol : $^{\underline{2}}$**P**)



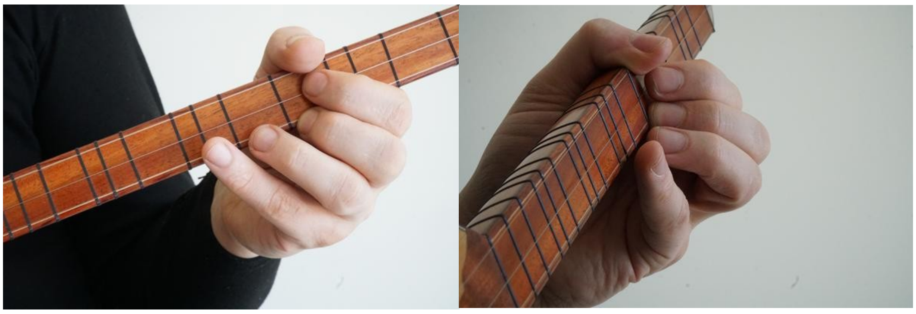
(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1,2		3	4
2nd st.	1,2		3	4
3rd st.		5	3	4

(b) **(c)**

Figure E.25 : L(-)&L(+2l) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-1) Fingering Type (Position Symbol : $^{-1}$**P**)



(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1,2	3	4
2nd st.	1,2	3	4
3rd st.	5	3	4

(b) **(c)**

Figure E.26 : L(-1) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(-1) Fingering Type (Position Symbol : ${}^{-1}_{i}\mathbf{P}$)

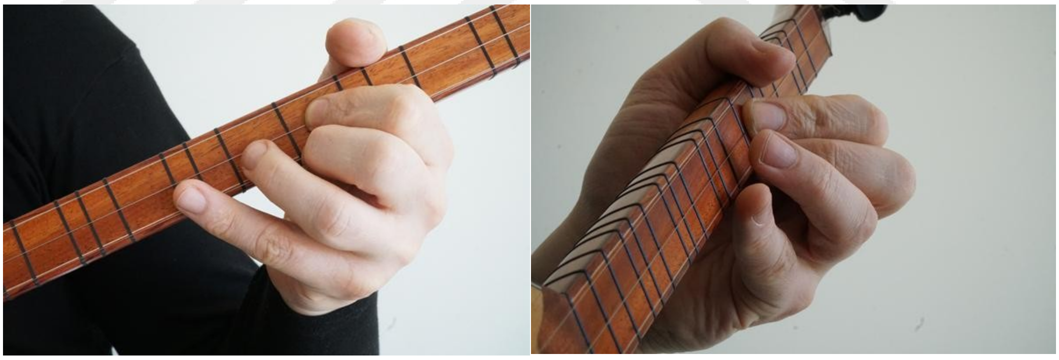
(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1,2	3	4
2nd st.	1,2	3	4
3rd st.	1,2	3	4

(b) (c)

Figure E.27 : L(i)&L(-1) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(-1) Fingering Type (Position Symbol : ${}^{-1}_{+}\mathbf{P}$)



(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.		1,2	3	4
2nd st.		1,2	3	4
3rd st.	5	1,2	3	4

(b) (c)

Figure E.28 : L(+)&L(-1) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(-1) Fingering Type (Position Symbol : $^{-1}\mathrm{P}$)

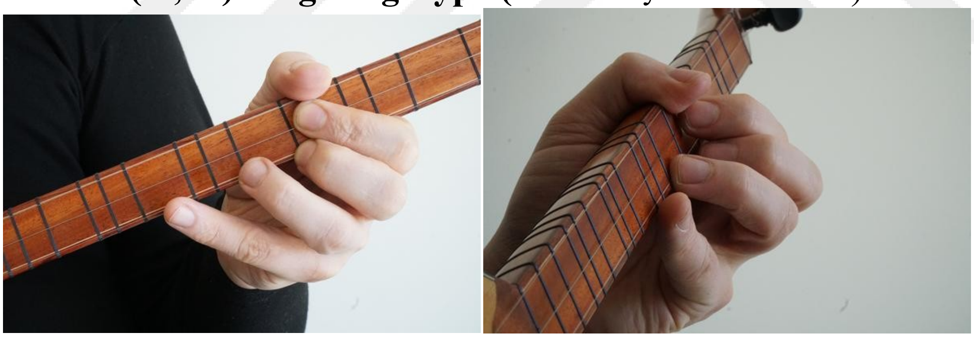
(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1,2	3	4
2nd st.	1,2	3	4
3rd st.	1,2	5	4

(b) (c)

Figure E.29 : L(-)&L(-1) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-1,+4) Fingering Type (Position Symbol : $^{4,-1}\mathrm{P}$)



(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1,2	3		4
2nd st.	1,2	3		4
3rd st.	5	3		4

(b) (c)

Figure E.30 : L(-1,+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(-1,+4) Fingering Type (Position Symbol : ${}^{4,-1}_{i}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1,2	3		4
2nd st.	1,2	3		4
3rd st.	1,2	3		4

(b)

(c)

Figure E.31 : L(i)&L(-1,+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(-1,+4) Fingering Type (Position Symbol : ${}^{4,-1}_{+}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.		1,2	3		4
2nd st.		1,2	3		4
3rd st.	5	1,2	3		4

(b)

(c)

Figure E.32 : L(+)&L(-1,+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(-1,+4) Fingering Type (Position Symbol : $^{4,-\underline{1}}\mathbf{P}$)

(a)

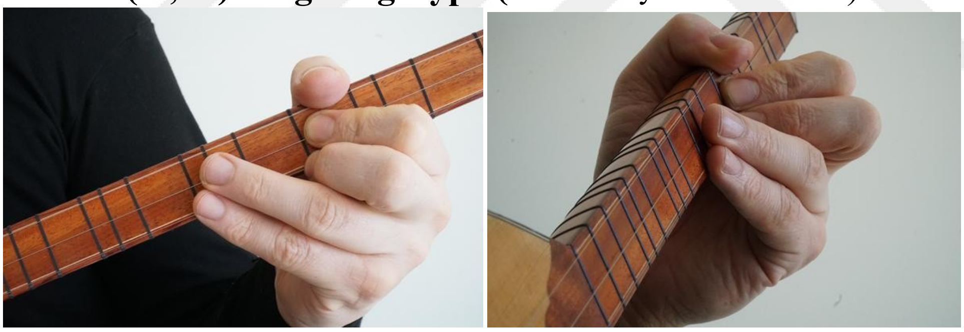
	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1,2	3		4
2nd st.	1,2	3		4
3rd st.		5		4

(b)

(c)

Figure E.33 : L(-)&L(-1,+4) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-1,+3) Fingering Type (Position Symbol : $^{3,-1}\mathbf{P}$)



(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1,2		3,4
2nd st.	1,2		3,4
3rd st.	5		3,4

(b)

(c)

Figure E.34 : L(-1,+3) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(-1,+3) Fingering Type (Position Symbol : ${}^{3,-1}_{i}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1,2		3,4
2nd st.	1,2		3,4
3rd st.	1,2		3,4

(b) **(c)**

Figure E.35 : L(i)&L(-1,+3) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(-1,+3) Fingering Type (Position Symbol : ${}^{3,-1}_{+}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.		1,2		3,4
2nd st.		1,2		3,4
3rd st.	5	1,2		3,4

(b) **(c)**

Figure E.36 : L(+)&L(-1,+3) fingering type : (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(-1,+3) Fingering Type (Position Symbol : $^{3,-\underline{1}}$P)

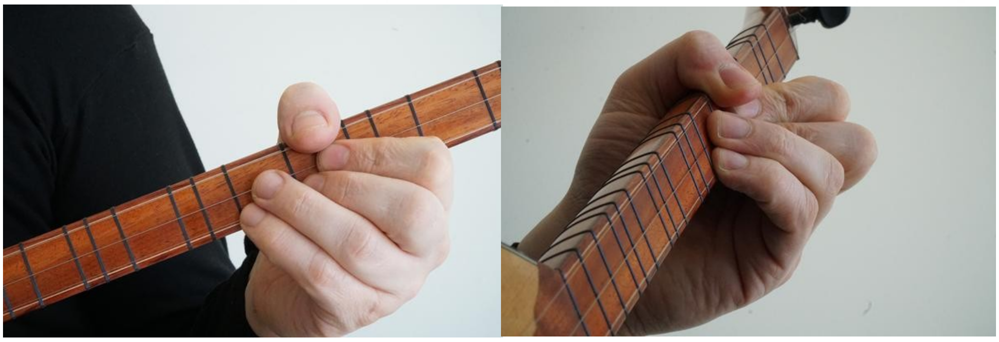
(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1,2		3,4
2nd st.	1,2		3,4
3rd st.		5	3,4

(b) **(c)**

Figure E.37 : L(-)&L(-1,+3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-1,-4) Fingering Type (Position Symbol : $^{-1,-4}$P)



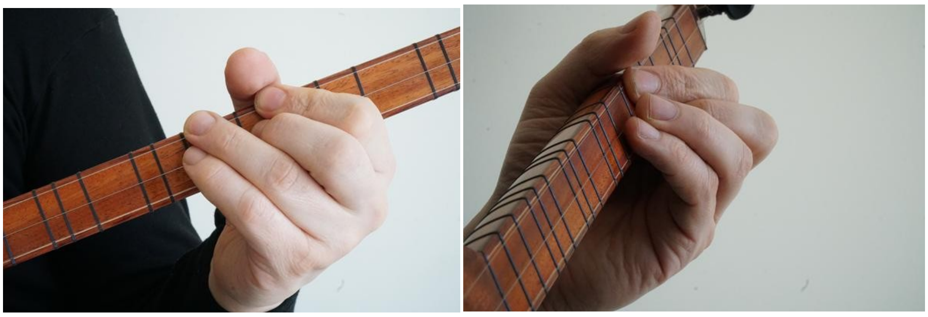
(a)

	c.c. 1	c.c. 2
1st st.	1,2	3,4
2nd st.	1,2	3,4
3rd st.	5	3,4

(b) **(c)**

Figure E.38 : L(-1,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(-1,-4) Fingering Type (Position Symbol : ${}^{-1,-4}_{i}\mathbf{P}$)



(a)

	c.c. 1	c.c. 2
1st st.	1,2	3,4
2nd st.	1,2	3,4
3rd st.	1,2	3,4

(b)

(c)

Figure E.39 : L(i)&L(-1,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(-1,-4) Fingering Type (Position Symbol : ${}^{-1,-4}_{+}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.		1,2	3,4
2nd st.		1,2	3,4
3rd st.	5	1,2	3,4

(b)

(c)

Figure E.40 : L(+)&L(-1,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(-1,-4) Fingering Type (Position Symbol : $^{-1,-\underline{4}}\mathbf{P}$)

(a)

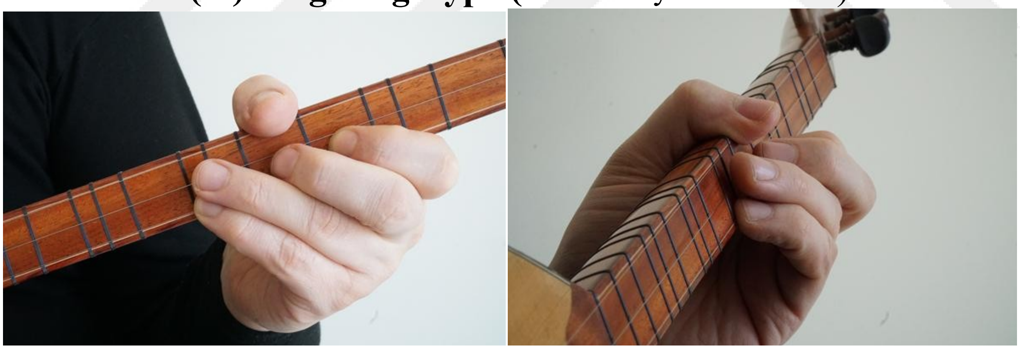
	c.c. 1	c.c. 2
1st st.	1,2	3,4
2nd st.	1,2	3,4
3rd st.	1,2	3,4

(b)

(c)

Figure E.41 : L(-)&L(-1,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-4) Fingering Type (Position Symbol : $^{-4}\mathbf{P}$)



(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1	2	3,4
2nd st.	1	2	3,4
3rd st.		5	3,4

(b)

(c)

Figure E.42 : L(-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(-4) Fingering Type (Position Symbol : $^{-4}_{i}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1	2	3,4
2nd st.	1	2	3,4
3rd st.	1	2	3,4

(b)

(c)

Figure E.43 : L(i)&L(-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(-4) Fingering Type (Position Symbol : $^{-4}_{+}\mathbf{P}$)

(a)

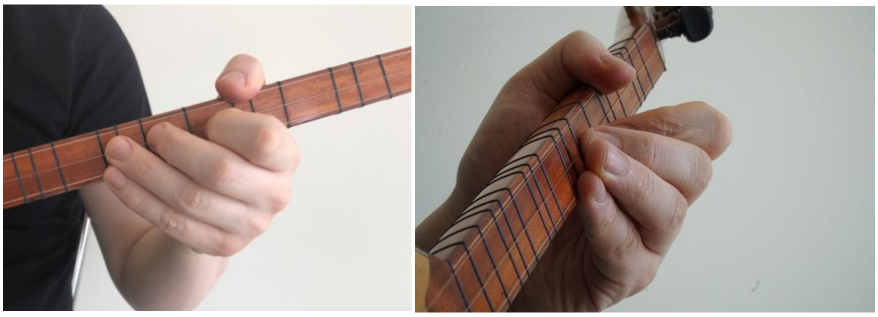
	c.c. 1	c.c. 2	c.c. 3
1st st.	1	2	3,4
2nd st.	1	2	3,4
3rd st.	5	2	3,4

(b)

(c)

Figure E.44 : L(+)&L(-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(++) & L(-4) Fingering Type (Position Symbol : $^{-4}_{\ddagger}$**P**)



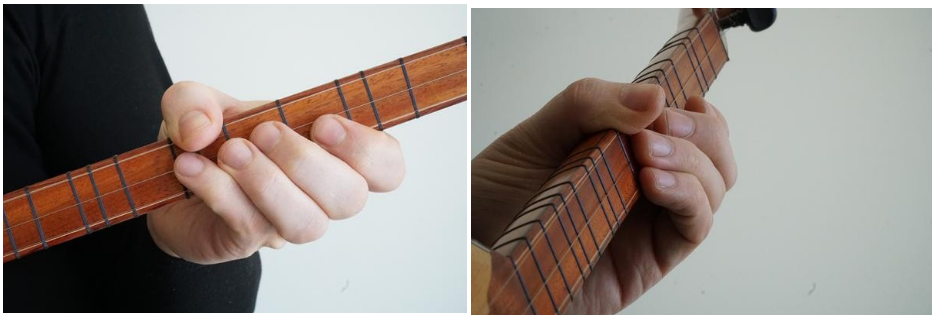
(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.		1	2	3,4
2nd st.		1	2	3,4
3rd st.	5	1	2	3,4

(b) **(c)**

Figure E.45 : L(++)&L(-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(-4) Fingering Type (Position Symbol : $^{-4}_{-}$**P**)



(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1	2	3,4
2nd st.	1	2	3,4
3rd st.			5

(b) **(c)**

Figure E.46 : L(-)&L(-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+3) Fingering Type (Position Symbol : ^{3}P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2		3,4
2nd st.	1	2		3,4
3rd st.		5		3,4

(b) (c)

Figure E.47 : L(+3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(+3) Fingering Type (Position Symbol : $^{3}_{i}$P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2		3,4
2nd st.	1	2		3,4
3rd st.	1	2		3,4

(b) (c)

Figure E.48 : L(i)&L(+3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(+3) Fingering Type (Position Symbol : ${}^{3}_{+}$P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2		3,4
2nd st.	1	2		3,4
3rd st.	5	2		3,4

(b)

(c)

Figure E.49 : L(+)&L(+3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(+3) Fingering Type (Position Symbol : ${}^{3}_{-}$P)

(a)

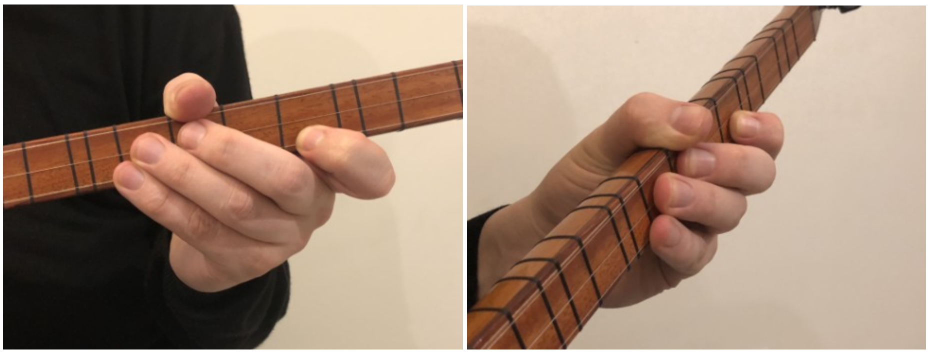
	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2		3,4
2nd st.	1	2		3,4
3rd st.			5	3,4

(b)

(c)

Figure E.50 : L(-)&L(+3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+2m,+3) Fingering Type (Position Symbol : $^{m,3}\mathbf{P}$)



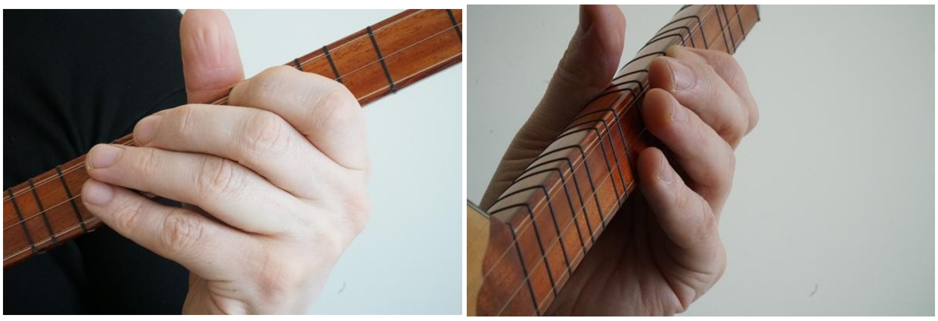
(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1		2	3,4
2nd st.	1		2	3,4
3rd st.			5	3,4

(b) **(c)**

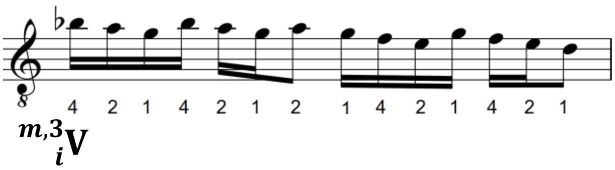
Figure E.51 : L(+2m,+3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(+2m,+3) Fingering Type (Position Symbol : $^{m,3}_{i}\mathbf{P}$)



(a)

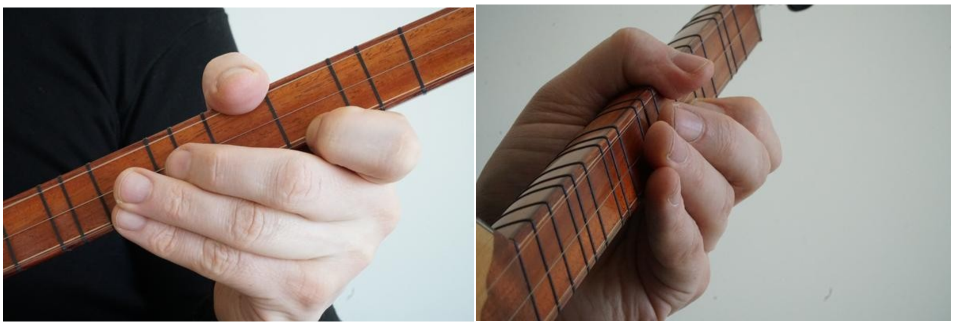
	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1		2	3,4
2nd st.	1		2	3,4
3rd st.	1		2	3,4



(b) **(c)**

Figure E.52 : L(i)&L(+2m,+3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(+2m,+3) Fingering Type (Position Symbol : $^{m,3}_{+}\mathbf{P}$)



(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1		2	3,4
2nd st.	1		2	3,4
3rd st.		5	2	3,4

(b) **(c)**

Figure E.53 : L(+)&L(+2m,+3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(++) & L(+2m,+3) Fingering Type (Position Symbol : $^{m,3}_{\ddagger}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1		2	3,4
2nd st.	1		2	3,4
3rd st.	5		2	3,4

(b) **(c)**

Figure E.54 : L(++)&L(+2m,+3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(+2m,+3) Fingering Type (Position Symbol : $^{m,\underline{3}}\mathbf{P}$)

(a)

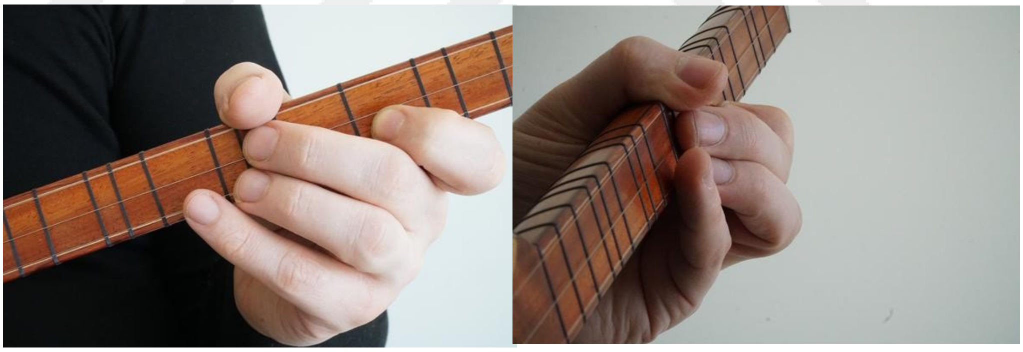
	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1		2	3,4
2nd st.	1		2	3,4
3rd st.				5

(b)

(c)

Figure E.55 : L(-)&L(+2m,+3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+2m) Fingering Type (Position Symbol : $^{m}\mathbf{P}$)



(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1		2,3	4
2nd st.	1		2,3	4
3rd st.			5	4

(b)

(c)

Figure E.56 : L(+2m) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(+2m) Fingering Type (Position Symbol : $^{m}_{i}$P)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1		2,3	4
2nd st.	1		2,3	4
3rd st.	1		2,3	4

(b) **(c)**

Figure E.57 : L(i)&L(+2m) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(+2m) Fingering Type (Position Symbol : $^{m}_{+}$P)

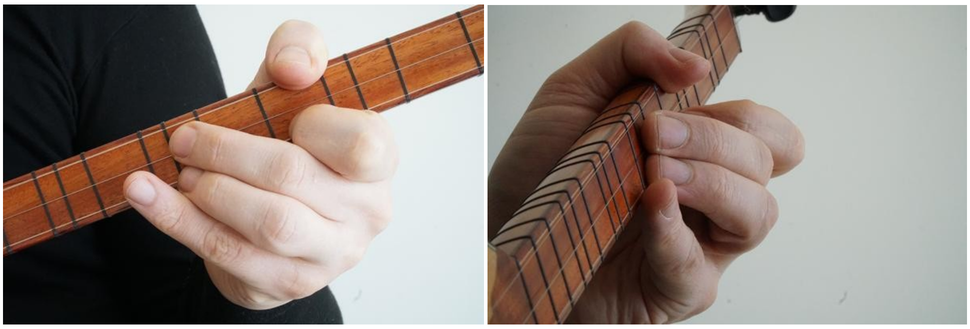
(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1		2,3	4
2nd st.	1		2,3	4
3rd st.		5	2,3	4

(b) **(c)**

Figure E.58 : L(+)&L(+2m) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(++) & L(+2m) Fingering Type (Position Symbol : $\overset{m}{\underset{\ddagger}{\mathbf{P}}}$)



(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1		2,3	4
2nd st.	1		2,3	4
3rd st.	5		2,3	4

(b)

(c)

Figure E.59 : L(++)&L(+2m) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-3) Fingering Type (Position Symbol : $^{-3}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2,3		4
2nd st.	1	2,3		4
3rd st.		5		4

(b)

(c)

Figure E.60 : L(-3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(-3) Fingering Type (Position Symbol : ${}^{-3}_{i}\mathrm{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2,3		4
2nd st.	1	2,3		4
3rd st.	1	2,3		4

(b)

(c)

Figure E.61 : L(i)&L(-3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(-3) Fingering Type (Position Symbol : ${}^{-3}_{+}\mathrm{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2,3		4
2nd st.	1	2,3		4
3rd st.	5	2,3		4

(b)

(c)

Figure E.62 : L(+)&L(-3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(++) & L(-3) Fingering Type (Position Symbol : $^{-3}_{\ddagger}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.		1	2,3		4
2nd st.		1	2,3		4
3rd st.	5	1	2,3		4

(b) (c)

Figure E.63 : L(++)&L(-3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-) & L(-3) Fingering Type (Position Symbol : $^{-3}_{-}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.	1	2,3		4
2nd st.	1	2,3		4
3rd st.			5	4

(b) (c)

Figure E.64 : L(-)&L(-3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+1,-3) Fingering Type (Position Symbol : $^{1,-3}\mathbf{P}$)

(a)

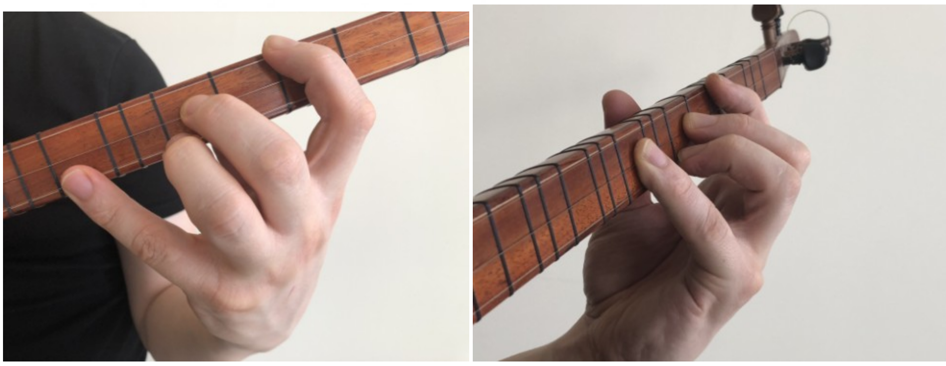
	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1		2,3		4
2nd st.	1		2,3		4
3rd st.			5		4

(b)

(c)

Figure E.65 : L(+1,-3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(+1,-3) Fingering Type (Position Symbol : $^{1,-3}_{i}\mathbf{P}$)



(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1		2,3		4
2nd st.	1		2,3		4
3rd st.	1		2,3		4

(b)

(c)

Figure E.66 : L(i)&L(+1,-3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) and L(+1,-3) Fingering Type (Position Symbol : ${}^{1,-3}_{+}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4	c.c. 5
1st st.	1		2,3		4
2nd st.	1		2,3		4
3rd st.		5	2,3		4

(b)

(c)

Figure E.67 : L(+)&L(+1,-3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-1,-3) Fingering Type (Position Symbol : ${}^{v,+4}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1,2,3		4
2nd st.	1,2,3		4
3rd st.	5		4

(b)

(c)

Figure E.68 : L(-1,-3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(-1,-3) Fingering Type (Position Symbol : $^{v,+4}_{\ i}\mathbf{P}$)

(a)

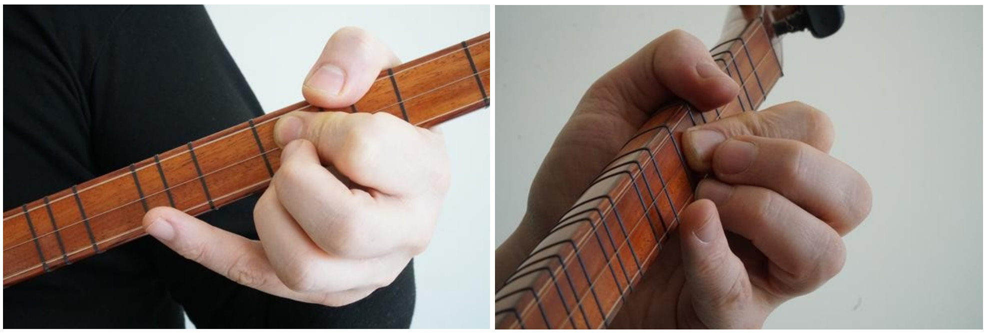
	c.c. 1	c.c. 2	c.c. 3
1st st.	1,2,3		4
2nd st.	1,2,3		4
3rd st.	1,2,3		4

(b)

(c)

Figure E.69 : L(i)&L(-1,-3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+)& L(-1,-3) Fingering Type (Position Symbol : $^{v,+4}_{\ +}\mathbf{P}$)



(a)

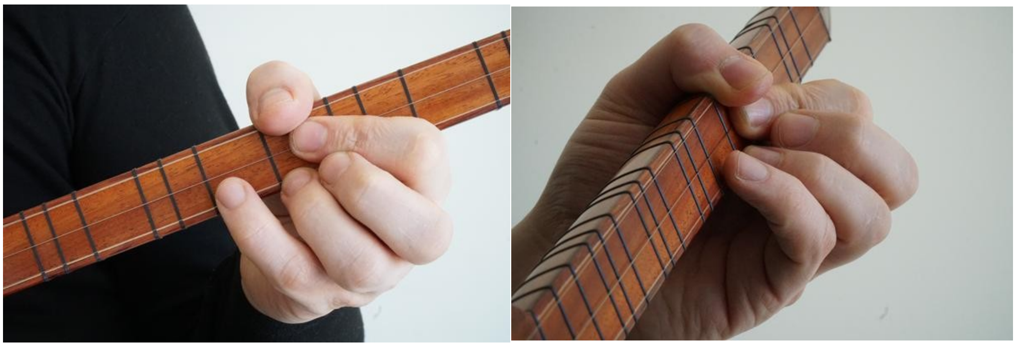
	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.		1,2,3		4
2nd st.		1,2,3		4
3rd st.	5	1,2,3		4

(b)

(c)

Figure E.70 : L(+)&L(-1,-3) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-1,-3,-4) Fingering Type (Position Symbol : ^{v4}P)



(a)

	c.c. 1	c.c. 2
1st st.	1,2,3	4
2nd st.	1,2,3	4
3rd st.	5	4

(b)

(c)

Figure E.71 : L(-1,-3,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(-1,-3,-4) Fingering Type (Position Symbol : $^{v4}_{i}$P)

(a)

	c.c. 1	c.c. 2
1st st.	1,2,3	4
2nd st.	1,2,3	4
3rd st.	1,2,3	4

(b)

(c)

Figure E.72 : L(i)&L(-1,-3,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+)& L(-1,-3,-4) Fingering Type (Position Symbol : $^{v4}_{+}$P)

(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.		1,2,3	4
2nd st.		1,2,3	4
3rd st.	5	1,2,3	4

(b) **(c)**

Figure E.73 : L(+)&L(-1,-3,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(++)& L(-1,-3,-4) Fingering Type (Position Symbol : $^{v4}_{\ddagger}$P)

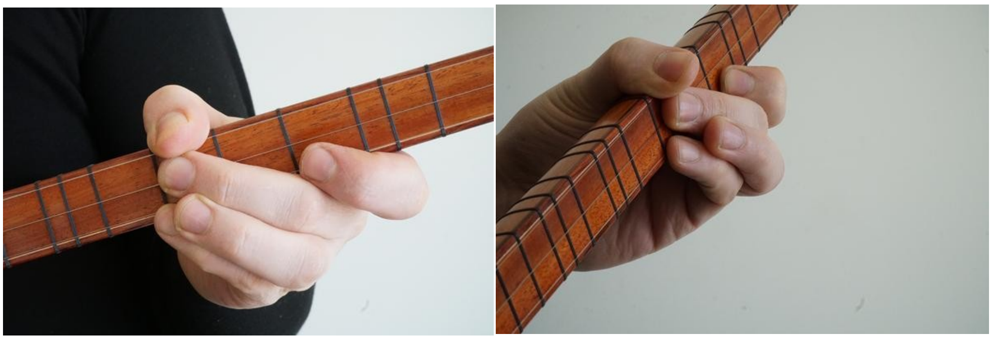
(a)

	c.c. 1	c.c. 2	c.c. 3	c.c. 4
1st st.			1,2,3	4
2nd st.			1,2,3	4
3rd st.	5		1,2,3	4

(b) **(c)**

Figure E.74 : L(++)&L(-1,-3,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+2m,-4) Fingering Type (Position Symbol : ${}^{+1,v}\mathbf{P}$)



(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1		2,3,4
2nd st.	1		2,3,4
3rd st.			5

(b)

(c)

Figure E.75 : L(+2m,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(+2m,-4) Fingering Type (Position Symbol : ${}^{+1,v}_{i}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1		2,3,4
2nd st.	1		2,3,4
3rd st.	1		2,3,4

(b)

(c)

Figure E.76 : L(i)&L(+2m,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(+2m,-4) Fingering Type (Position Symbol : $^{+1,v}_{+}\mathbf{P}$)

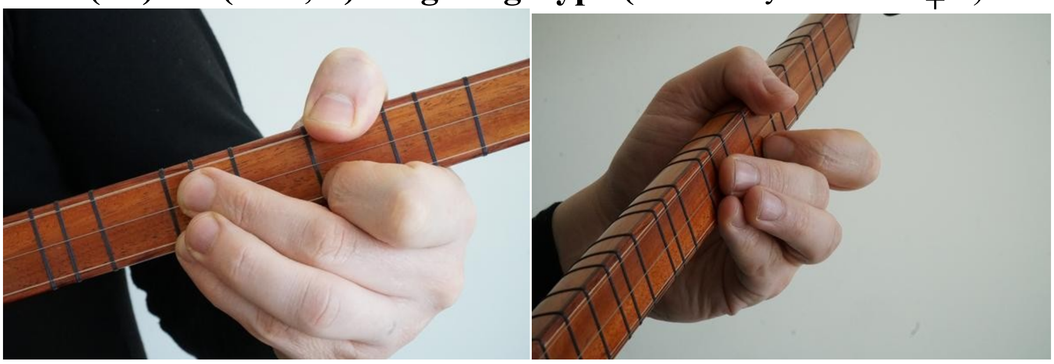
(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1		2,3,4
2nd st.	1		2,3,4
3rd st.		5	2,3,4

(b) **(c)**

Figure E.77 : L(+)&L(+2m,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(++)& L(+2m,-4) Fingering Type (Position Symbol : $^{+1,v}_{+}\mathbf{P}$)



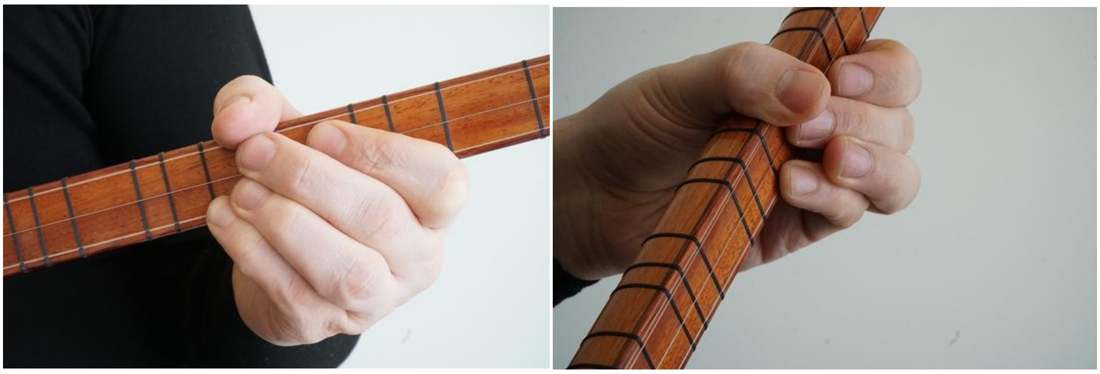
(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.	1		2,3,4
2nd st.	1		2,3,4
3rd st.	5		2,3,4

(b) **(c)**

Figure E.78 : L(++)&L(+2m,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-1,+2m,-4) Fingering Type (Position Symbol : ^{1v}P)



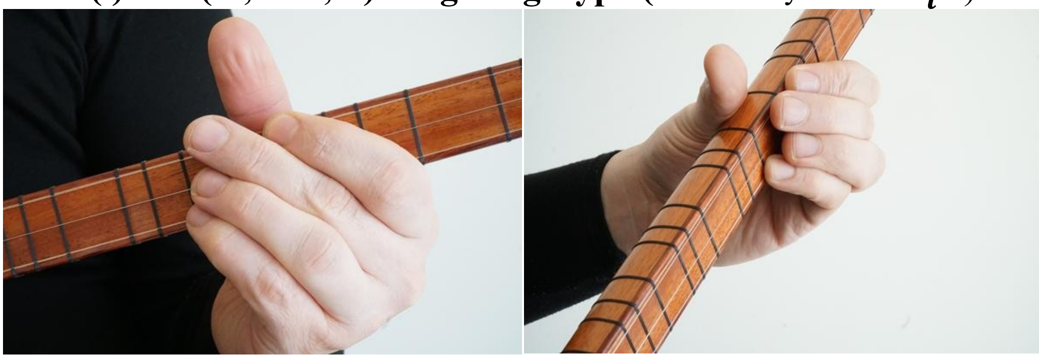
(a)

	c.c. 1	c.c. 2
1^{st} st.	1	2,3,4
2^{nd} st.	1	2,3,4
3^{rd} st.	1	5

(b) **(c)**

Figure E.79 : L(-1,+2m,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(-1,+2m,-4) Fingering Type (Position Symbol : $^{1v}_{i}$P)



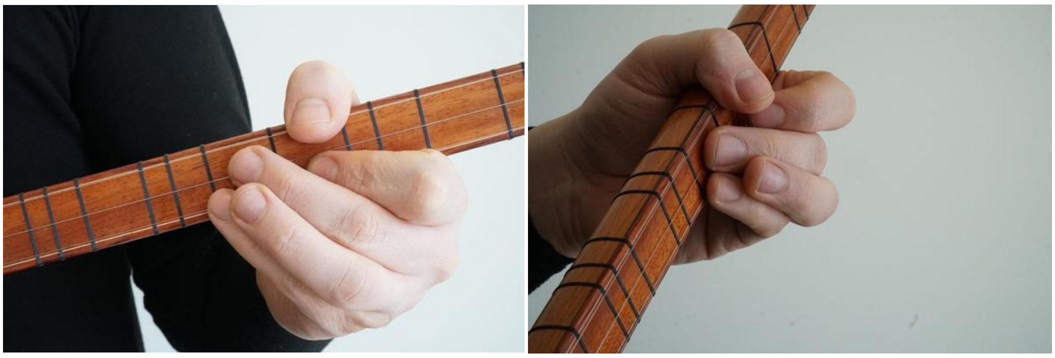
(a)

	c.c. 1	c.c. 2
1^{st} st.	1	2,3,4
2^{nd} st.	1	2,3,4
3^{rd} st.	1	2,3,4

(b) **(c)**

Figure E.80 : L(i)&L(-1,+2m,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+) & L(-1,+2m,-4) Fingering Type (Position Symbol : $^{1v}_{+}$P)



(a)

	c.c. 1	c.c. 2
1st st.	1	2,3,4
2nd st.	1	2,3,4
3rd st.	5	2,3,4

(b)

(c)

Figure E.81 : L(+)&L(-1,+2m,-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(++) & L(-1,+2m,-4) Fingering Type (Position Symbol : $^{1v}_{‡}$P)

(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.		1	2,3,4
2nd st.		1	2,3,4
3rd st.	5	1	2,3,4

(b)

(c)

Figure E.82 : L(++)&L(-1,+2m,-4) fingering type fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(-1,-3,(-)-4) Fingering Type (Position Symbol : $^{v}\mathbf{P}$)

(a)

	c.c. 1
1st st.	1,2,3,4
2nd st.	1,2,3,4
3rd st.	5

(b)

(c)

Figure E.83 : L(-1,-3,(-)-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(i) & L(-1,-3,(-)-4) Fingering Type (Position Symbol : $^{v}_{i}\mathbf{P}$)

(a)

	c.c. 1
1st st.	1,2,3,4
2nd st.	1,2,3,4
3rd st.	1,2,3,4

(b)

(c)

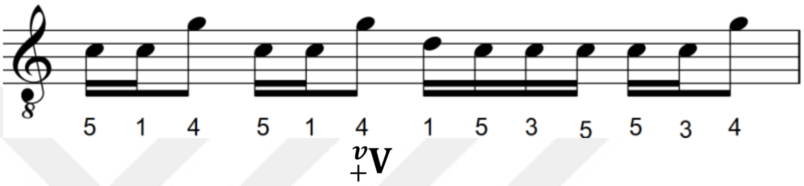
Figure E.84 : L(i)&L(-1,-3,(-)-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(+)& L(-1,-3,(-)-4) Fingering Type (Position Symbol : $^{v}_{+}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2
1st st.		1,2,3,4
2nd st.		1,2,3,4
3rd st.	5	1,2,3,4

(b)



(c)

Figure E.85 : L(+)&L(-1,-3,(-)-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

L(++) & L(-1,-3,(-)-4) Fingering Type (Position Symbol : $^{v}_{\ddagger}\mathbf{P}$)

(a)

	c.c. 1	c.c. 2	c.c. 3
1st st.			1,2,3,4
2nd st.			1,2,3,4
3rd st.	5		1,2,3,4

(b)

(c)

Figure E.86 : L(++)&L(-1,-3,(-)-4) fingering type (a) Posture. (b) Finger placement. (c) Representation on notation.

APPENDIX F: SCORES OF ARRANGEMENTS AND COMPOSITIONS WITH POSITION&FINGERING SYMBOLIZATION SYSTEM SIGNS FOR PICKLESS *SAZ* PLAYING TECHNIQUE

APPENDIX F.1	Göç Yolları
APPENDIX F.2	Azeri Oyun Havası
APPENDIX F.3	Topal
APPENDIX F.4	Alla Turca
APPENDIX F.5	Sarı Zeybek
APPENDIX F.6	Anadolu
APPENDIX F.7	Giriftar
APPENDIX F.8	Elmas
APPENDIX F.9	Fur Elise
APPENDIX F.10	Badinerie
APPENDIX F.11	Ay Laçin
APPENDIX F.12	Kolhoz Barı

Düzenleme : Erol Parlak
Notasyon : Erol Parlak

Müzik :Erol Parlak

Göç Yolları

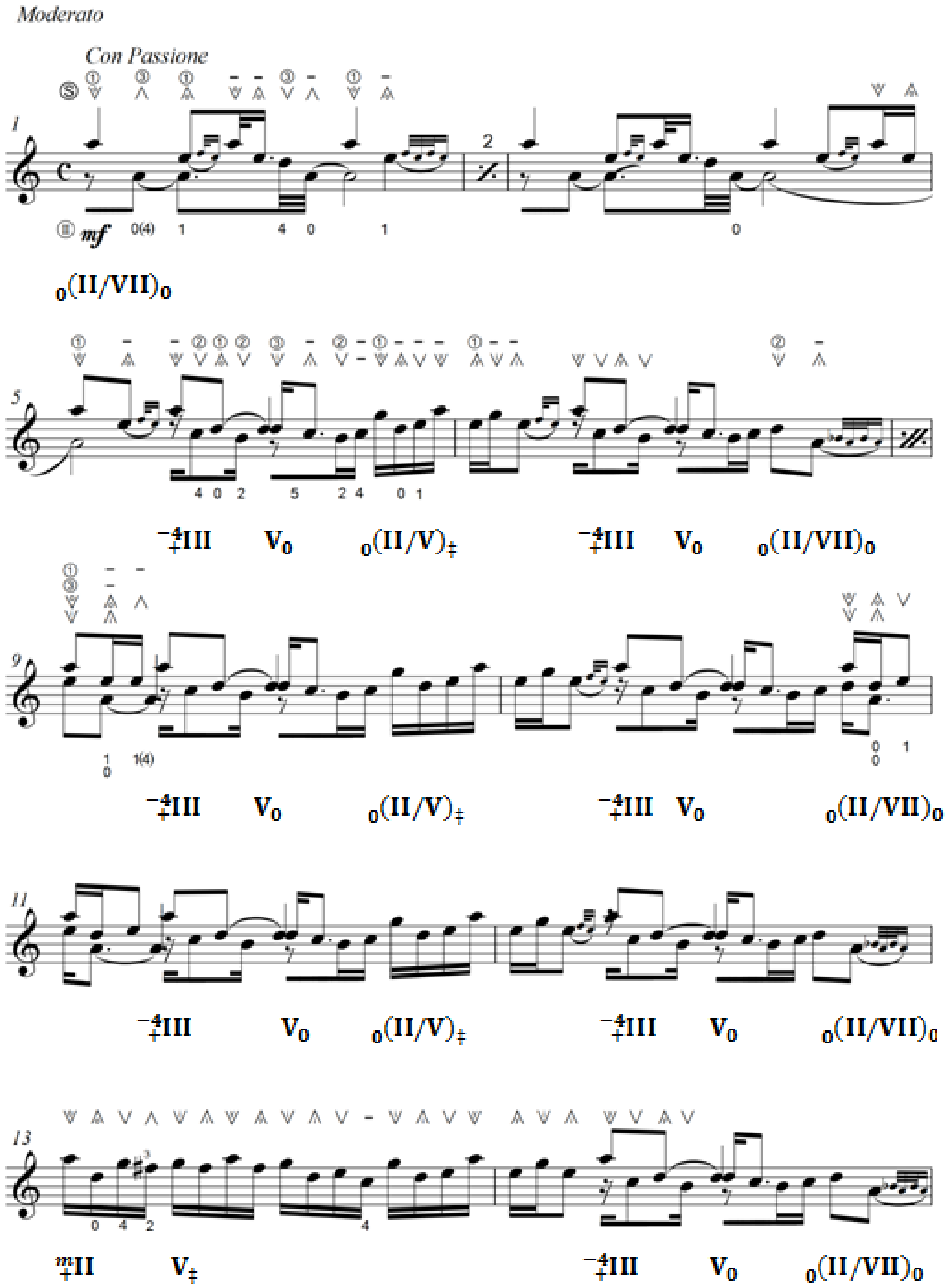


Figure F.1 : Erol Parlak's *Göç Yolları* (Adapted from Parlak, 2010).

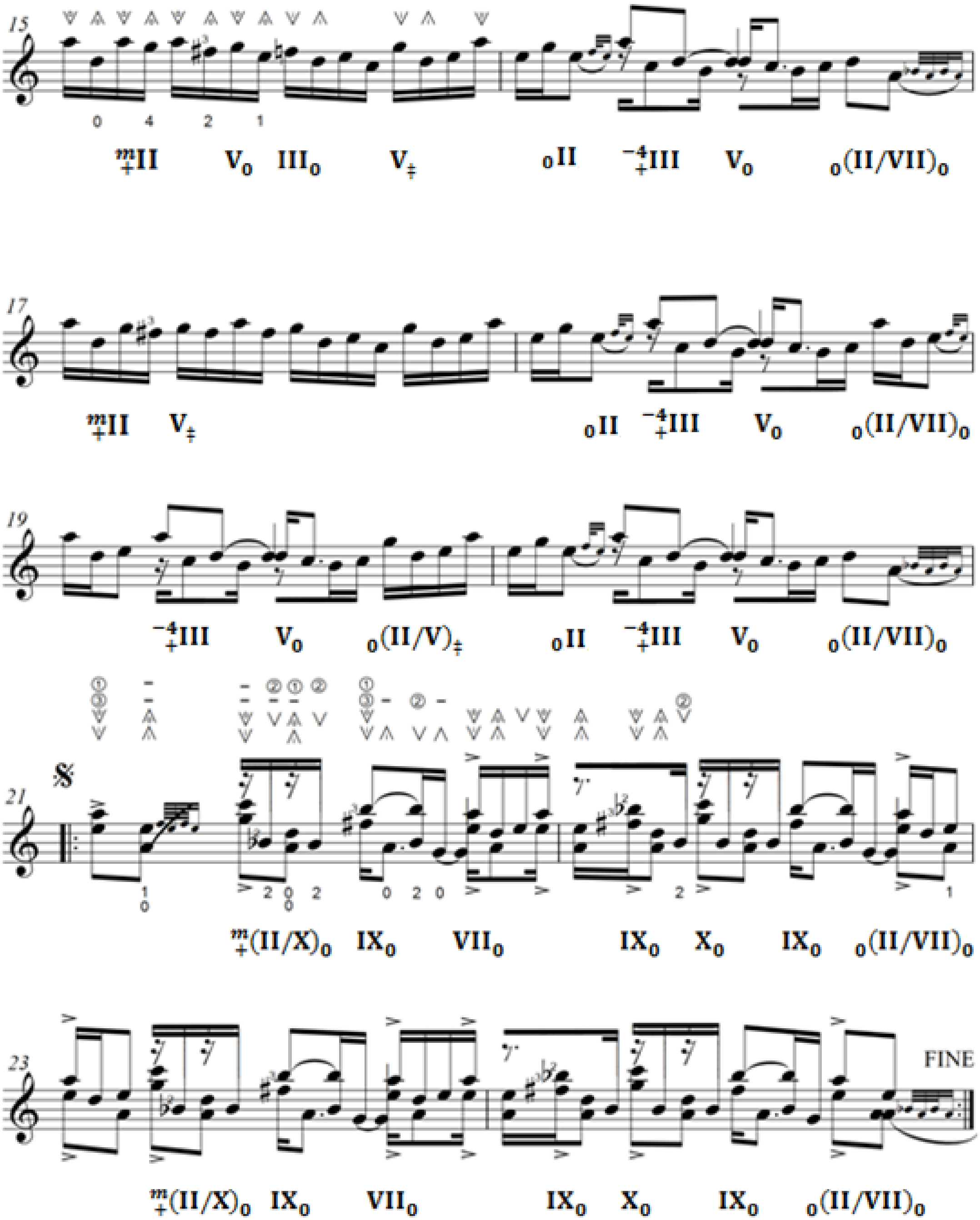


Figure F.1 (continued) : Erol Parlak's *Göç Yolları* (Adapted from Parlak, 2010).

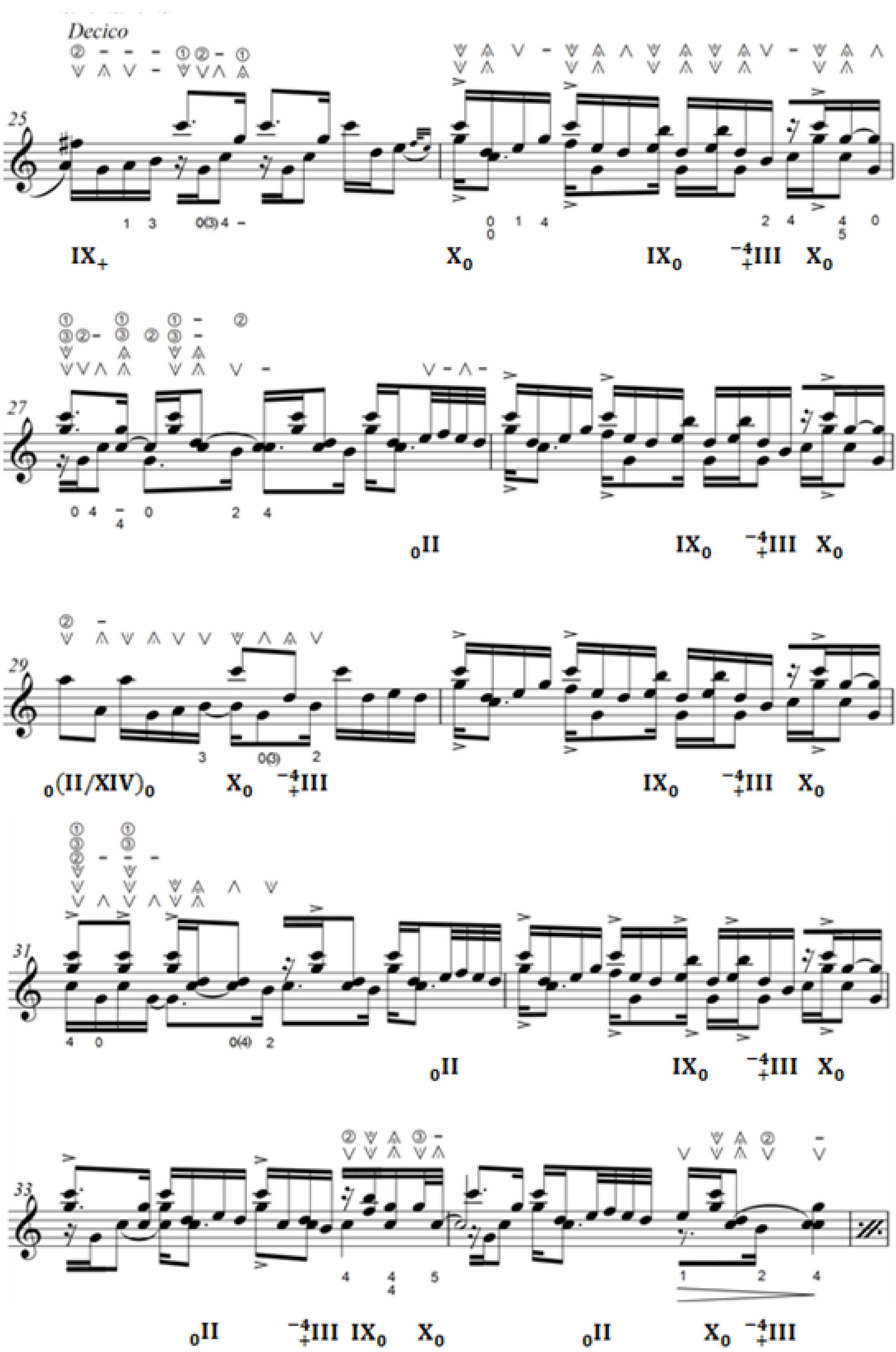


Figure F.1 (continued) : Erol Parlak's *Göç Yolları* (Adapted from Parlak, 2010).

Figure F.1 (continued) : Erol Parlak's *Göç Yolları* (Adapted from Parlak, 2010).

Figure F.1 (continued) : Erol Parlak's *Göç Yolları* (Adapted from Parlak, 2010).

Figure F.1 (continued) : Erol Parlak's *Göç Yolları* (Adapted from Parlak, 2010).

Figure F.1 (continued) : Erol Parlak's *Göç Yolları* (Adapted from Parlak, 2010).

Figure F.2 : Erol Parlak's *Azeri Oyun Havası* arrangement (Adapted from Parlak, 2005).

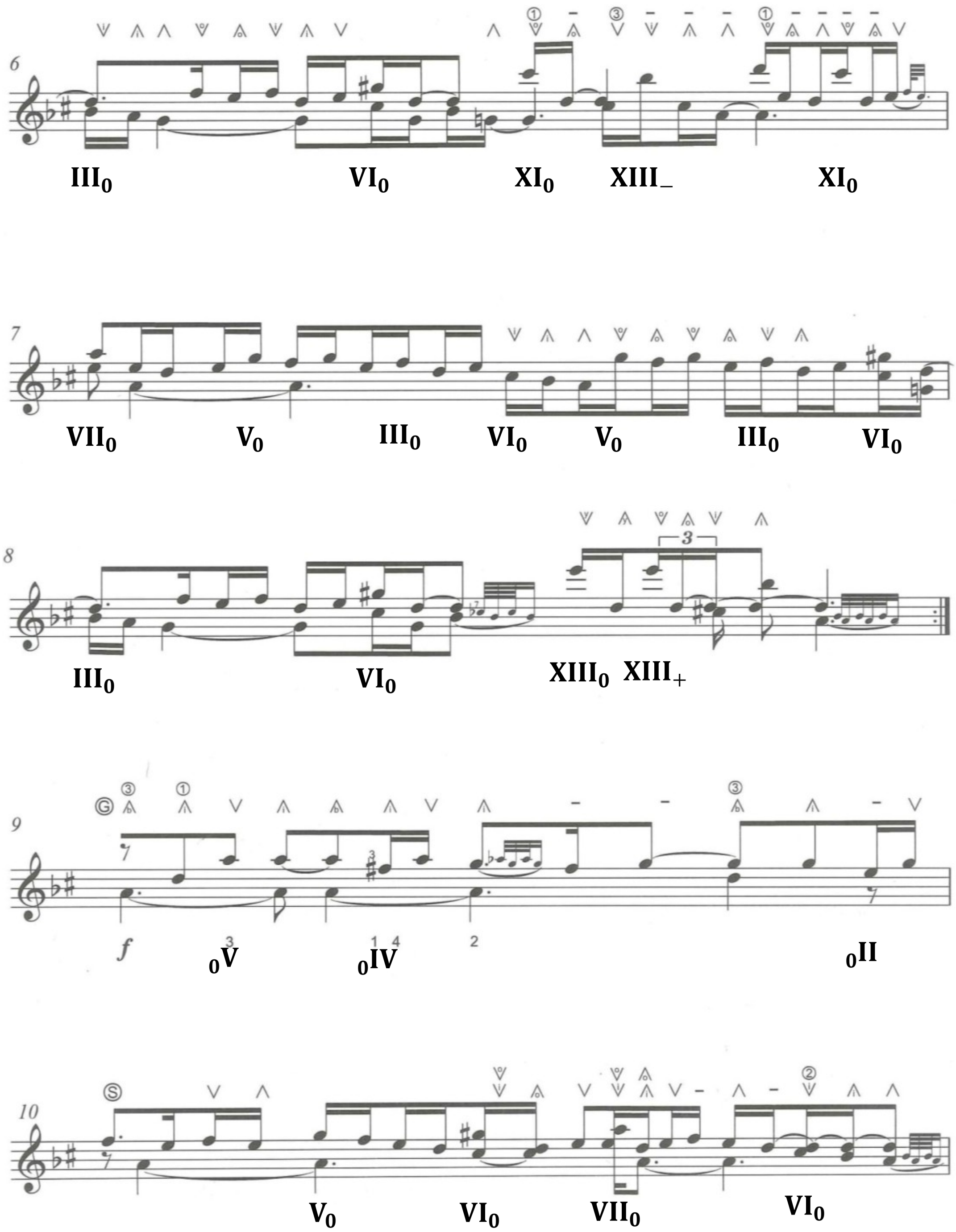


Figure F.2 (continued) : Erol Parlak's *Azeri Oyun Havası* arrangement (Adapted from Parlak, 2005).

Figure F.2 (continued) : Erol Parlak's *Azeri Oyun Havası* arrangement (Adapted from Parlak, 2005).

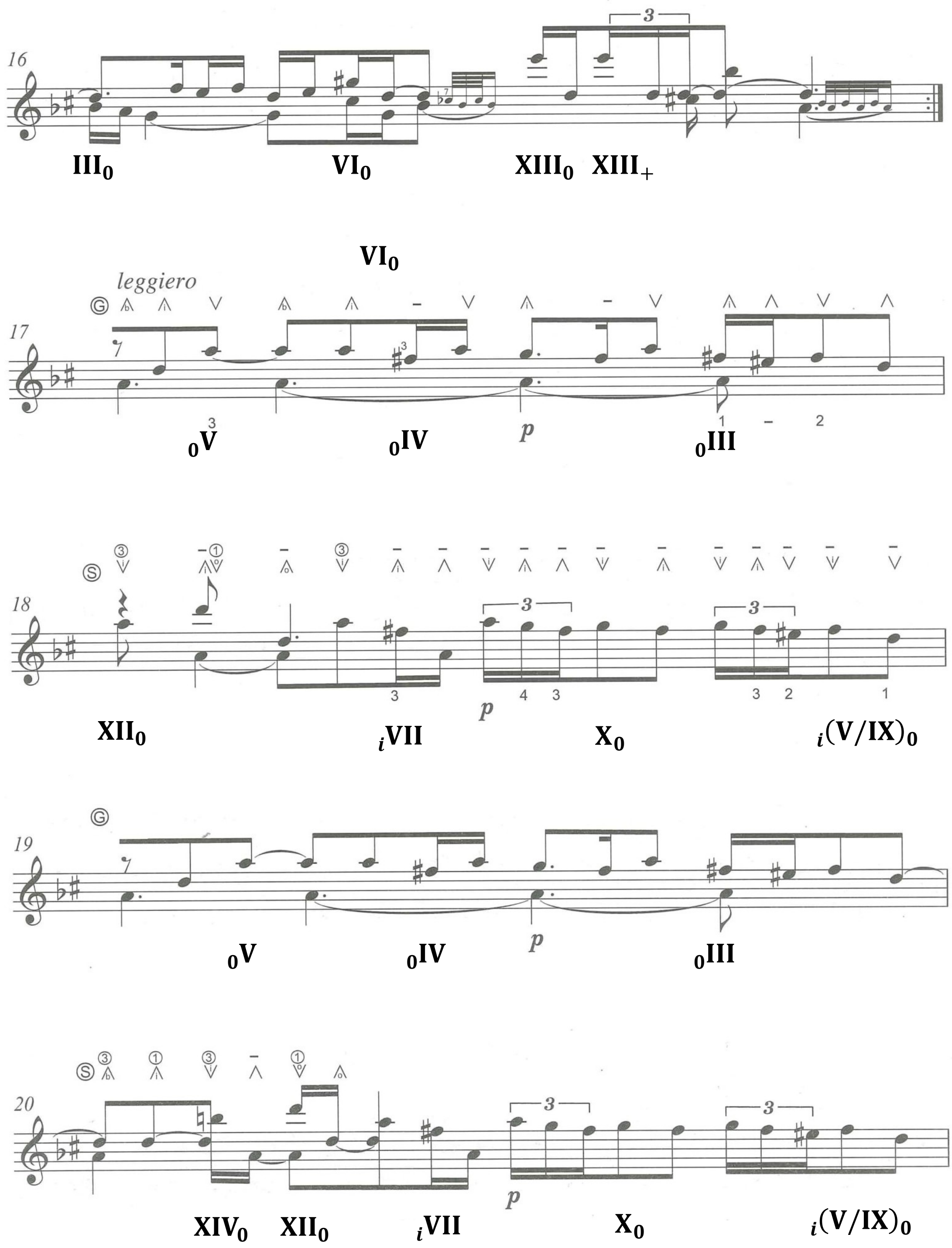


Figure F.2 (continued) : Erol Parlak's *Azeri Oyun Havası* arrangement (Adapted from Parlak, 2005).

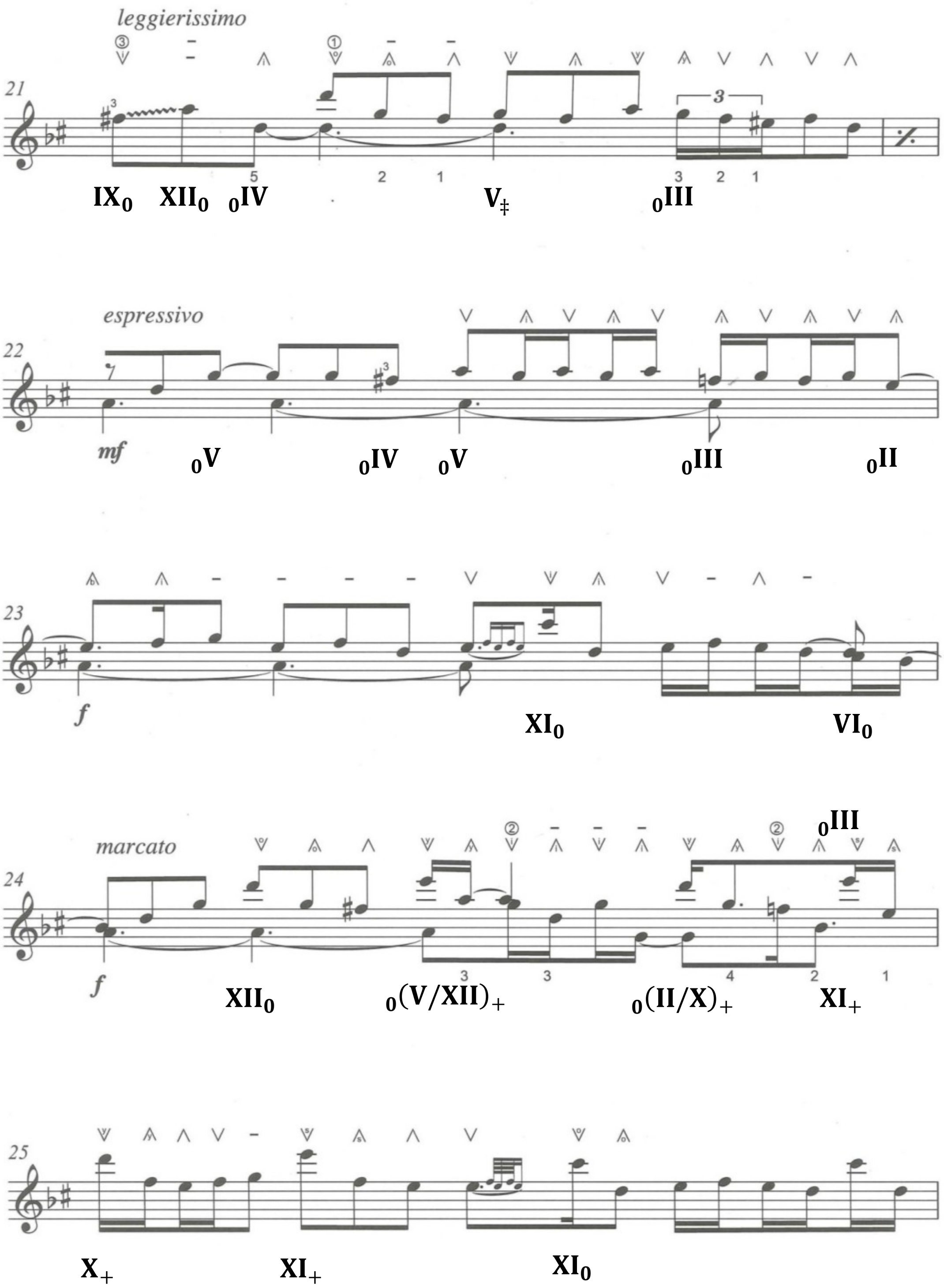


Figure F.2 (continued) : Erol Parlak's *Azeri Oyun Havası* arrangement (Adapted from Parlak, 2005).

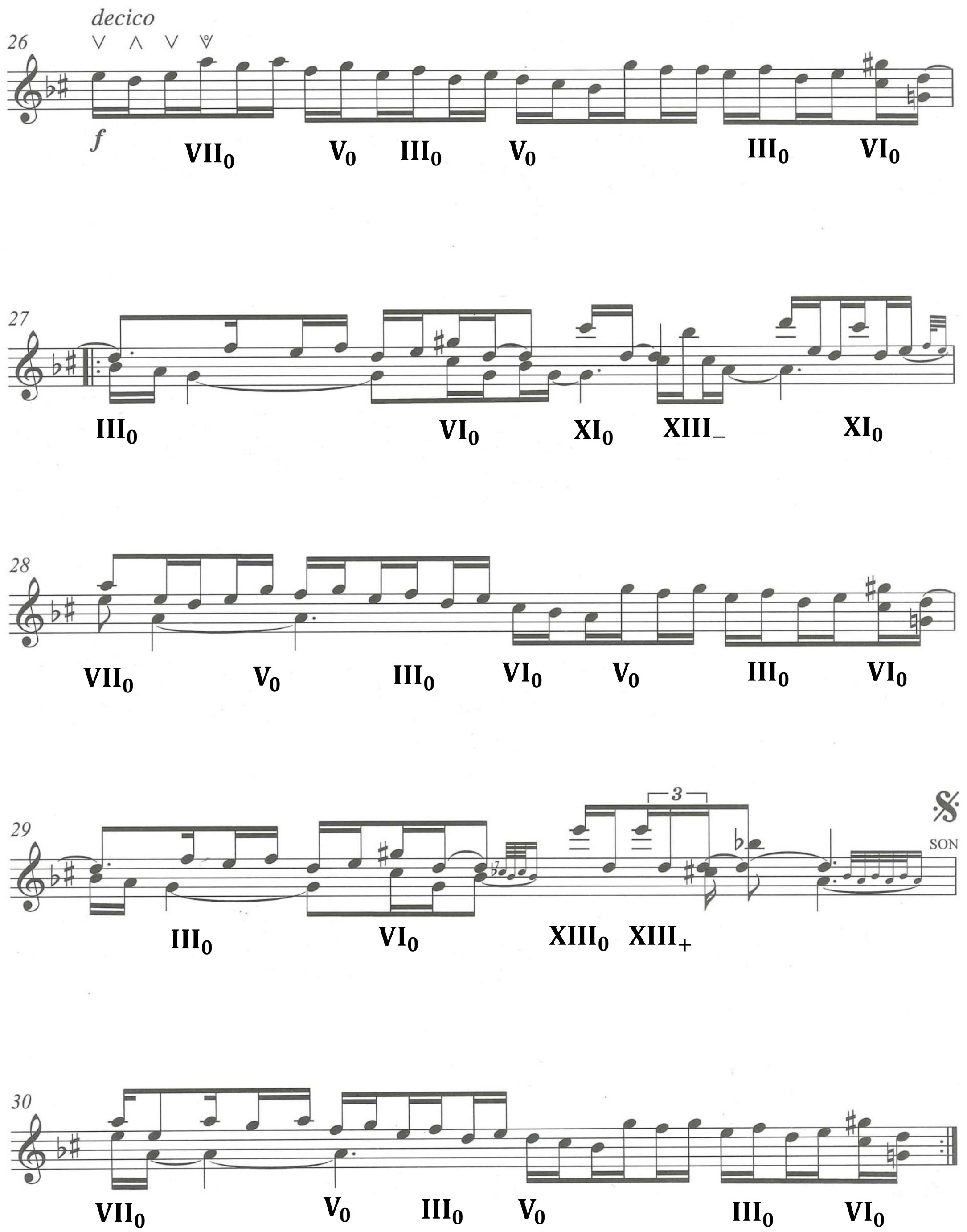


Figure F.2 (continued) : Erol Parlak's *Azeri Oyun Havası* arrangement (Adapted from Parlak, 2005).

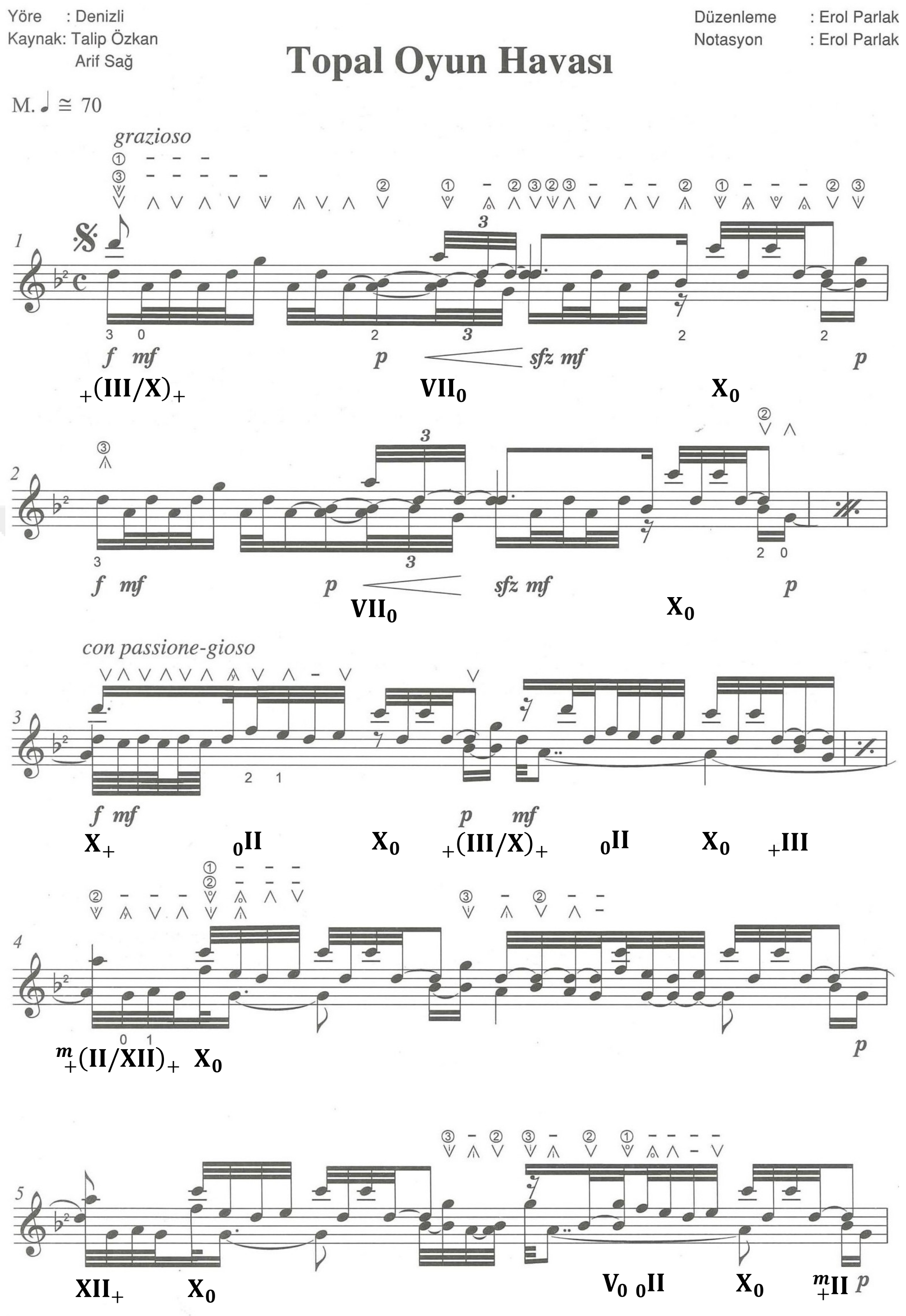


Figure F.3 : Erol Parlak's *Topal Oyun Havası* arrangement (Adapted from Parlak, 2005).

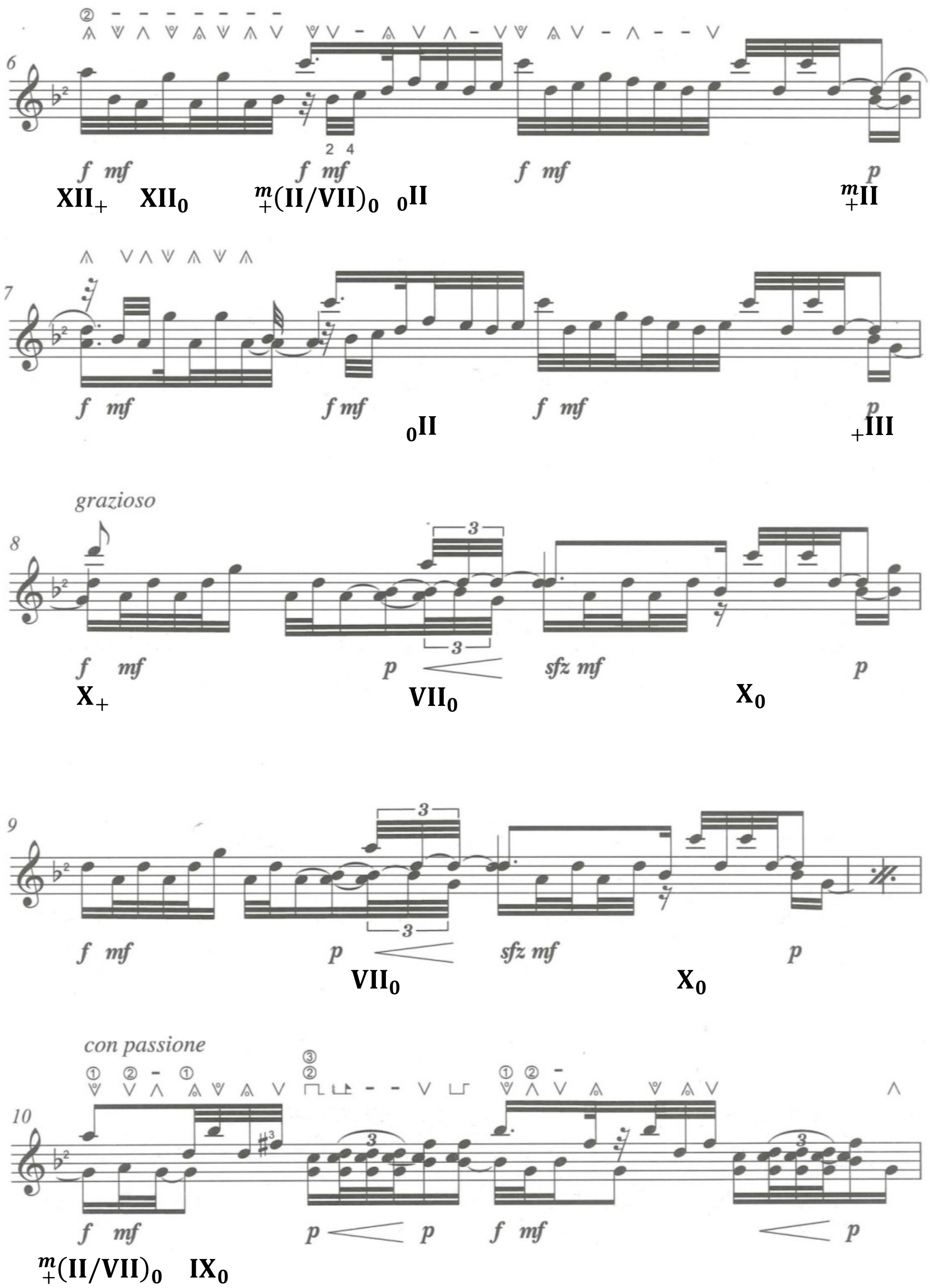


Figure F.3 (continued) : Erol Parlak's *Topal Oyun Havası* arrangement (Adapted from Parlak, 2005).

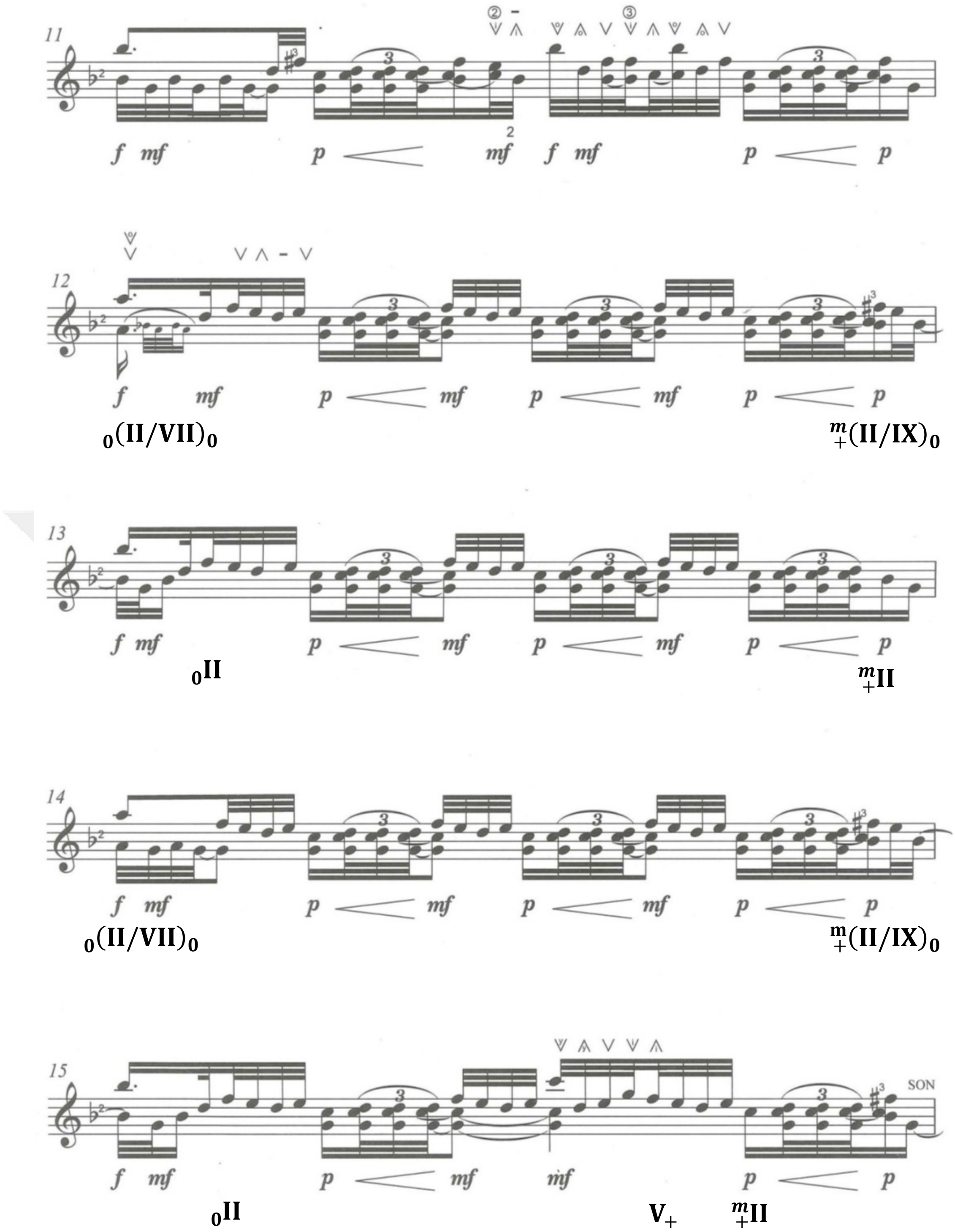


Figure F.3 (continued) : Erol Parlak's *Topal Oyun Havası* arrangement (Adapted from Parlak, 2005).

Figure F.3 (continued) : Erol Parlak's *Topal Oyun Havası* arrangement (Adapted from Parlak, 2005).

Figure F.3 (continued) : Erol Parlak's *Topal Oyun Havası* arrangement (Adapted from Parlak, 2005).

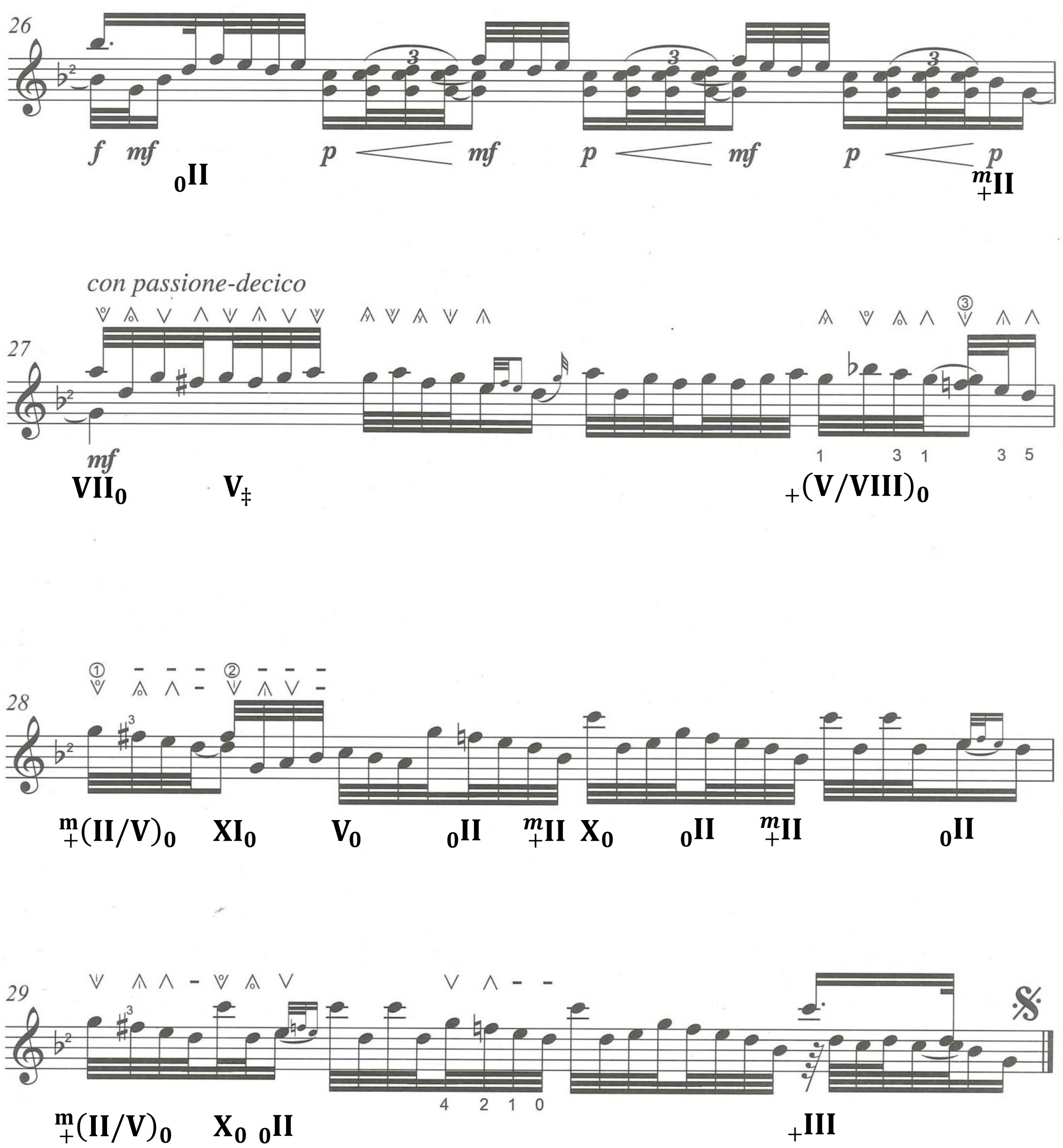


Figure F.3 (continued) : Erol Parlak's *Topal Oyun Havası* arrangement (Adapted from Parlak, 2005).

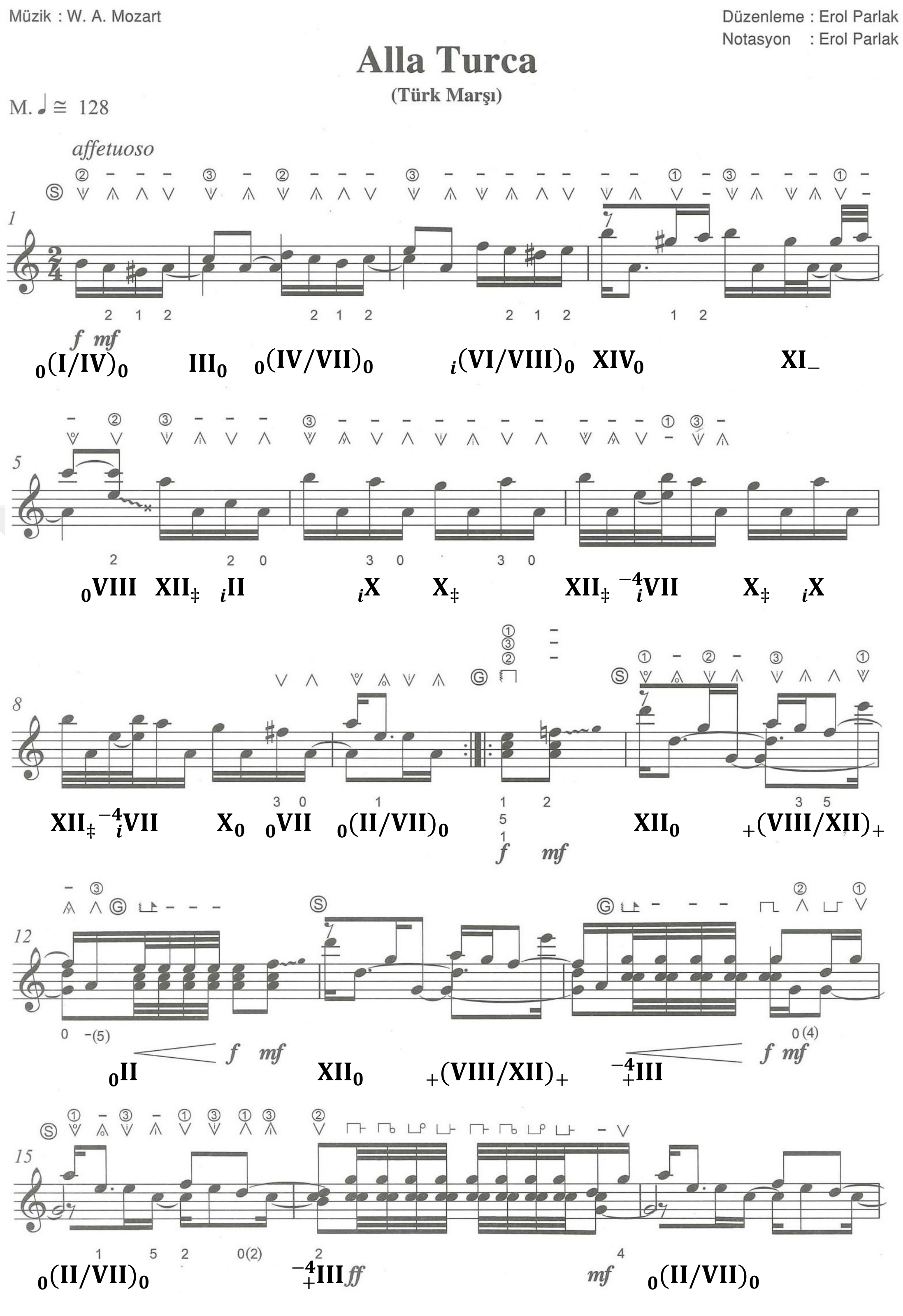


Figure F.4 : Erol Parlak's arrangement of W.A.Mozart's *Alla Turca* (Adapted from Parlak, 2005).

Figure F.4 (continued) : Erol Parlak's arrangement of W.A.Mozart's *Alla Turca* (Adapted from Parlak, 2005).

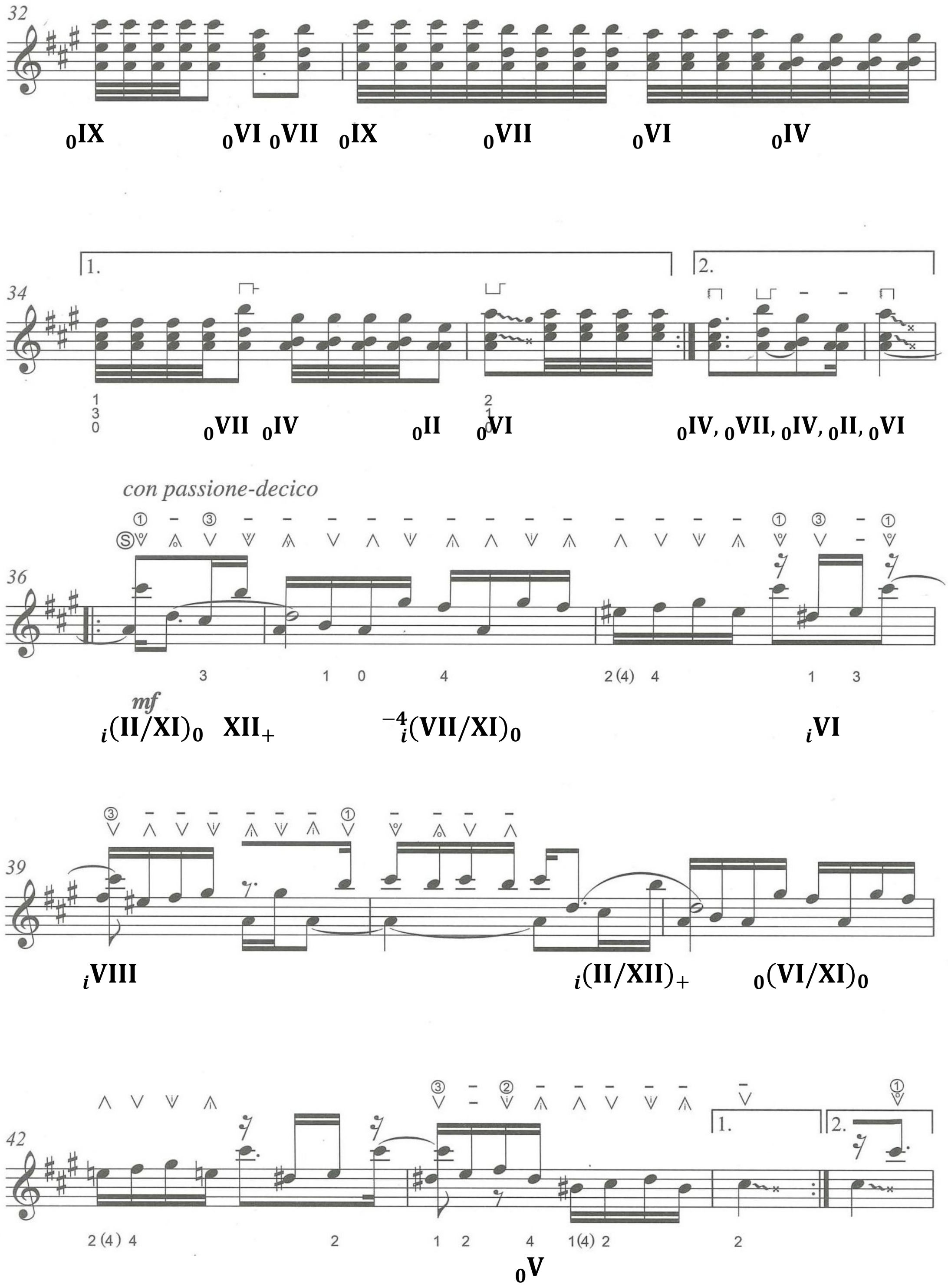


Figure F.4 (continued) : Erol Parlak's arrangement of W.A.Mozart's *Alla Turca* (Adapted from Parlak, 2005).

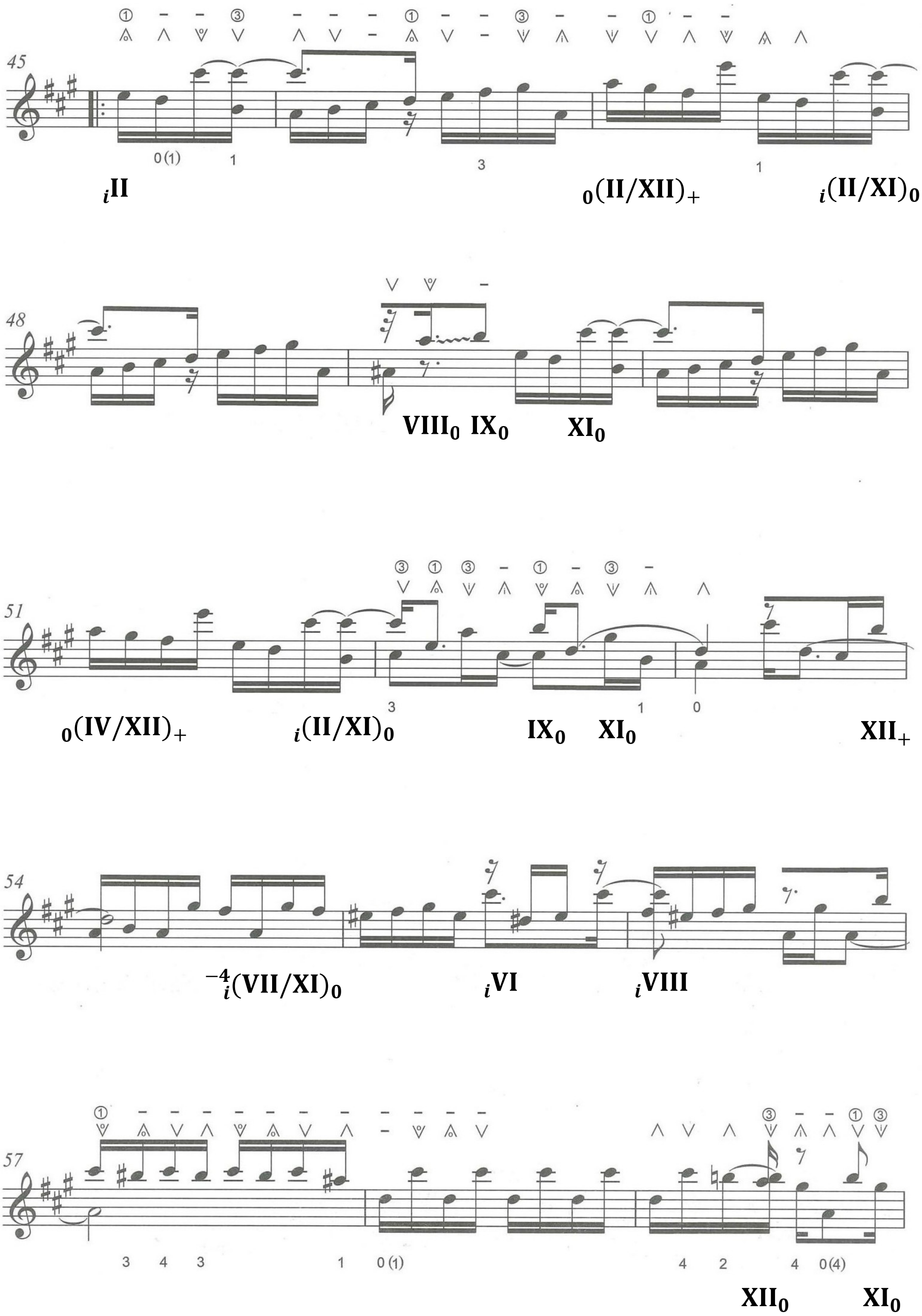


Figure F.4 (continued) : Erol Parlak's arrangement of W.A.Mozart's *Alla Turca* (Adapted from Parlak, 2005).

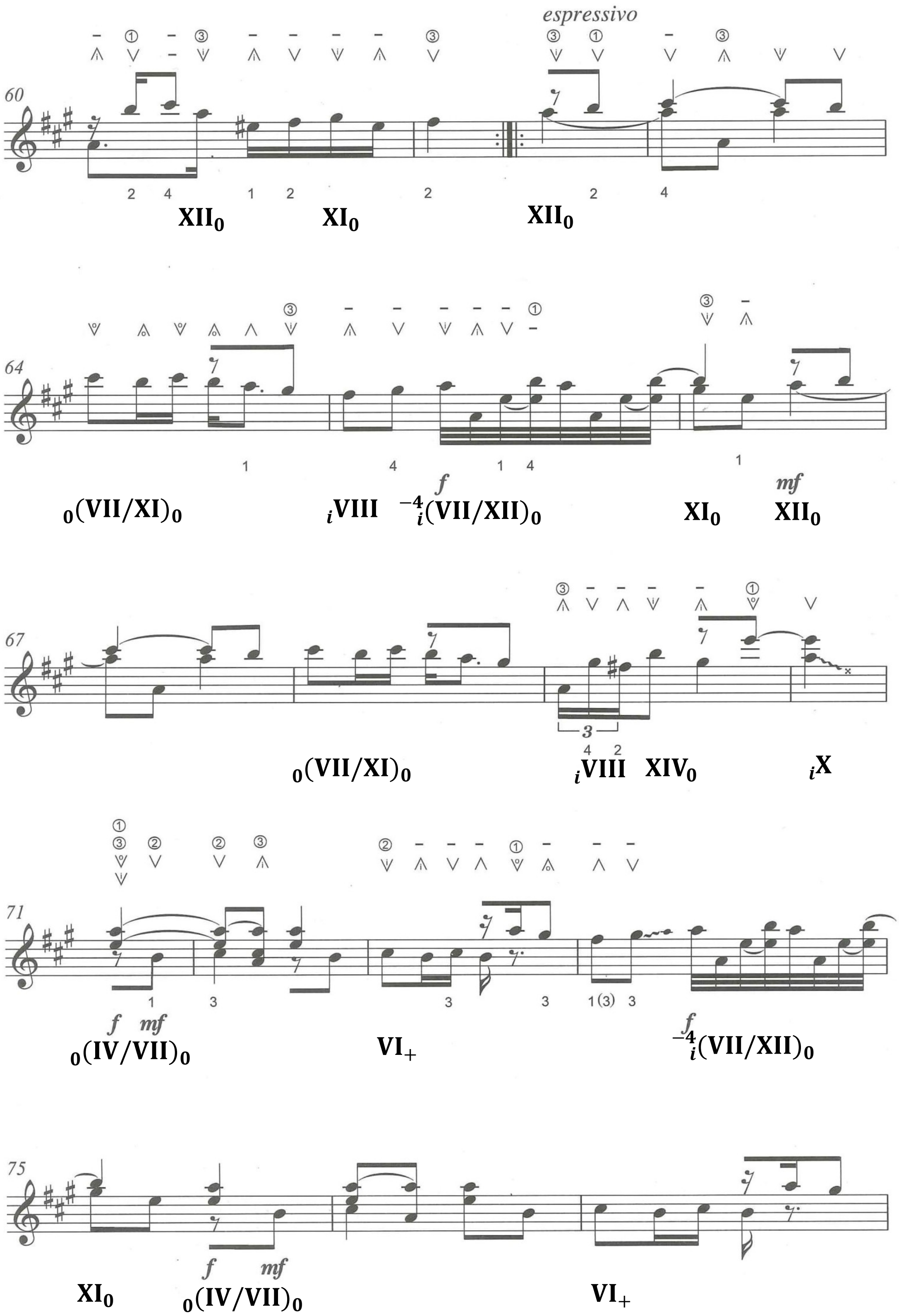


Figure F.4 (continued) : Erol Parlak's arrangement of W.A.Mozart's *Alla Turca* (Adapted from Parlak, 2005).

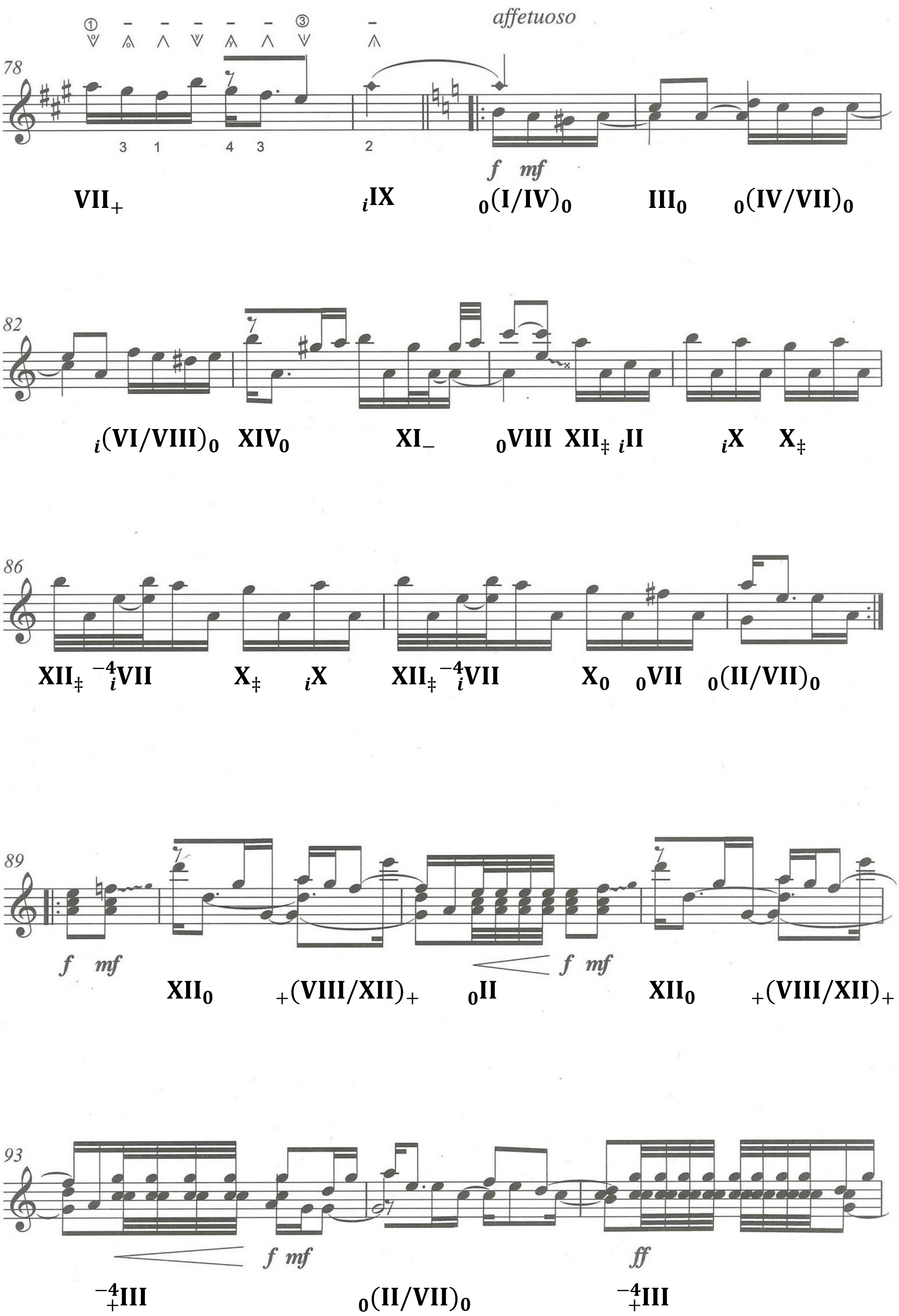


Figure F.4 (continued) : Erol Parlak's arrangement of W.A.Mozart's *Alla Turca* (Adapted from Parlak, 2005).

Figure F.4 (continued) : Erol Parlak's arrangement of W.A.Mozart's *Alla Turca* (Adapted from Parlak, 2005).

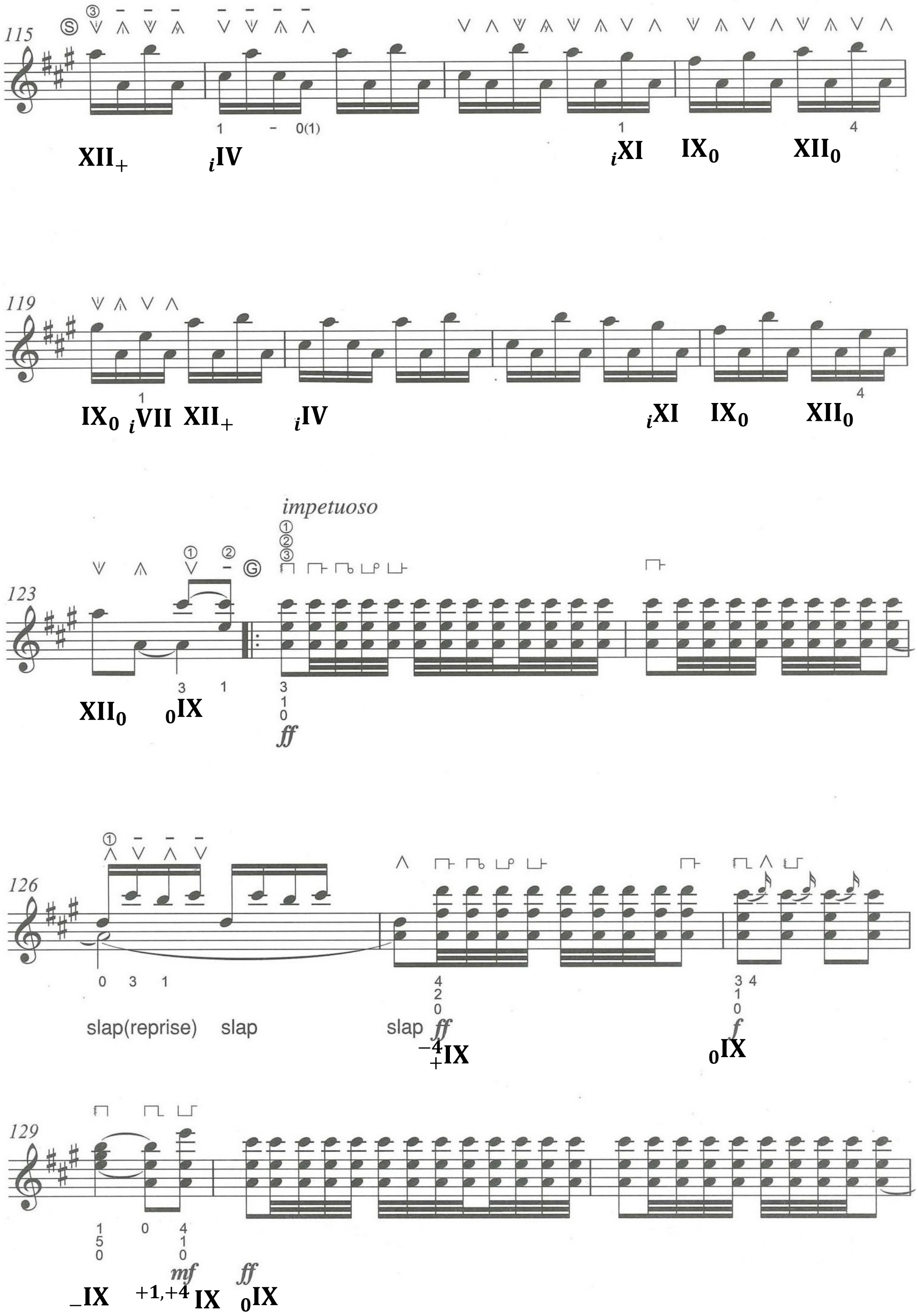


Figure F.4 (continued) : Erol Parlak's arrangement of W.A.Mozart's *Alla Turca* (Adapted from Parlak, 2005).

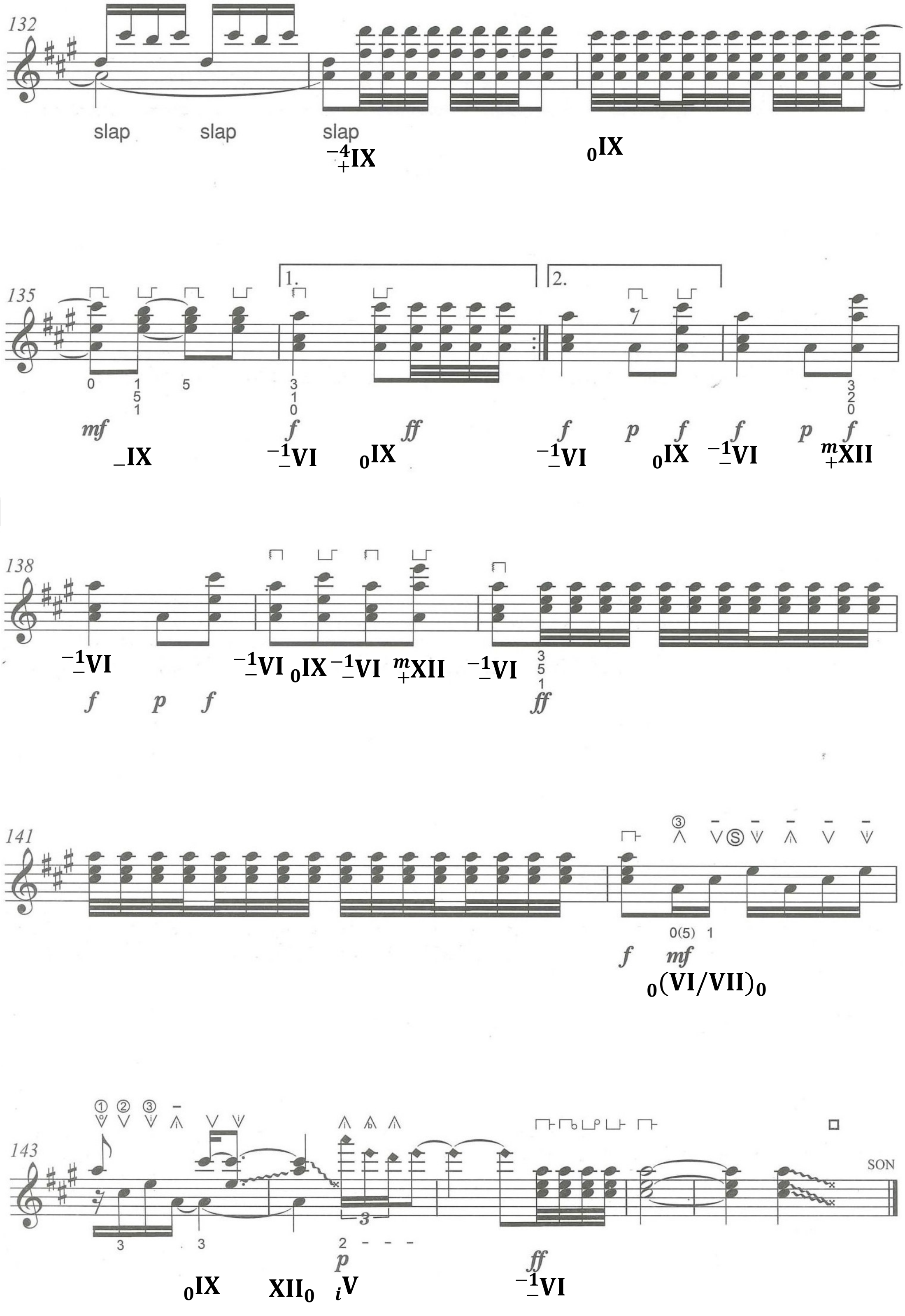


Figure F.4 (continued) : Erol Parlak's arrangement of W.A.Mozart's *Alla Turca* (Adapted from Parlak, 2005).

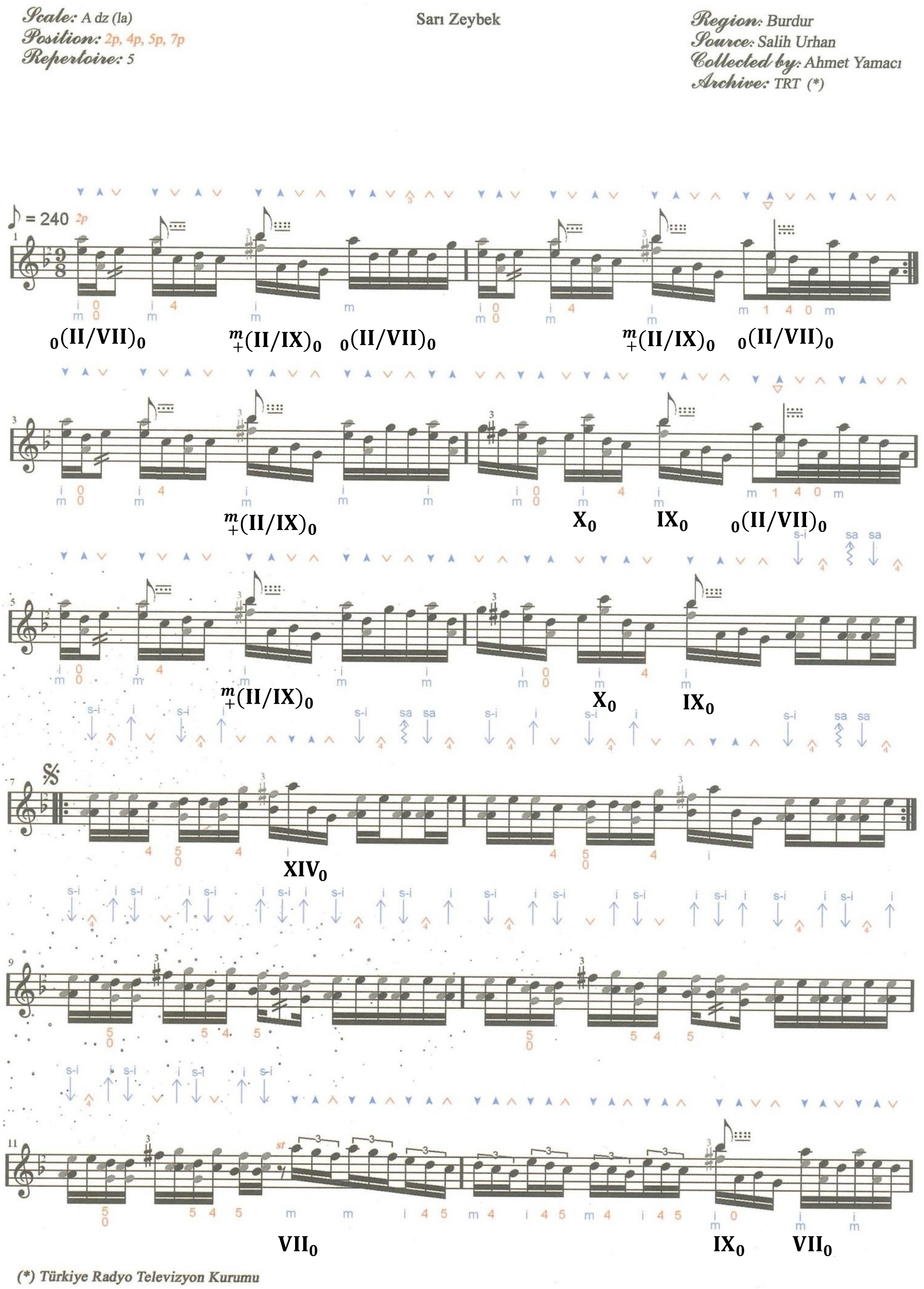


Figure F.5 : Erdal Erzincan's *Sarı Zeybek* arrangement (Adapted from Sağ and Erzincan, 2009).

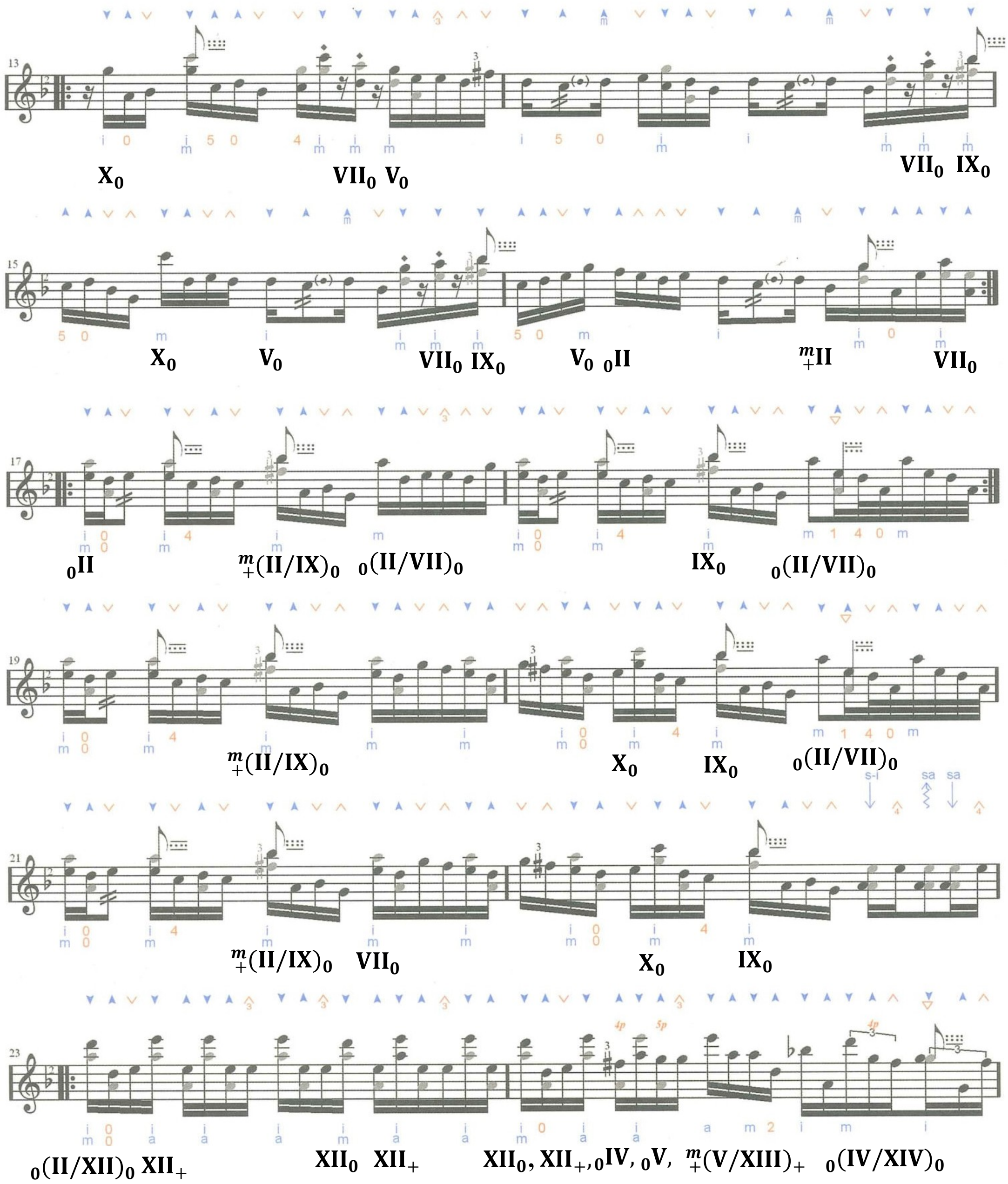


Figure F.5 (continued) : Erdal Erzincan's *Sarı Zeybek* arrangement (Adapted from Sağ and Erzincan, 2009).

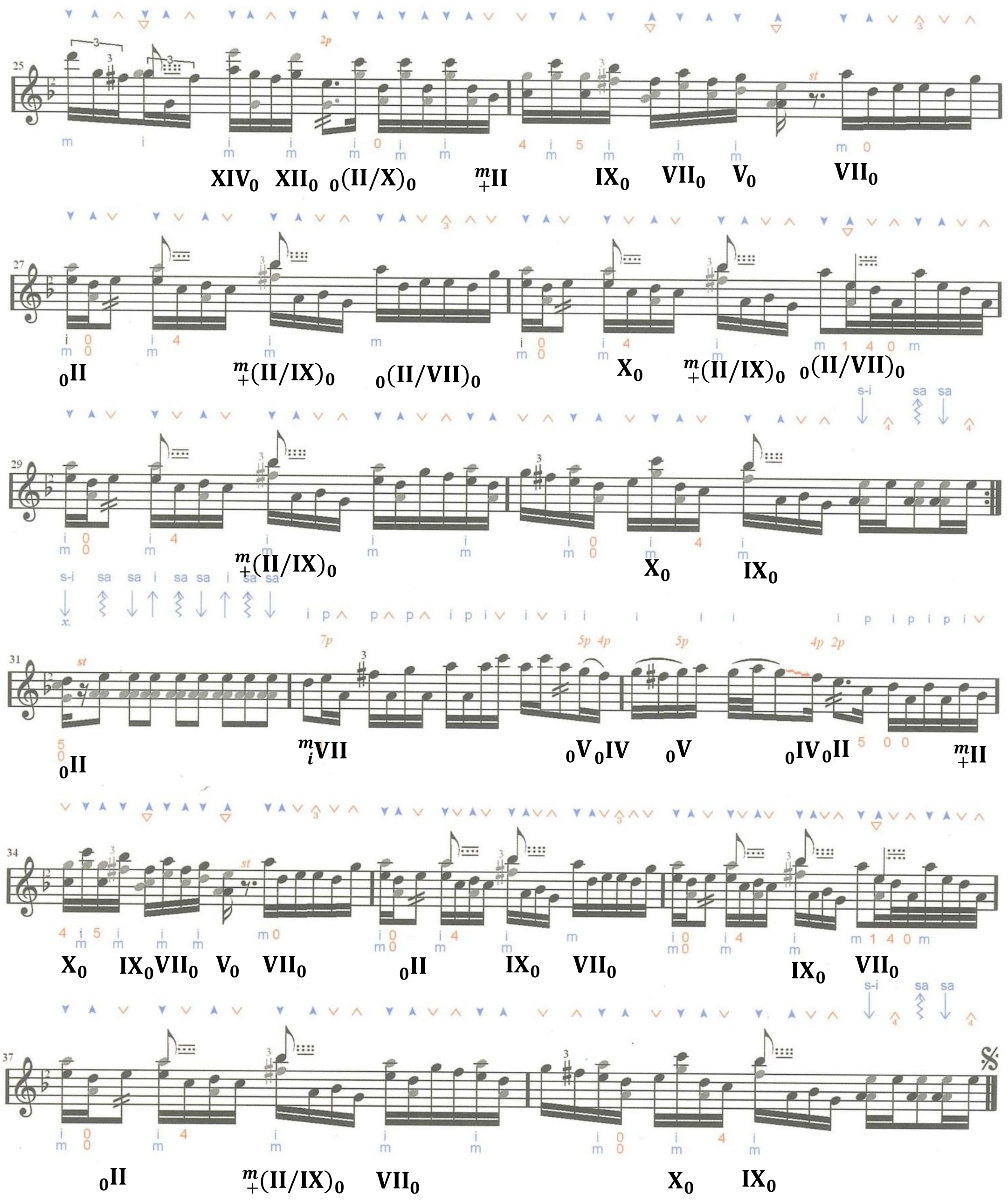


Figure F.5 (continued) : Erdal Erzincan's *Sarı Zeybek* arrangement (Adapted from Sağ and Erzincan, 2009).

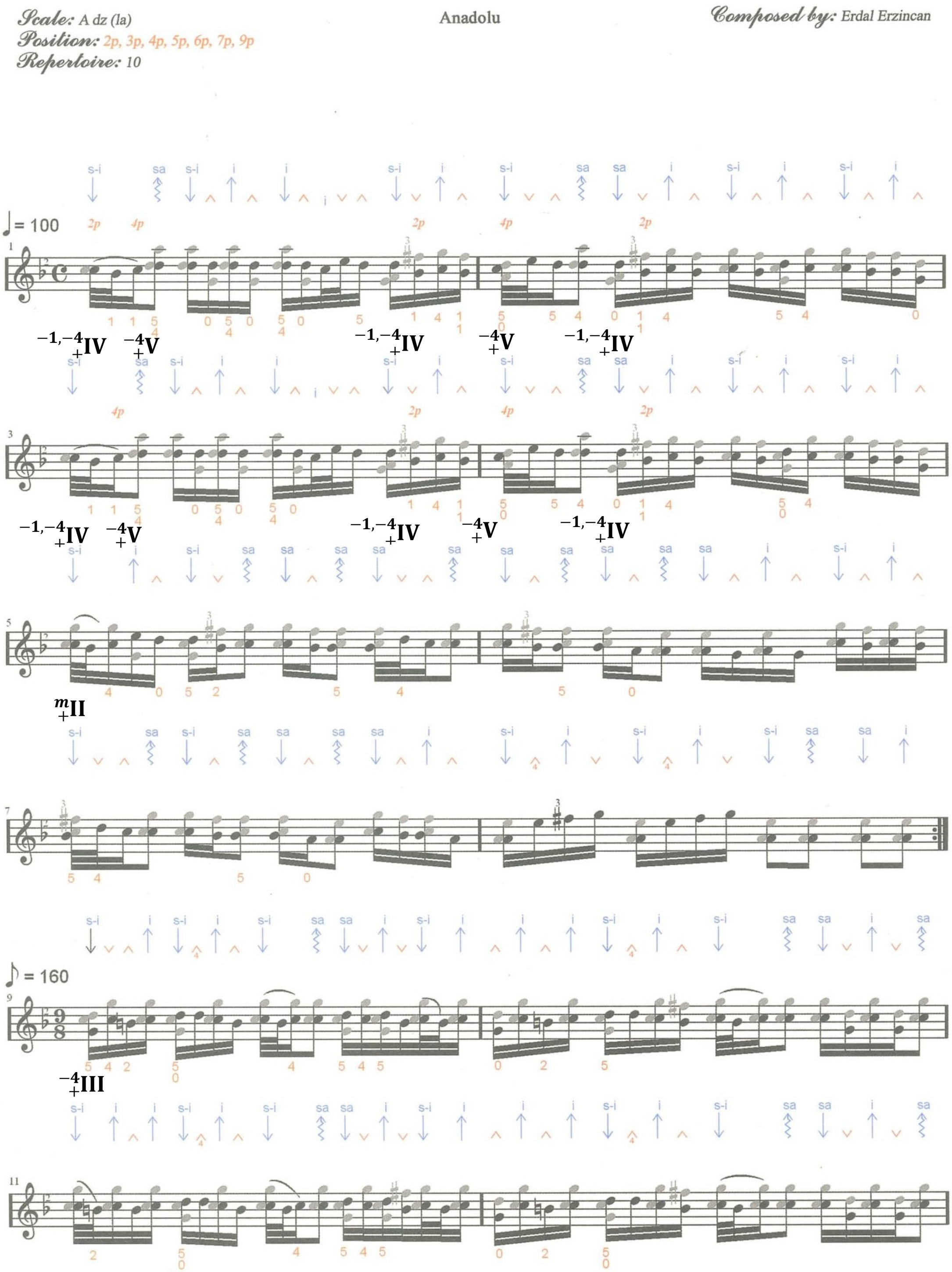


Figure F.6 Erdal Erzincan's *Anadolu* (Adapted from Sağ and Erzincan, 2009).

Figure F.6 (continued) : Erdal Erzincan's *Anadolu* (Adapted from Sağ and Erzincan, 2009).

Figure F.6 (continued) : Erdal Erzincan's *Anadolu* (Adapted from Sağ and Erzincan, 2009).

Figure F.6 (continued) : Erdal Erzincan's *Anadolu* (Adapted from Sağ and Erzincan, 2009).

Figure F.6 (continued) : Erdal Erzincan's *Anadolu* (Adapted from Sağ and Erzincan, 2009).

Figure F.6 (continued) : Erdal Erzincan's *Anadolu* (Adapted from Sağ and Erzincan, 2009).

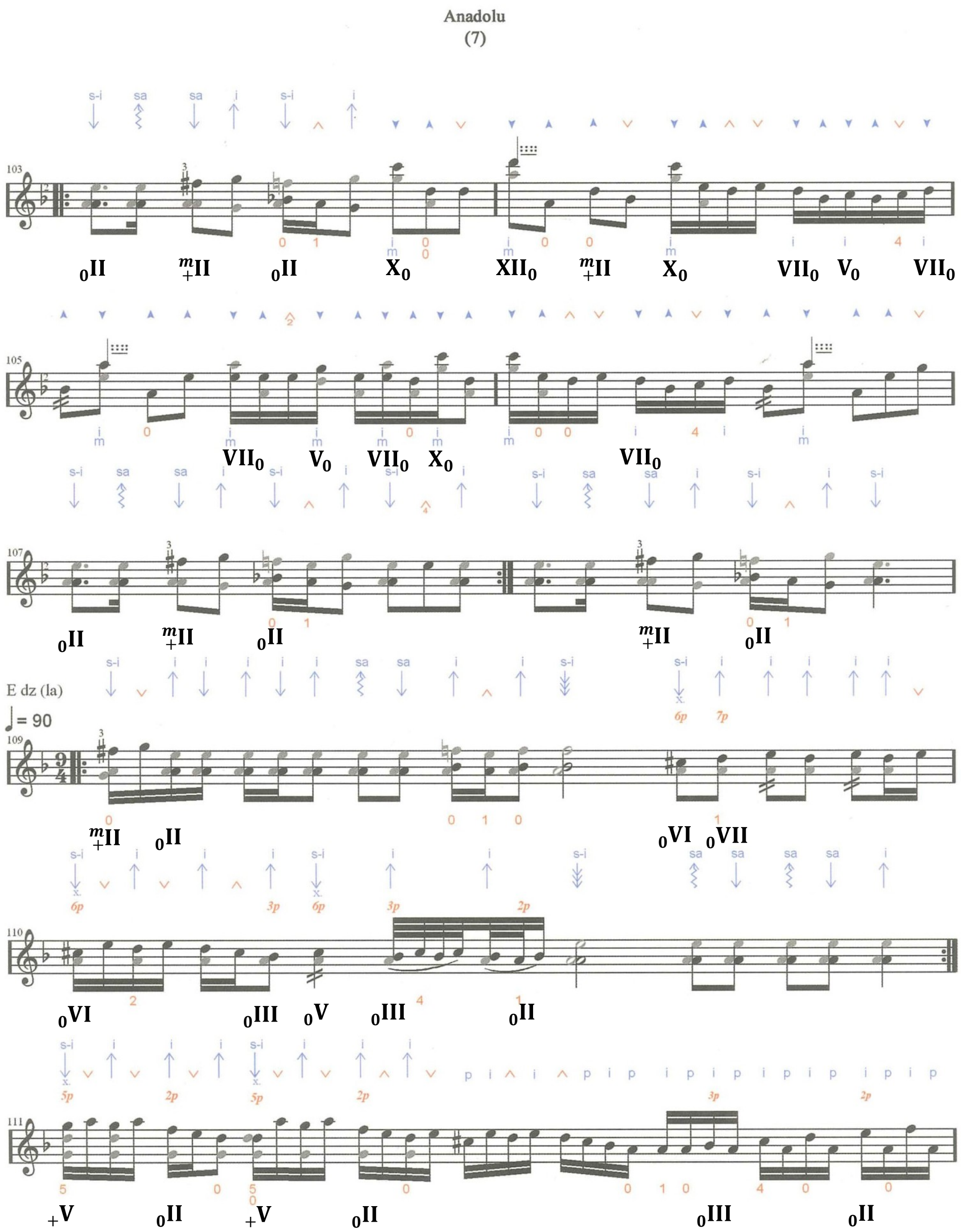


Figure F.6 (continued) : Erdal Erzincan's *Anadolu* (Adapted from Sağ and Erzincan, 2009).

Figure F.6 (continued) : Erdal Erzincan's *Anadolu* (Adapted from Sağ and Erzincan, 2009).

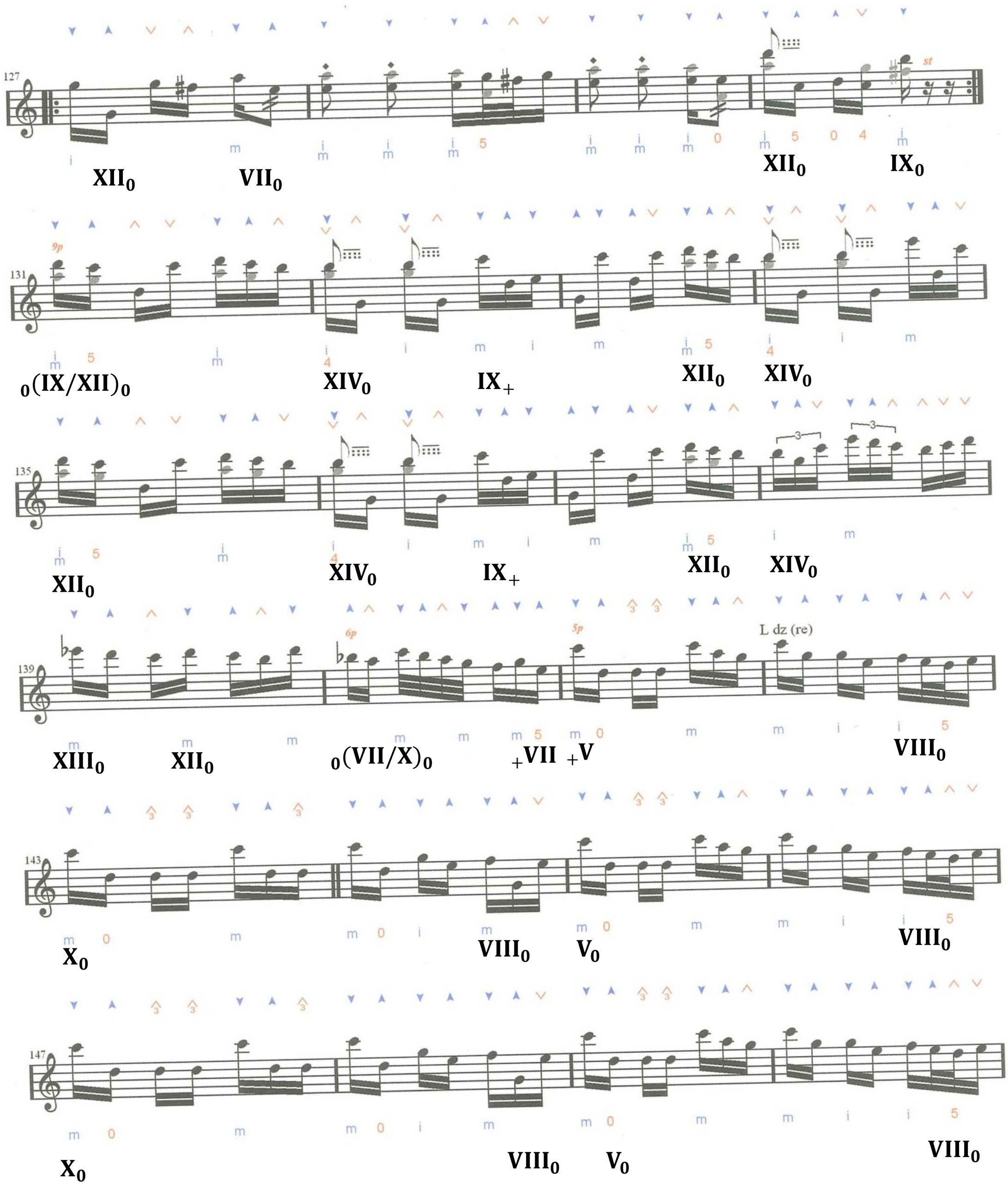


Figure F.6 (continued) : Erdal Erzincan's *Anadolu* (Adapted from Sağ and Erzincan, 2009).

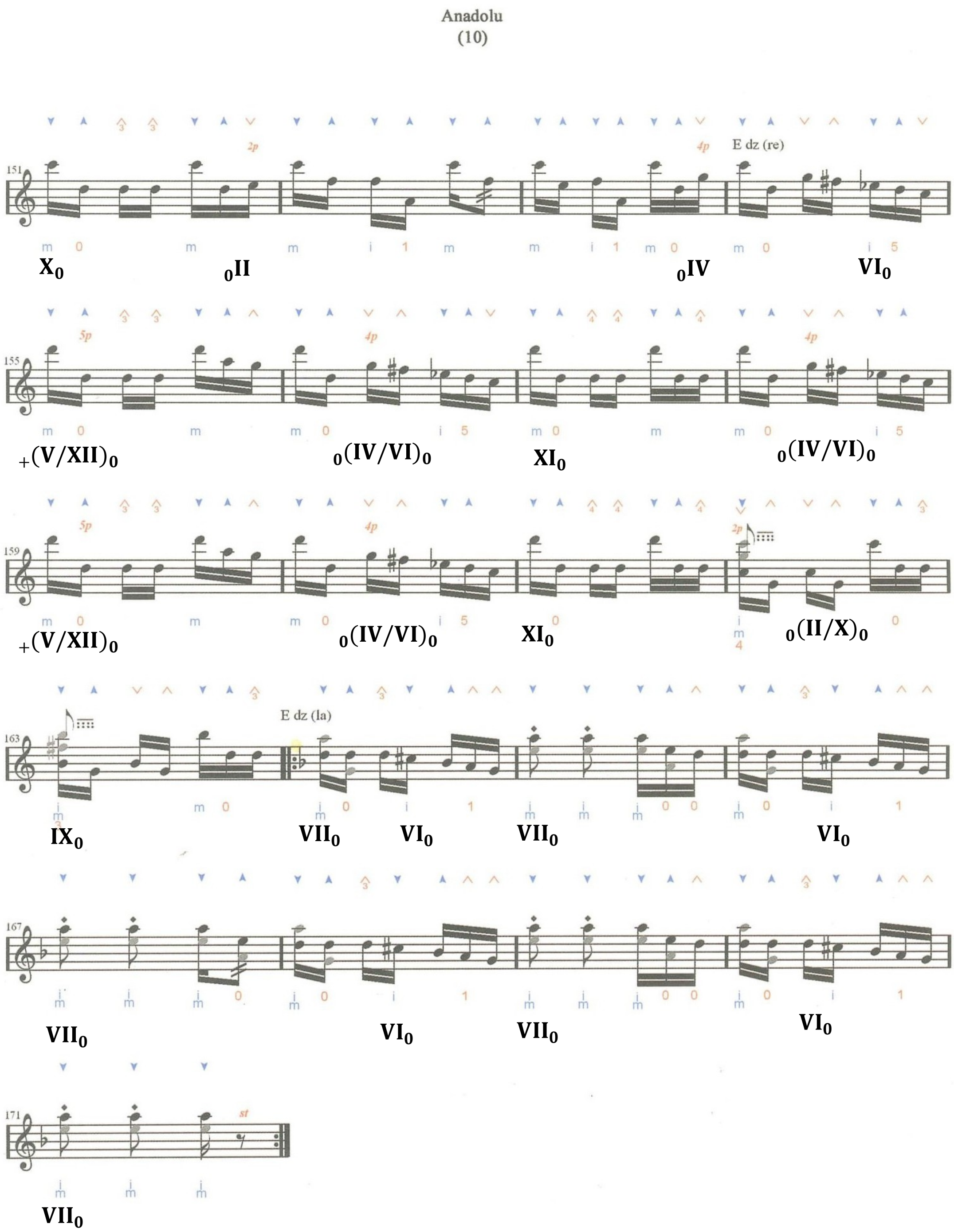


Figure F.6 (continued) : Erdal Erzincan's *Anadolu* (Adapted from Sağ and Erzincan, 2009).

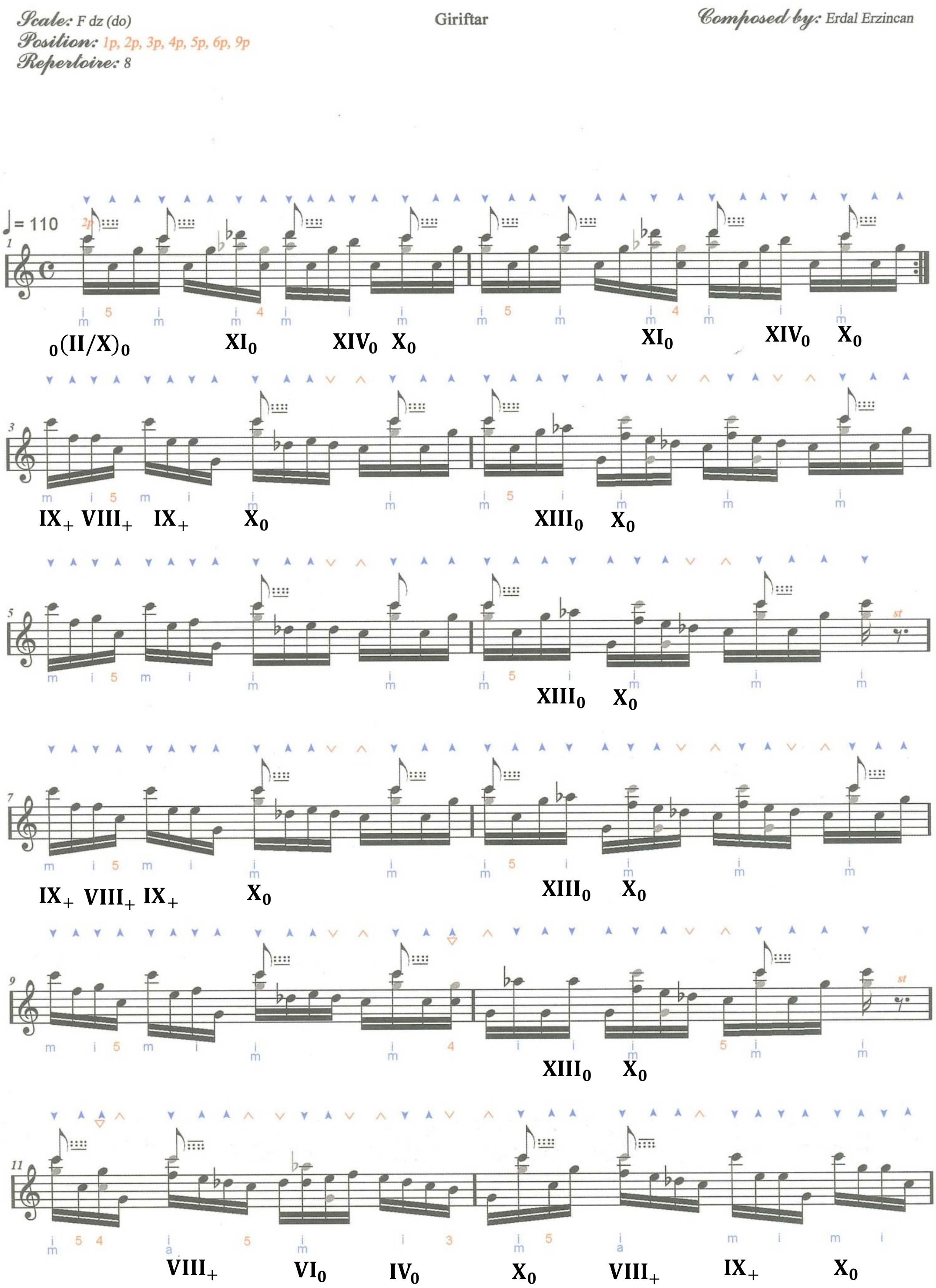


Figure F.7 : Erdal Erzincan's *Giriftar* (Adapted from Sağ and Erzincan, 2009).

Figure F.7 (continued) : Erdal Erzincan's *Giriftar* (Adapted from Sağ and Erzincan, 2009).

Figure F.7 (continued) : Erdal Erzincan's *Giriftar* (Adapted from Sağ and Erzincan, 2009).

Figure F.7 (continued) : Erdal Erzincan's *Giriftar* (Adapted from Sağ and Erzincan, 2009).

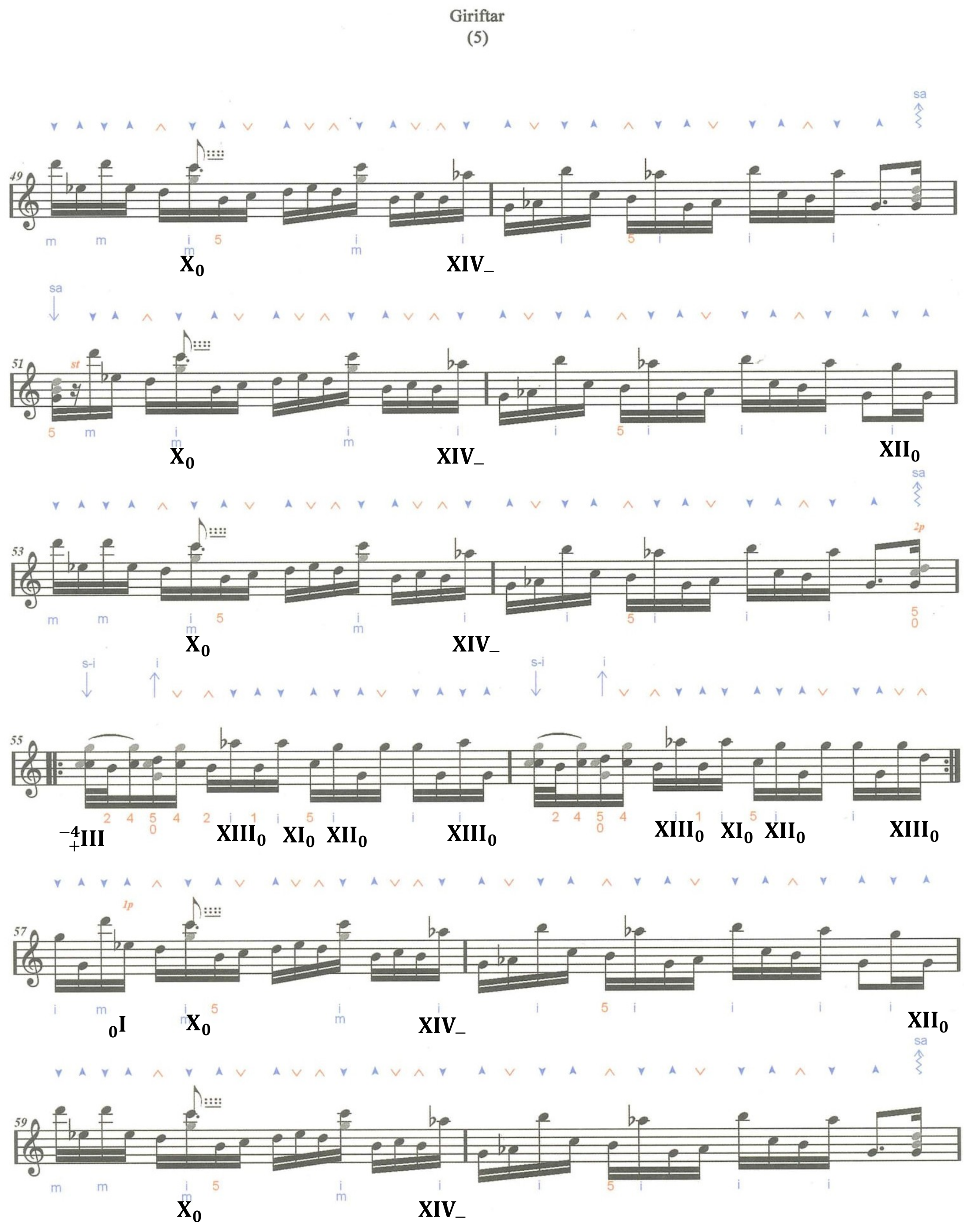


Figure F.7 (continued) : Erdal Erzincan's *Giriftar* (Adapted from Sağ and Erzincan, 2009).

Figure F.7 (continued) : Erdal Erzincan's *Giriftar* (Adapted from Sağ and Erzincan, 2009).

Figure F.8 : Erdal Erzincan's *Elmas* Arrangement (Adapted from Sağ and Erzincan, 2009).

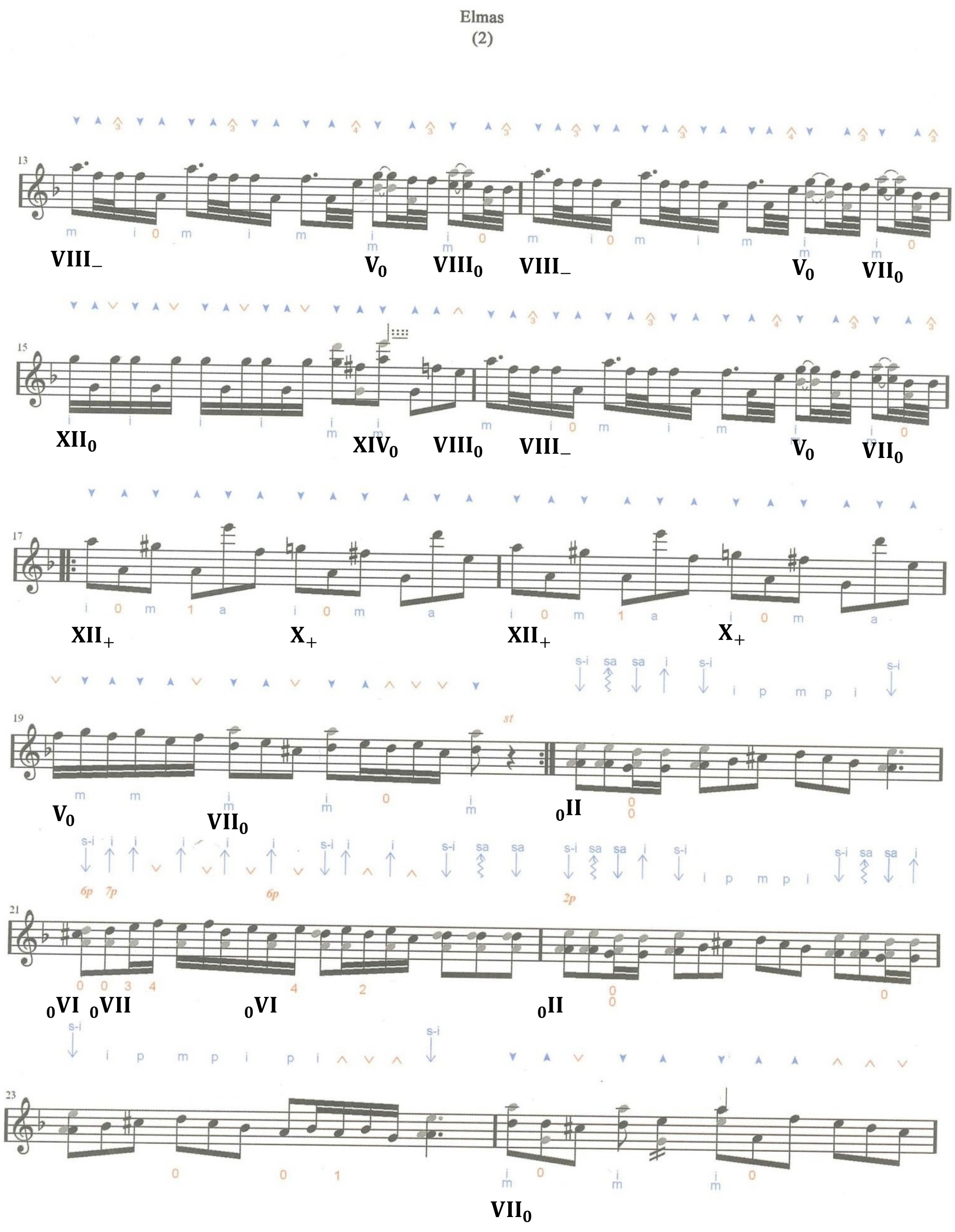


Figure F.8 (continued) : Erdal Erzincan's *Elmas* Arrangement (Adapted from Sağ and Erzincan, 2009).

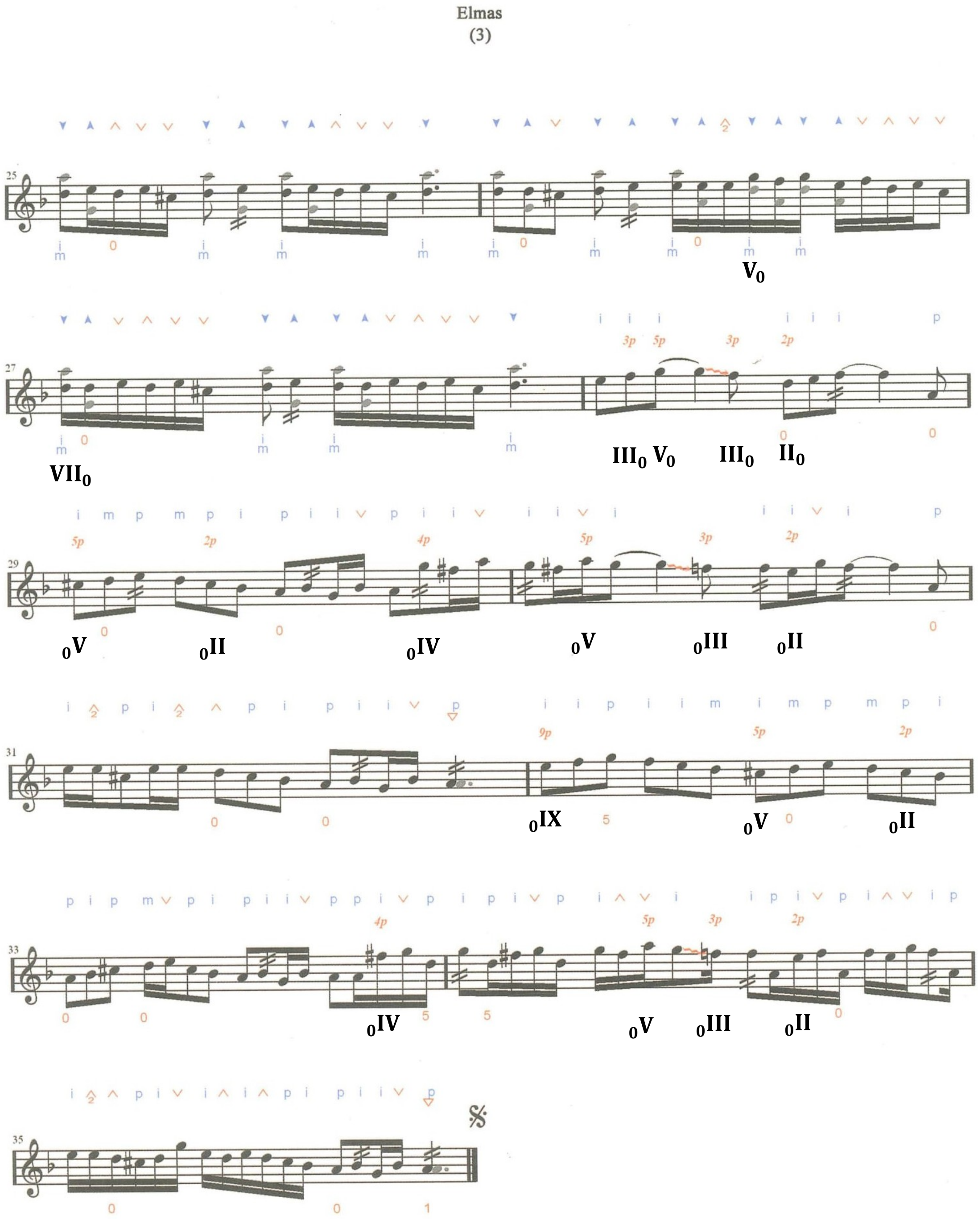


Figure F.8 (continued) : Erdal Erzincan's *Elmas* Arrangement (Adapted from Sağ and Erzincan, 2009).

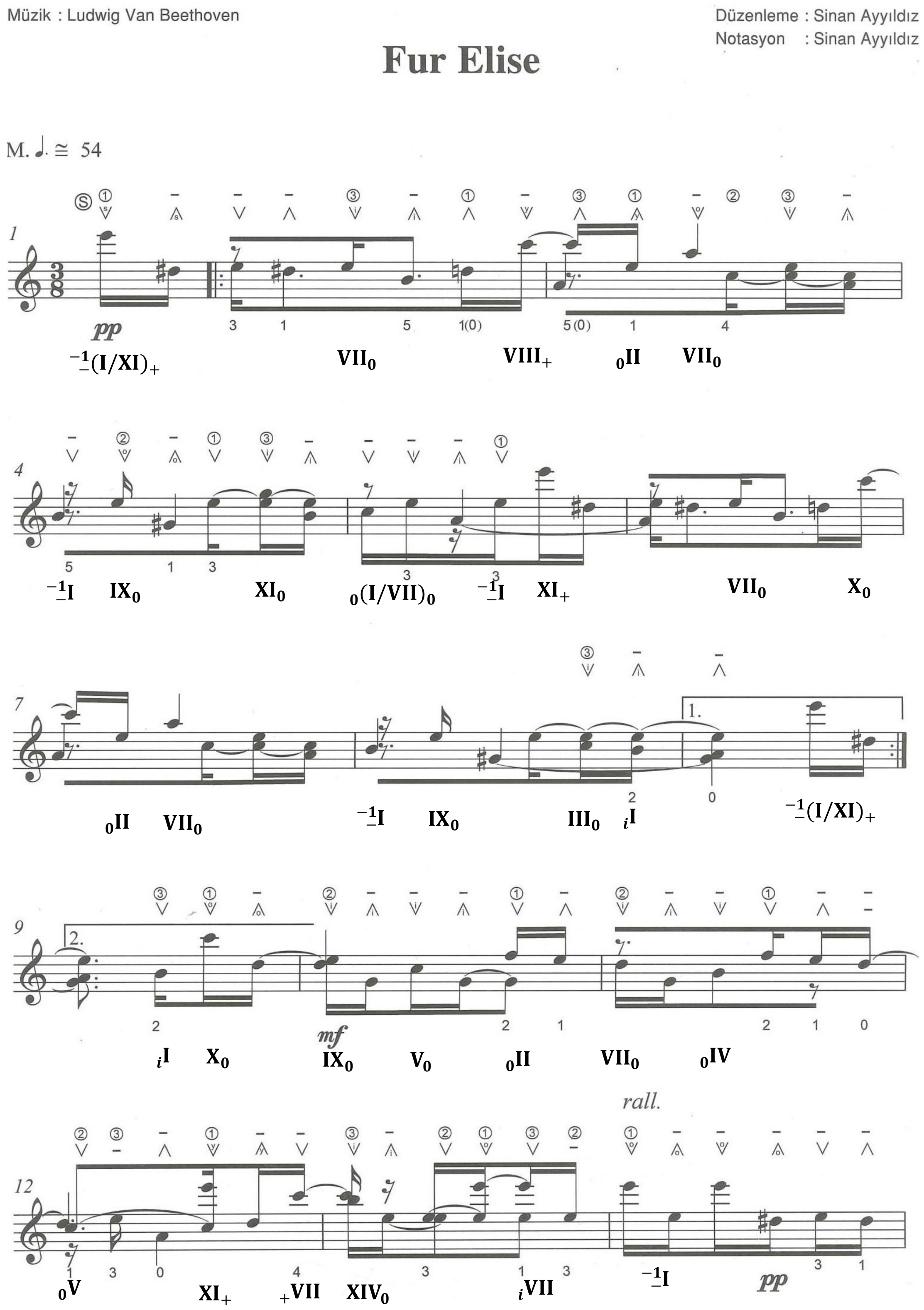


Figure F.9 : Sinan Ayyıldız's arrangement of L.V.Beethoven's *Fur Elise (*Adapted from Parlak, 2005).

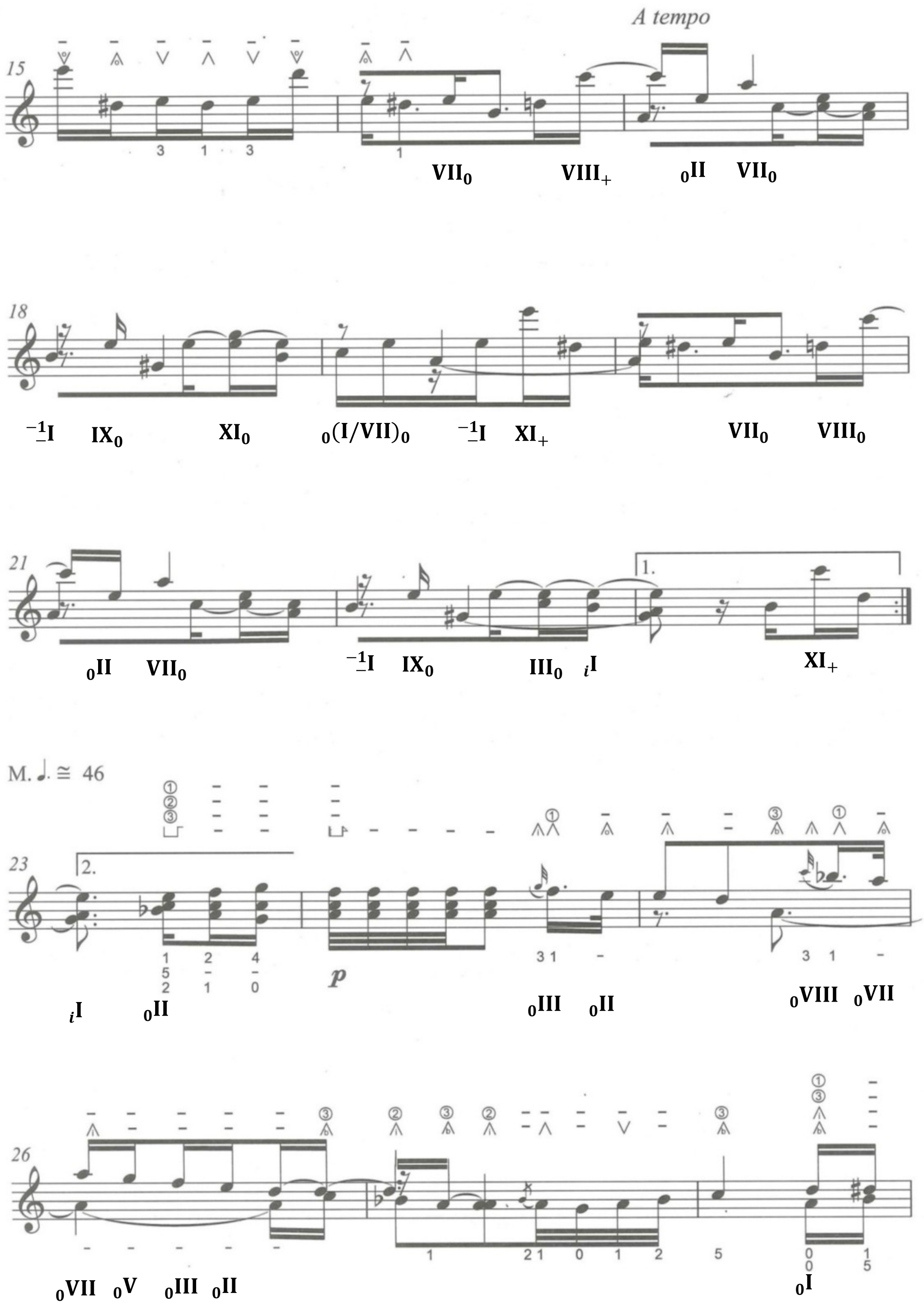


Figure F.9 (continued) : Sinan Ayyıldız's arrangement of L.V.Beethoven's *Fur Elise (*Adapted from Parlak, 2005).

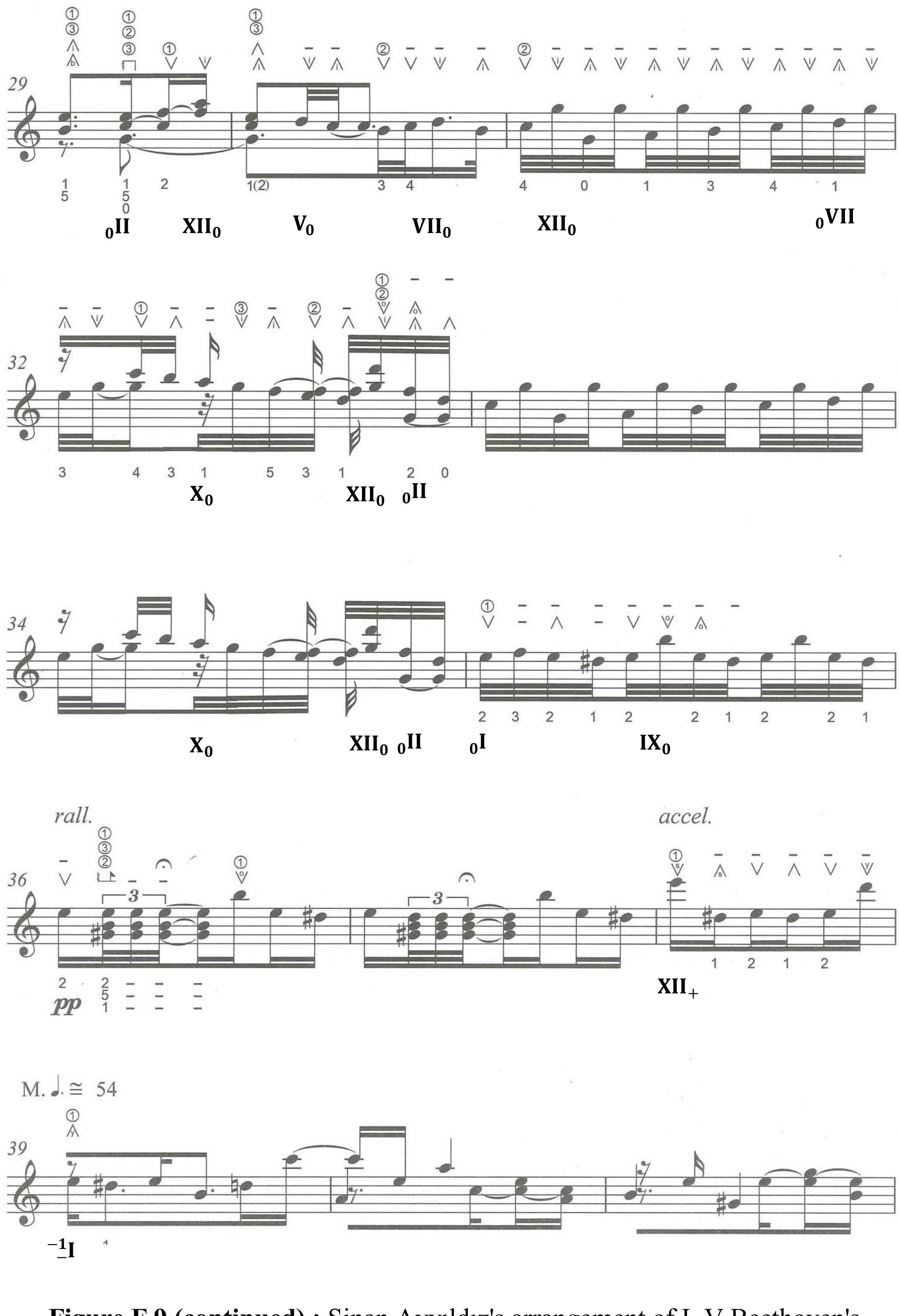


Figure F.9 (continued) : Sinan Ayyıldız's arrangement of L.V.Beethoven's *Fur Elise (*Adapted from Parlak, 2005).

Figure F.9 (continued) : Sinan Ayyıldız's arrangement of L.V.Beethoven's *Fur Elise (*Adapted from Parlak, 2005).

Figure F.9 (continued) : Sinan Ayyıldız's arrangement of L.V.Beethoven's *Fur Elise (*Adapted from Parlak, 2005).

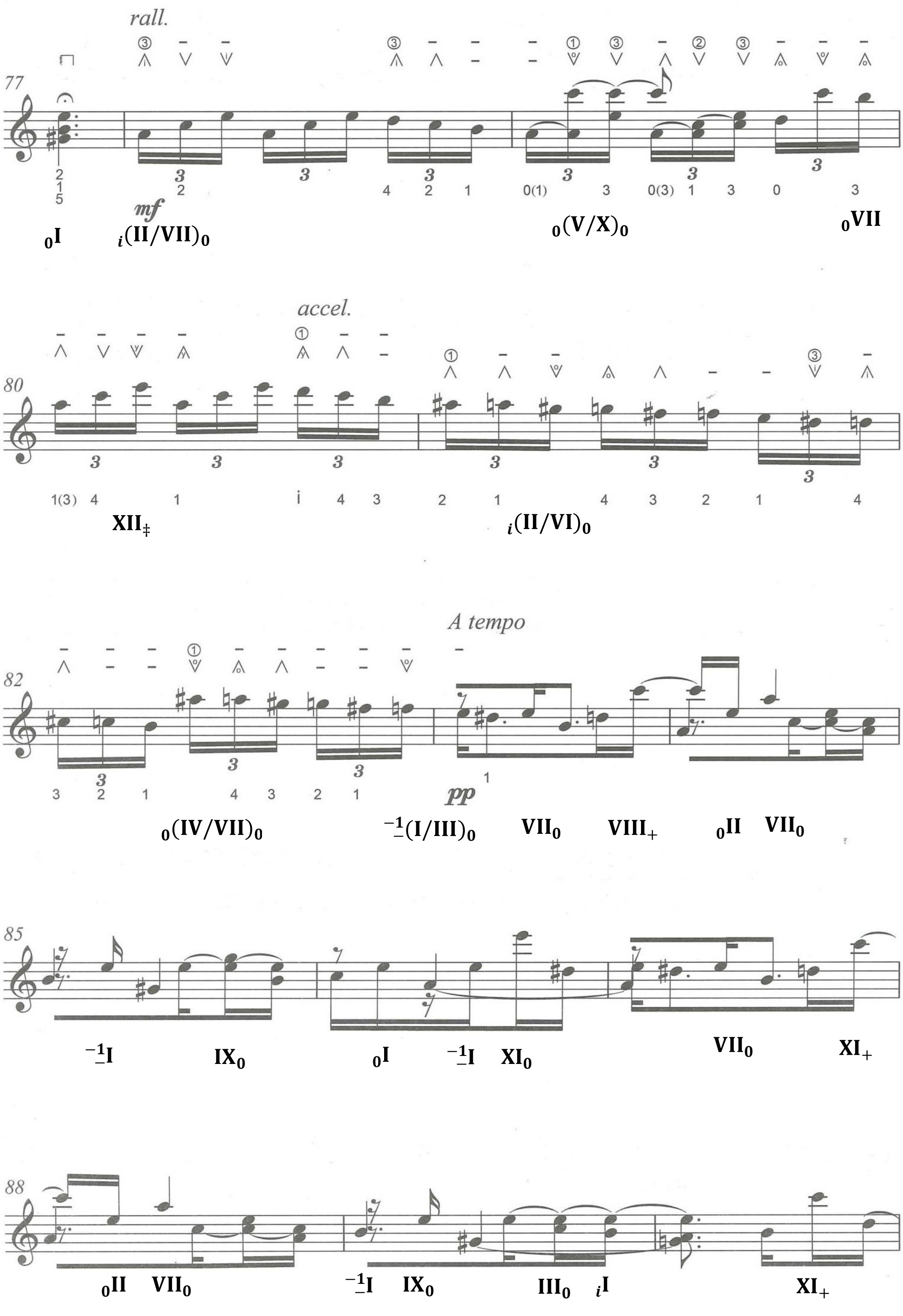


Figure F.9 (continued) : Sinan Ayyıldız's arrangement of L.V.Beethoven's *Fur Elise (*Adapted from Parlak, 2005).

Figure F.9 (continued) : Sinan Ayyıldız's arrangement of L.V.Beethoven's *Fur Elise (*Adapted from Parlak, 2005).

Müzik : Johann Sebastian Bach

Düzenleme : Sinan Ayyıldız
Dinçer Serin
Notasyon : Sinan Ayyıldız

Badinerie

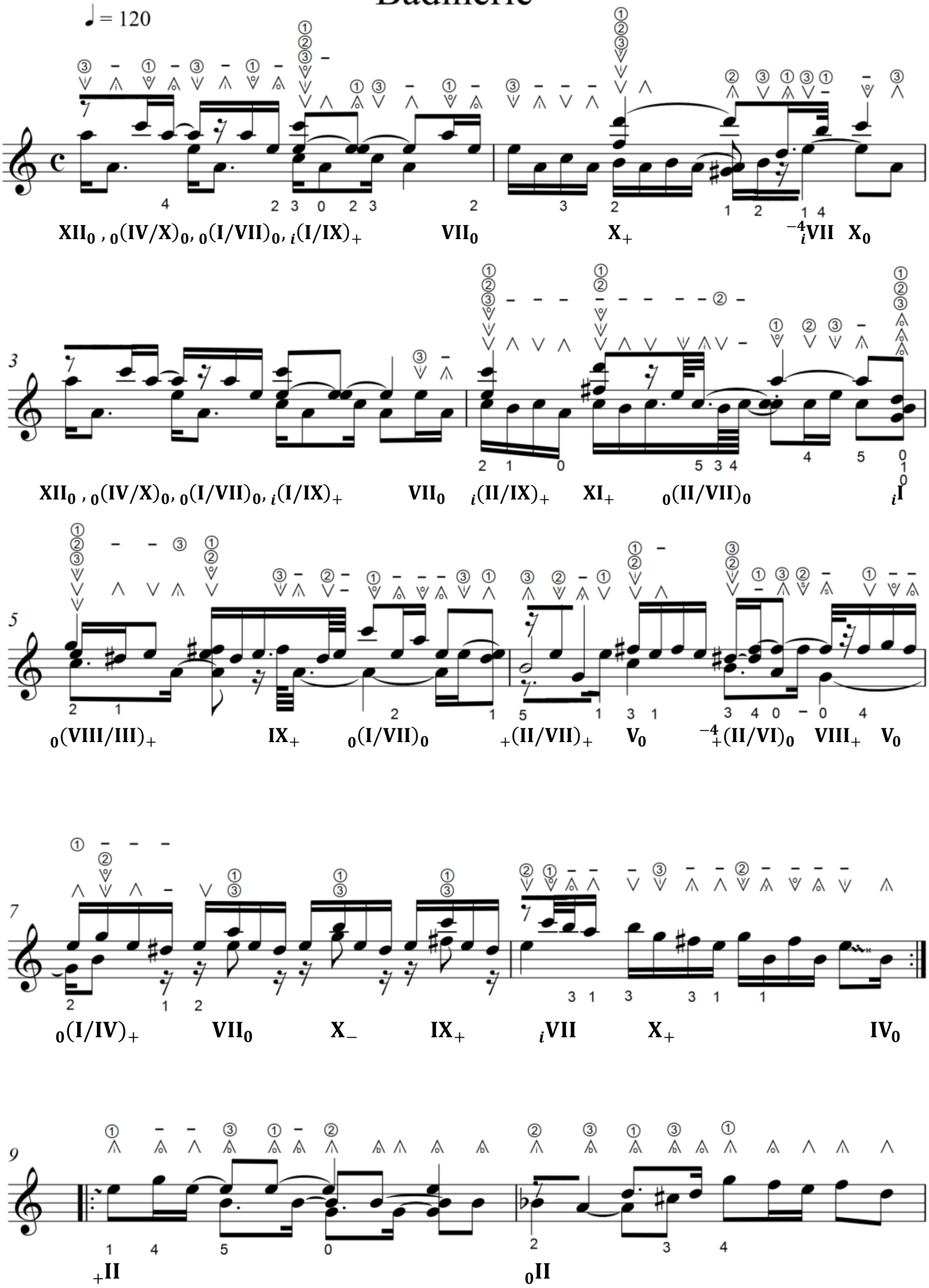


Figure F.10 : Sinan Ayyıldız's and Dinçer Serin's arrangement of J.S.Bach's *Badinerie (*Adapted from Ayyıldız, 2016).

Figure F.10 (continued) : Sinan Ayyıldız's and Dinçer Serin's arrangement of J.S.Bach's *Badinerie (*Adapted from Ayyıldız, 2016).

Region :Azerbaijan
Music : Traditional

Arrangement for PVT : Sinan Ayyıldız

Ay Laçin

Figure F.11 : Sinan Ayyıldız's *Ay Laçin* arrangement (Adapted from Ayyıldız, 2016).

Figure F.11 (continued) : Sinan Ayyıldız's *Ay Laçin* arrangement (Adapted from Ayyıldız, 2016).

Figure F.11 (continued) : Sinan Ayyıldız's *Ay Laçin* arrangement (Adapted from Ayyıldız, 2016).

Figure F.12 : Sinan Ayyıldız's *Kolhoz Barı* arrangement (Adapted from Ayyıldız, 2016).

Figure F.12 (continued) : Sinan Ayyıldız's *Kolhoz Barı* arrangement (Adapted from Ayyıldız, 2016).

Figure F.12 (continued) : Sinan Ayyıldız's *Kolhoz Barı* arrangement (Adapted from Ayyıldız, 2016).

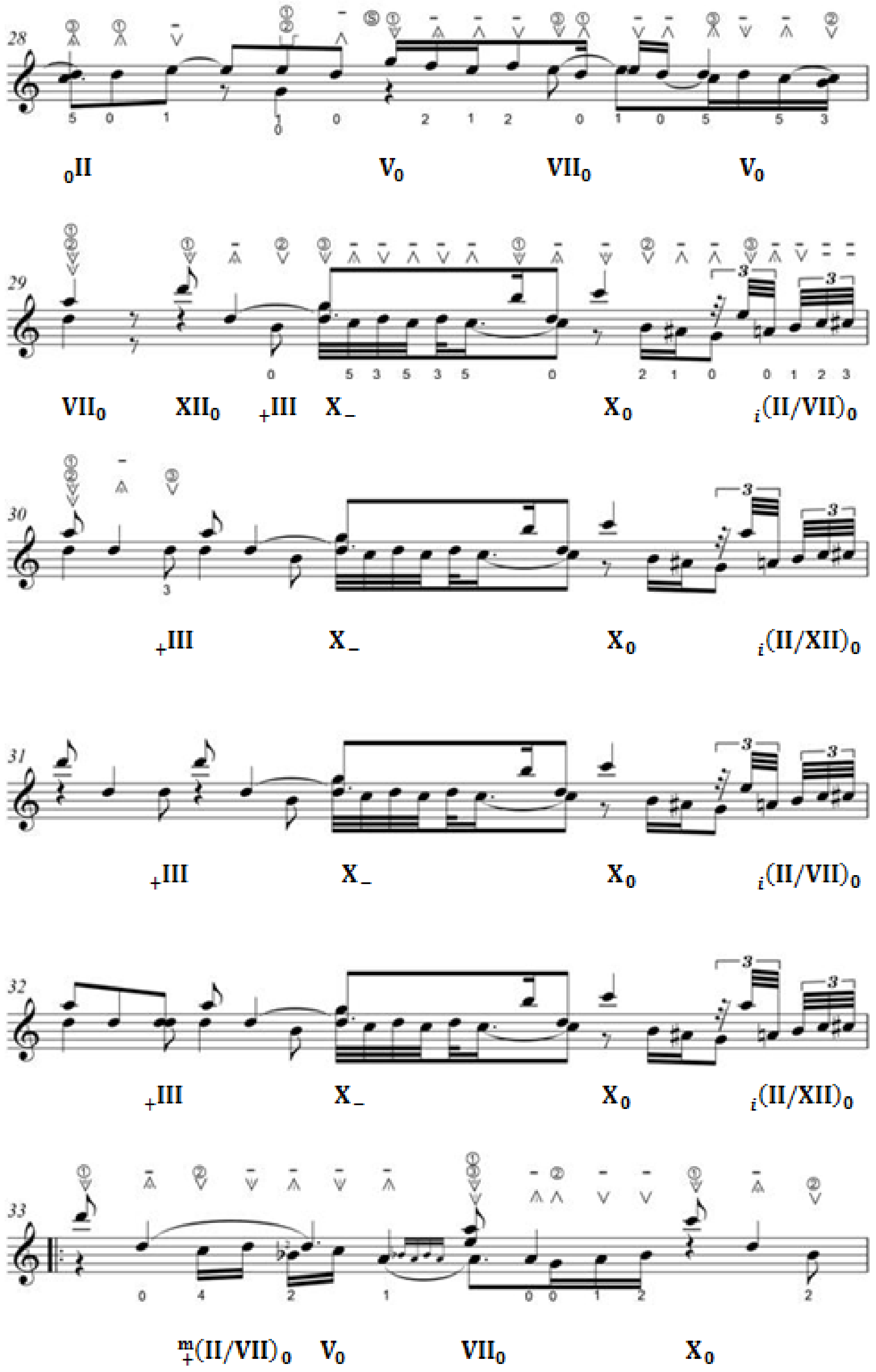


Figure F.12 (continued) : Sinan Ayyıldız's *Kolhoz Barı* arrangement (Adapted from Ayyıldız, 2016).

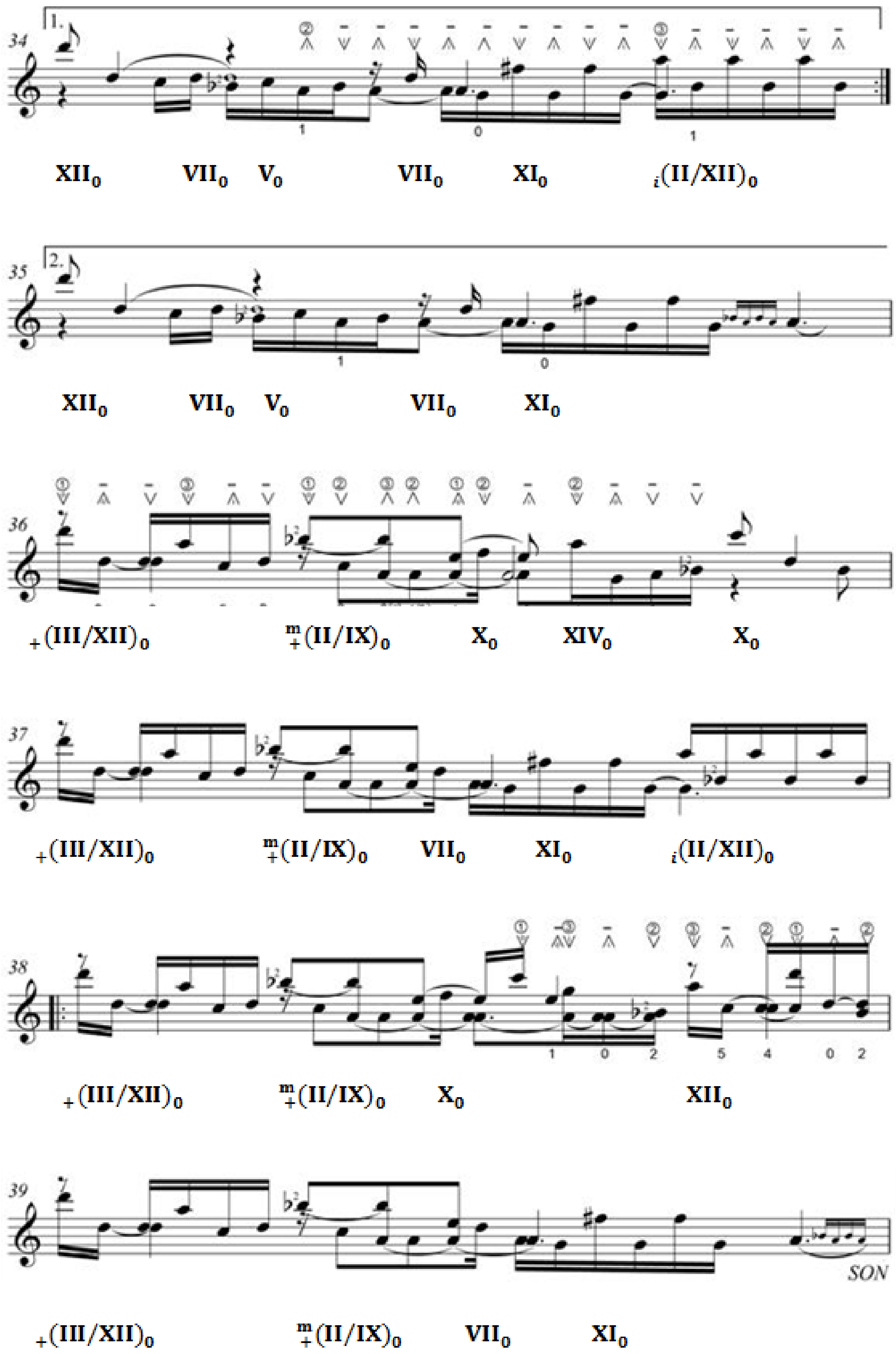


Figure F.12 (continued) : Sinan Ayyıldız's *Kolhoz Barı* arrangement (Adapted from Ayyıldız, 2016).

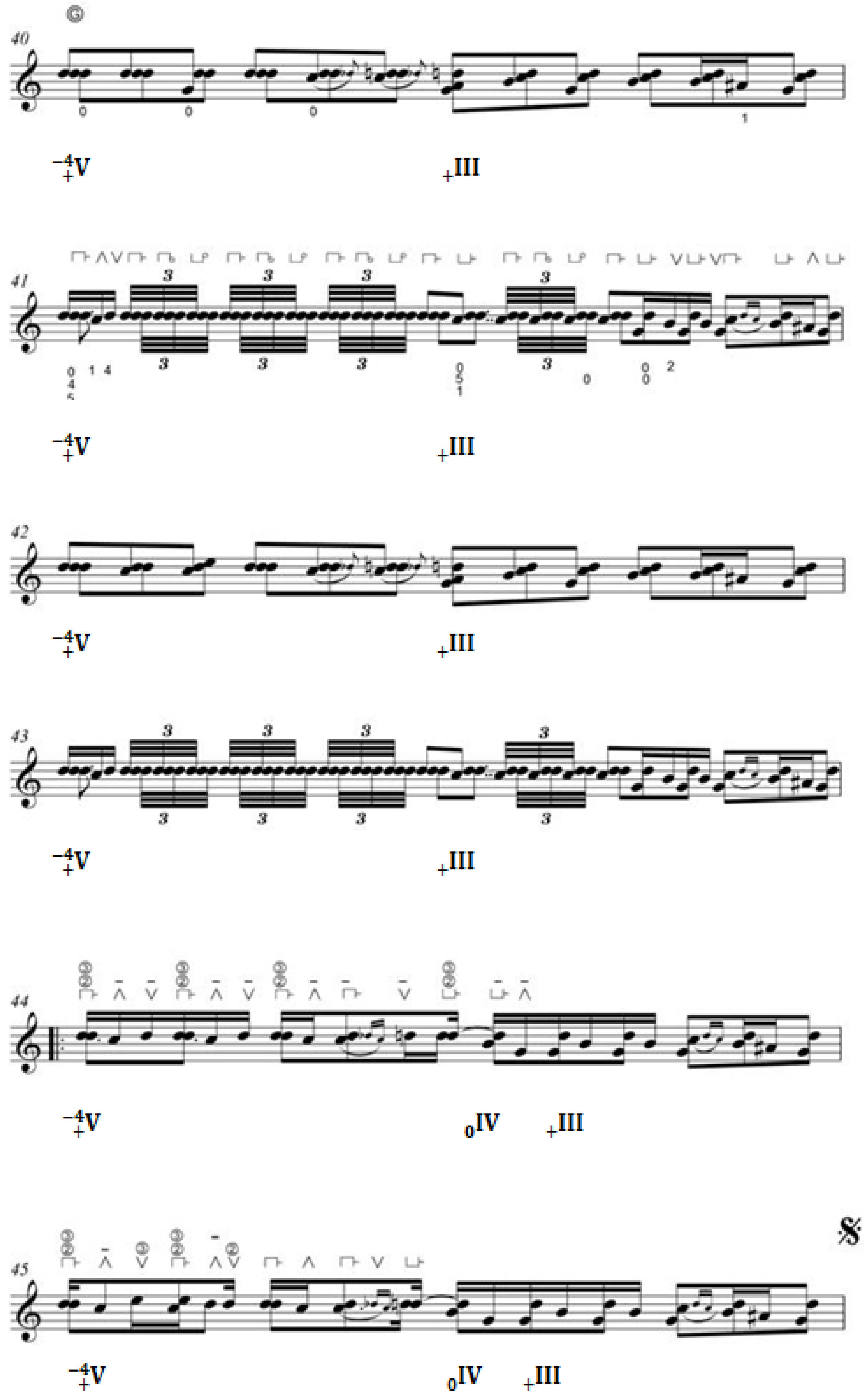


Figure F.12 (continued) : Sinan Ayyıldız's *Kolhoz Barı* arrangement (Adapted from Ayyıldız, 2016).

APPENDIX G: PROPORTION OF USE OF FINGERING TYPES IN THE SCORES IN APPENDIX F

Table G.1. : Proportion of Use of Fingering Types in the Scores in Appendix F.

Piece	Performer	USING RATE OF LEFT HAND FINGERING TYPES (%)												USING RATE OF RIGHT HAND FINGERING TYPES (%)				
		L(0)	L(i)	L (+)	L(-)	L(i) & L(-4)	L(+) & L(-4)	L(-) & L(-1)	L(+) & L(+2m)	L(+) & L(-1,-4)	L(i) & L(+2m)	L(+1,+4)	Total	R(0)	R(+)	R(-)	R(++)	Total
Göç Yolları	Erol Parlak	41,04	0,28	-	-	0,56	41,18	-	16,94	-	-	-	100	86,22	5,45	0,32	8,01	100
Azeri Oyun Havası	Erol Parlak	94,44	2,78	-	-	2,18	-	0,60	-	-	-	-	100	82,76	14,94	0,69	2,76	100
Topal	Erol Parlak	29,24	-	43,92	-	-	-	-	26,84	-	-	-	100	80,01	19,18	-	1,34	100
Alla Turca	Erol Parlak	51,52	31,19	3,03	-	5,56	4,29	4,04	0,25	-	-	0,13	100	69,88	13,51	3,47	13,13	100
Sarı Zeybek	Erdal Erzincan	31,93	-	-	-	-	-	1,13	65,82	-	1,13	-	100	95,44	4,56	-	-	100
Anadolu	Erdal Erzincan	63,89	2,81	0,30	-	-	8,46	-	22,13	2,41	-	-	100	96,26	3,74	-	-	100
Giriftar	Erdal Erzincan	95,58	-	-	-	-	4,42	-	-	-	-	-	100	71,39	22,03	6,58	-	100
Elmas	Erdal Erzincan	100	-	-	-	-	-	-	-	-	-	-	100	82,35	11,76	5,88	-	100
Fur Elise	Sinan Ayyıldız	46,22	14,61	3,32	-	0,80	-	34,26	0,80	-	-	-	100	73,52	25,16	-	1,32	100
Badinerie	Sinan Ayyıldız	59,38	27,68	4,46	1,79	1,79	2,68	2,23	-	-	-	-	100	58,50	35,50	6,00	-	100
Ay Laçin	Sinan Ayyıldız	38,07	4,59	30,73	-	23,85	2,75	-	-	-	-	-	100	76,32	18,42	5,26	-	100
Kolhoz Barı	Sinan Ayyıldız	12,73	11,57	20,02	1,39	-	11,35	-	43,52	-	-	-	100	92,00	-	8,00	-	100
AVERAGE		55,34	7,96	8,82	0,26	2,89	6,26	3,52	14,64	0,20	0,01	0,09	100	80,39	14,52	3,02	2,21	100

Table G.2 : Proportion of Use of Left Hand Fingering Types in PVT parts of the Scores in Appendix F.

Piece	Performer	USING RATE OF LEFT HAND FINGERING TYPES (%)											
		L(0)	L(i)	L (+)	L(-)	L(i) & L(-4)	L(+) & L(-4)	L(-) & L(-1)	L(+) & L(+2m)	L(+) & L(-1,-4)	L(i) & L(+2m)	L(+1,+4)	Total
Göç Yolları	Erol Parlak	47,04	0,32	-	-	0,64	32,45	-	19,55	-	-	-	100
Azeri Oyun Havası	Erol Parlak	93,86	3,18	-	-	2,50	-	0,45	-	-	-	-	100
Topal	Erol Parlak	25,96	-	53,76	-	-	-	-	20,29	-	-	-	100
Alla Turca	Erol Parlak	42,20	46,63	1,93	-	8,48	0,77	-	-	-	-	-	100
Sarı Zeybek	Erdal Erzincan	37,73	-	-	-	-	-	1,47	60,81	-	-	-	100
Anadolu	Erdal Erzincan	76,89	7,31	-	-	-	3,14	-	12,67	-	-	-	100
Giriftar	Erdal Erzincan	93,92	-	-	-	-	6,08	-	-	-	-	-	100
Elmas	Erdal Erzincan	100	-	-	-	-	-	-	-	-	-	-	100
Fur Elise	Sinan Ayyıldız	36,08	18,12	3,29	-	-	-	42,50	-	-	-	-	100
Badinerie	Sinan Ayyıldız	58,50	31,00	1,00	2,00	2,00	3,00	2,50	-	-	-	-	100
Ay Laçin	Sinan Ayyıldız	38,07	4,59	30,73	-	23,85	2,75	-	-	-	-	-	100
Kolhoz Barı	Sinan Ayyıldız	23,33	19,33	7,33	-	-	-	-	50,00	-	-	-	100
AVERAGE		59,11	10,10	8,25	0,18	3,41	4,38	4,27	10,30	-	-	-	100

Table G.3 : Proportion of Use of Left Hand Fingering Types in PT parts of the Scores in Appendix F.

Piece	Performer	USING RATE OF LEFT HAND FINGERING TYPES (%)											
		L(0)	L(i)	L (+)	L(-)	L(i) & L(-4)	L(+) & L(-4)	L(-) & L(-1)	L(+) & L(+2m)	L(+) & L(-1,-4)	L(i) & L(+2m)	L(+1,+4)	Total
Göç Yolları	Erol Parlak	2,08	-	-	-	-	97,92	-	-	-	-	-	100
Azeri Oyun Havası	Erol Parlak	-	-	-	-	-	-	-	-	-	-	-	-
Topal	Erol Parlak	43,90	-	-	-	-	-	-	56,10	-	-	-	100
Alla Turca	Erol Parlak	63,47	0,46	6,39	-	-	13,70	14,61	0,91	-	0,46	-	100
Sarı Zeybek	Erdal Erzincan	8,16	-	-	-	-	-	-	91,84	-	-	-	100
Anadolu	Erdal Erzincan	50,16	-	-	-	-	21,05	-	21,36	7,43	-	-	100
Giriftar	Erdal Erzincan	94,40	-	-	-	-	3,60	-	-	-	-	-	100
Elmas	Erdal Erzincan	100	-	-	-	-	-	-	-	-	-	-	100
Fur Elise	Sinan Ayyıldız	85,22	-	4,35	-	5,22	-	-	5,22	-	-	-	100
Badinerie	Sinan Ayyıldız	-	-	-	-	-	-	-	-	-	-	-	-
Ay Laçin	Sinan Ayyıldız	-	-	-	-	-	-	-	-	-	-	-	-
Kolhoz Barı	Sinan Ayyıldız	9,65	-	42,11	5,26	-	42,98	-	-	-	-	-	100
AVERAGE		56,18	0,06	1,34	-	0,65	17,03	1,83	21,93	0,93	0,06	-	100

Table G.4 : Proportion of Use of Left Hand Fingering Types in TÇT parts of the Scores in Appendix F.

Piece	Performer	USING RATE OF LEFT HAND FINGERING TYPES (%)											
		L(0)	L(i)	L (+)	L(-)	L(i) & L(-4)	L(+) & L(-4)	L(-) & L(-1)	L(+) & L(+2m)	L(+) & L(-1,-4)	L(i) & L(+2m)	L(+1,+4)	Total
Göç Yolları	Erol Parlak	-	-	-	-	-	-	-	-	-	-	-	-
Azeri Oyun Havası	Erol Parlak	98,44	-	-	-	-	-	1,82	-	-	-	-	100
Topal	Erol Parlak	-	-	-	-	-	-	-	-	-	-	-	-
Alla Turca	Erol Parlak	92,59	7,41	-	-	-	-	-	-	-	-	-	100
Sarı Zeybek	Erdal Erzincan	50,00	-	-	-	-	-	-	5,56	-	44,44	-	100
Anadolu	Erdal Erzincan	62,04	-	1,02	-	-	1,44	-	35,50	-	-	-	100
Giriftar	Erdal Erzincan	100	-	-	-	-	-	-	-	-	-	-	100
Elmas	Erdal Erzincan	100	-	-	-	-	-	-	-	-	-	-	100
Fur Elise	Sinan Ayyıldız	100	-	-	-	-	-	-	-	-	-	-	100
Badinerie	Sinan Ayyıldız	66,67	-	33,33	-	-	-	-	-	-	-	-	100
Ay Laçin	Sinan Ayyıldız	-	-	-	-	-	-	-	-	-	-	-	-
Kolhoz Barı	Sinan Ayyıldız	5,36	12,50	16,37	-	-	-	-	65,77	-	-	-	100
AVERAGE		83,72	0,93	4,29	0,0	0,0	0,18	0,20	5,13	0,0	5,56	0,0	100

APPENDIX H: NOTATION OF ASCENDING-DESCENDING IONIAN PLAYING WITH DIFFERENT SOP ALTERNATIVES THAT DON'T USE LH THUMB ON TABLE 4.11

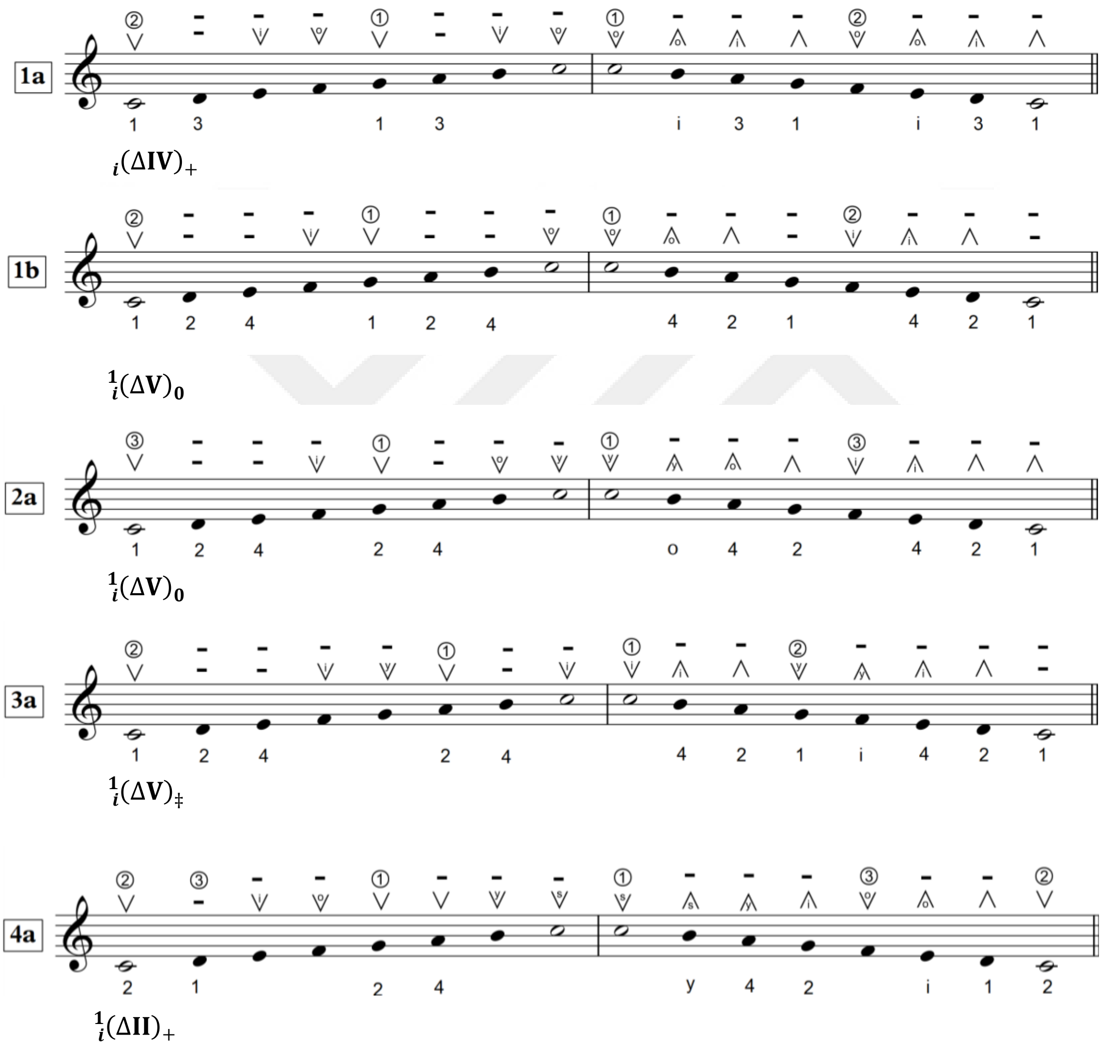


Figure H.1 : Representation on notation of ascending playing of Ionian scale with different SOP alternatives on Table 4.11.

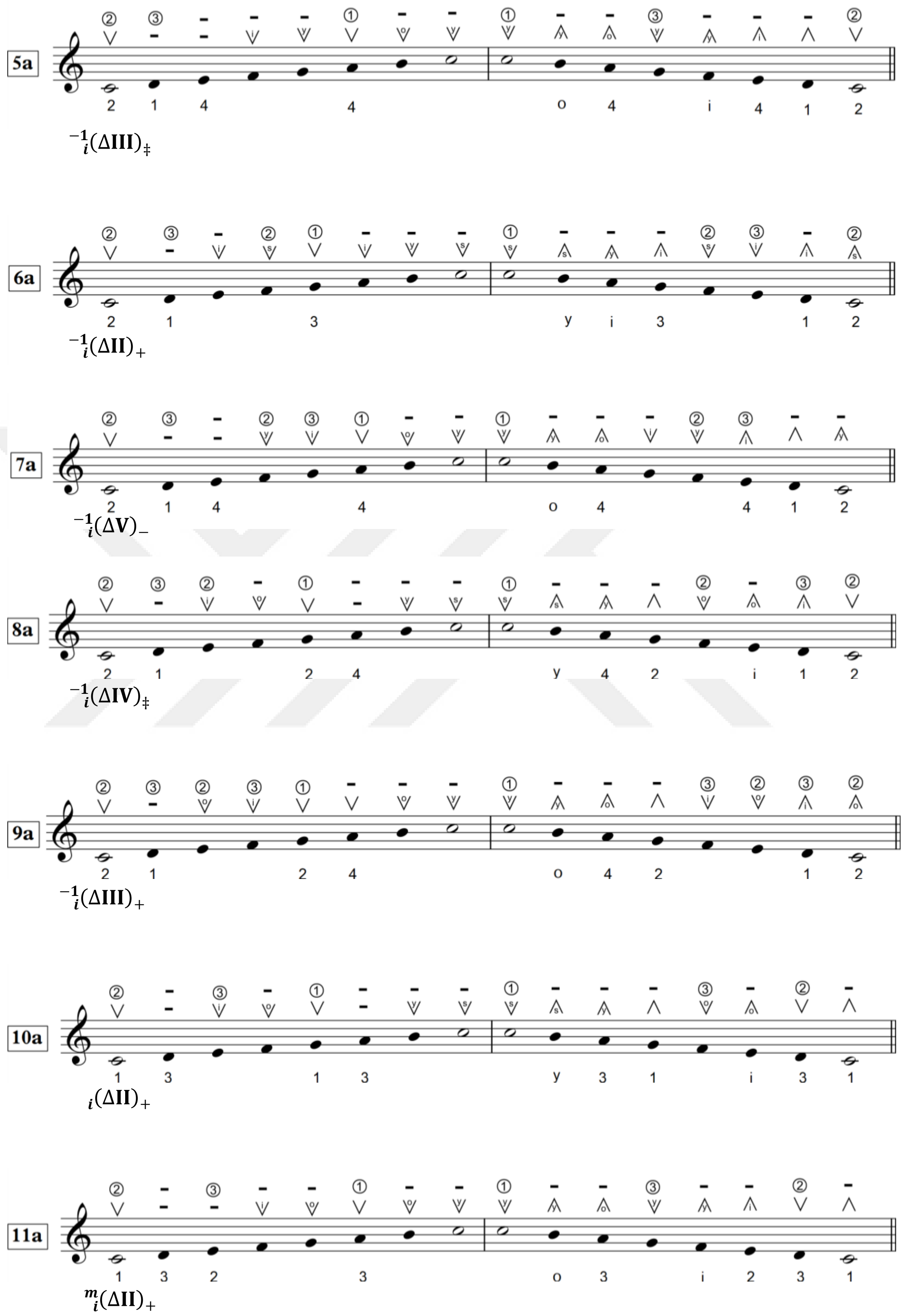


Figure H.1 (continued) : Representation on notation of ascending playing of Ionian scale with different SOP alternatives on Table 4.11.

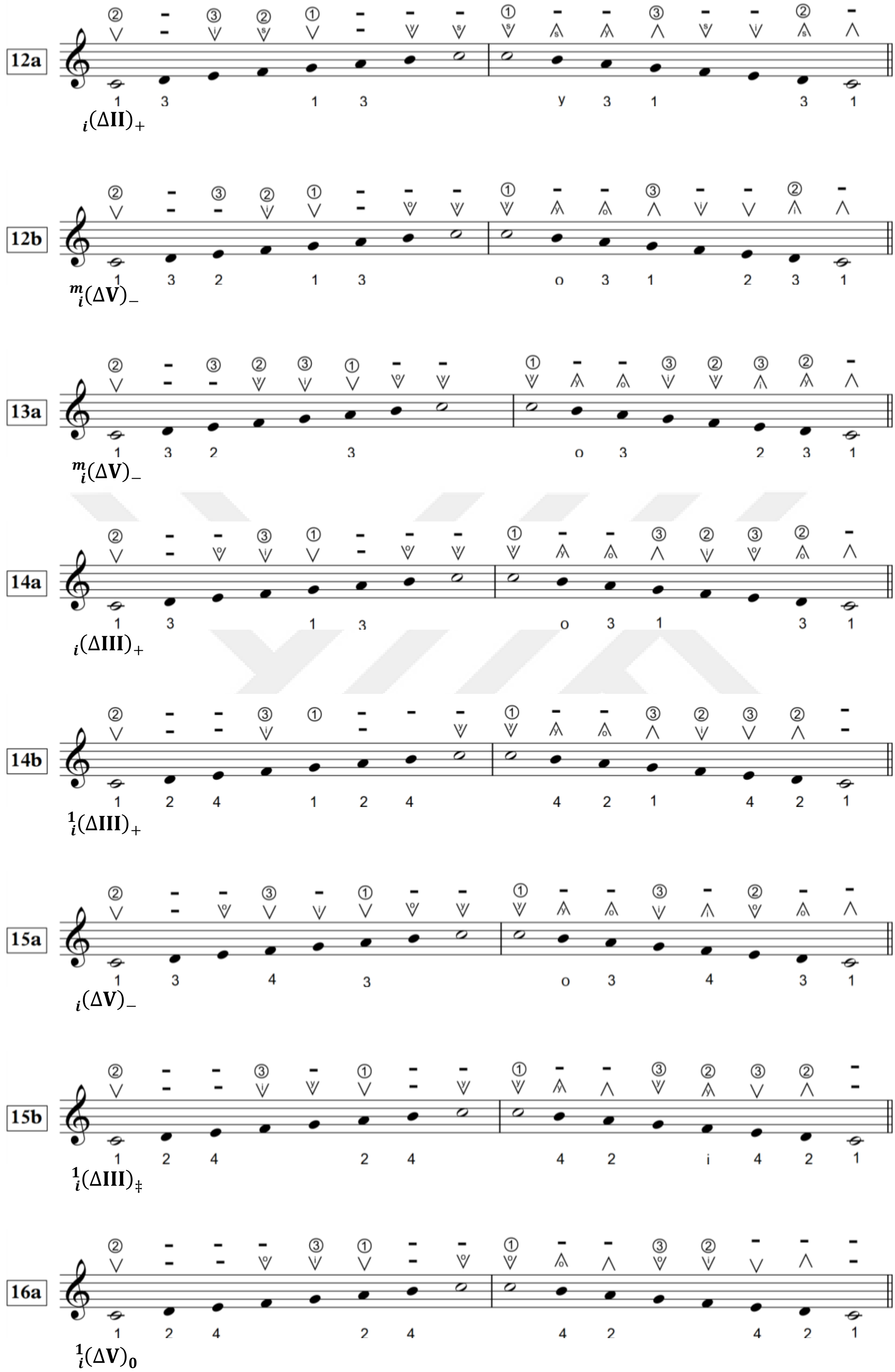


Figure H.1 (continued) : Representation on notation of ascending playing of Ionian scale with different SOP alternatives on Table 4.11.

APPENDIX I: NOTATION OF ASCENDING DESCENDING PLAYING OF HEPTATONIC SCALE WITH DIFFERENT SOP ALTERNATIVES THAT IS USED LH THUMB ON TABLE 4.12

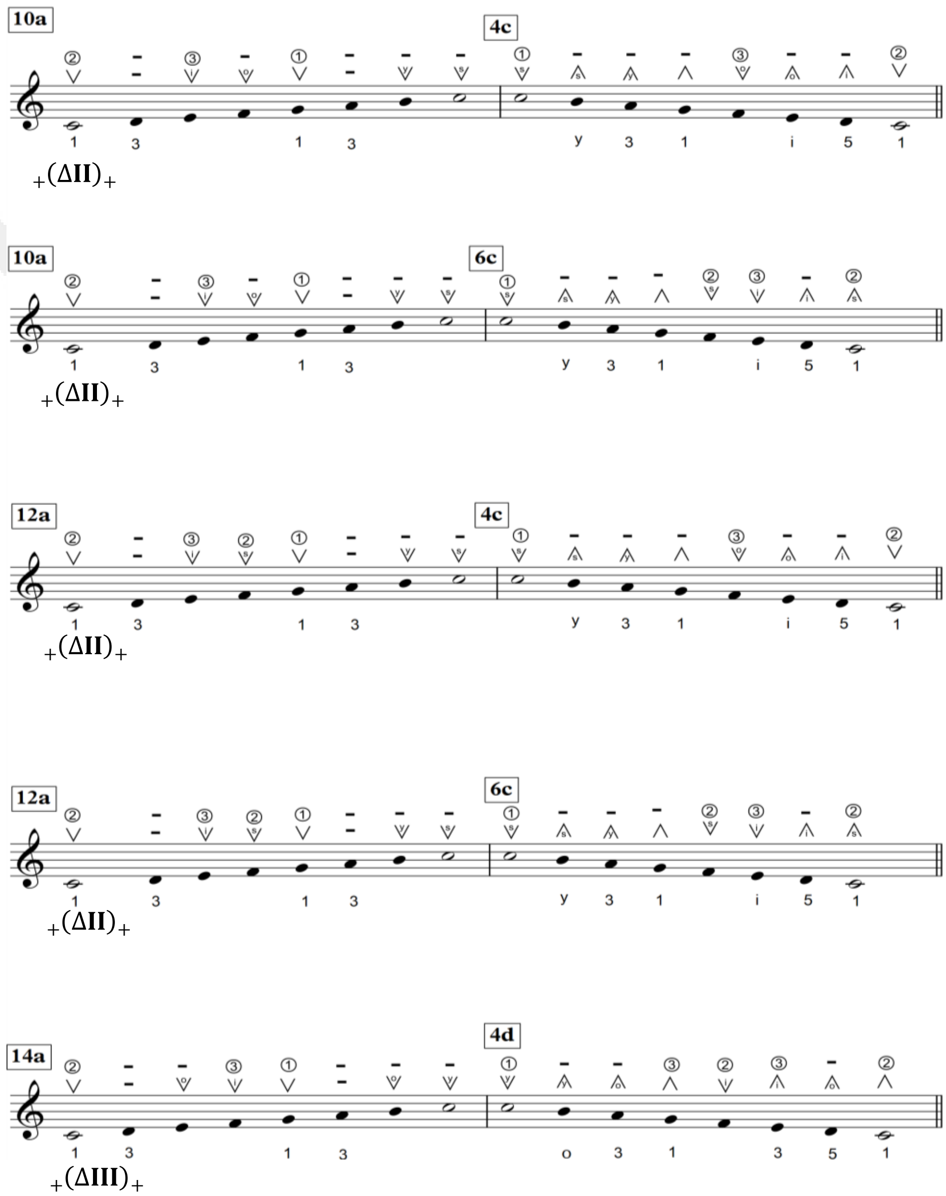


Figure I.1 : Representation on notation of ascending descending playing of Ionian scale with different SOP alternatives that is used LH Thumb on Table 4.12.

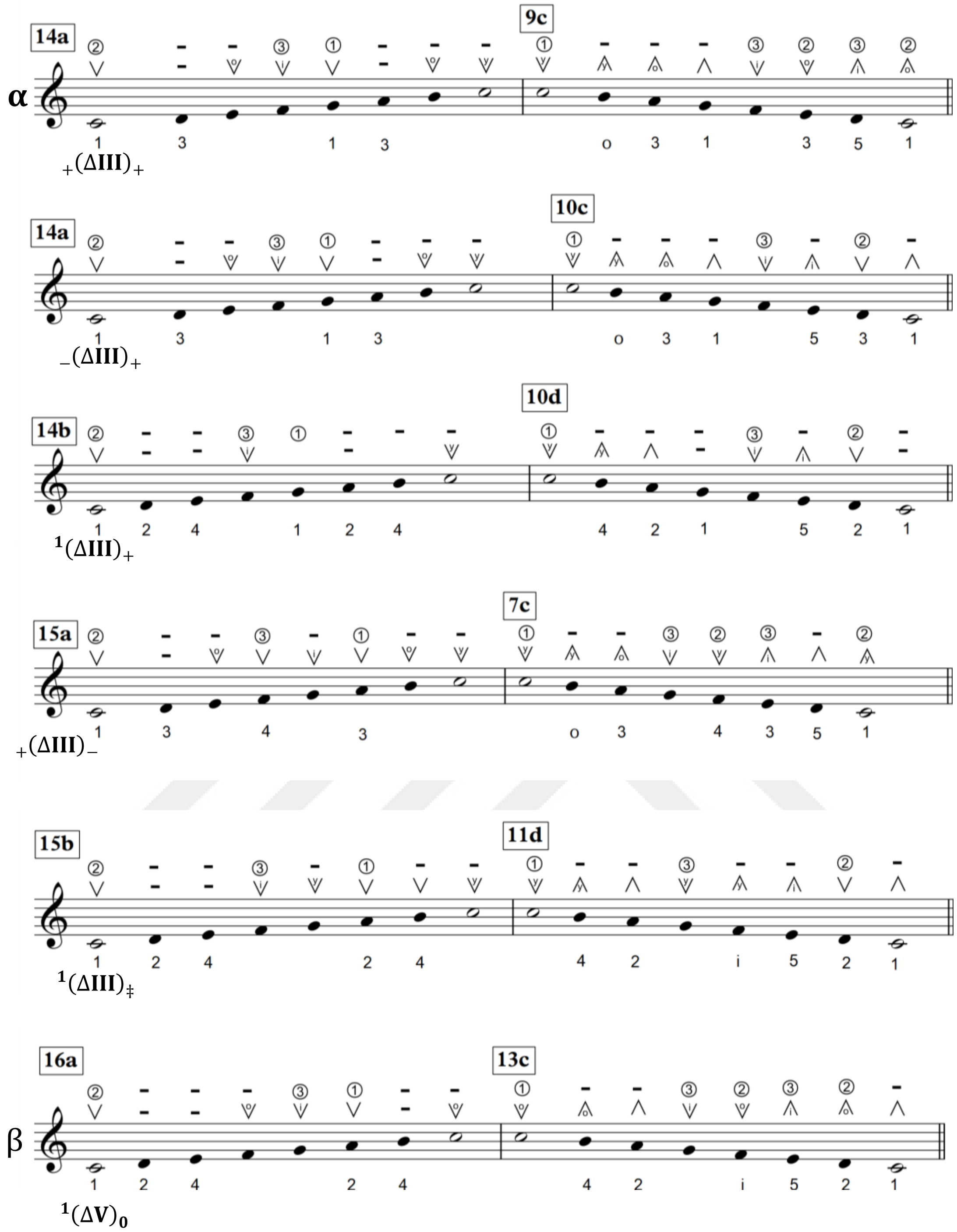


Figure I.1 (continued) : Representation on notation of ascending descending playing of Ionian scale with different SOP alternatives that is used LH Thumb on Table 4.12.

APPENDIX J: HAMMER -ON AND PULL OFF POSSIBILITIES OF PDC-TREES

Table J.1 : Hammer -on and pull off possibilities of PDC-trees of **α-** type PDCs.

LH		RH	Hammer On Possibilities							Pull -Off Possibilities						
			I	II	III	IV	V	VI	VII	VIII	IX or II	X or III	XI or IV	XII or V	VI	VII
1.2.5.6. (2.3.4.)	α	3.4.4.5. 7.8.	1. 8.	2. 2.	3. 3.	4. 4.	5. 5.	6.	7.	8-7 8-6 8-5	2-1	3-2 3-2 3-1	4-3 4-3 4-2 4-2 4-1	5-2 5-3 5-4	6-5	7-6 7-5
	α_1	4.5.5.6. 8.9.	1. 8.	2. 2. 9.	3.	4. 4.	5. 5. 5.	6. 6.	–	8-6 8-5	9-8 2-1 9-6 9-5	3-2	4-3 4-2 4-2 4-1	5-4 5-4 5-3 5-2 5-2 5-1	6-5 6-5 6-4 6-3 6-2	–
	α_2	5.6.6.7. 9.10.	1.	2. 2. 9.	3. 10.	4.	5. 5.	6. 6. 6.	7.		2-1 9-6 9-5	10-9 3-2 10-6 10-5	4-3 4-2	5-2 5-1	6-5 6-5 6-2 6-1	7-6 7-4 7-3 7-2
	α_3	6.7.7.8. 10.11.	1. 8.	2. 2.	3. 10.	4. 11.	5.	6. 6.	7. 7.	8-7 8-4 8-3 8-2	2-1	3-2 10-6 10-5	11-10 4-3 11-6 4-2 11-5		6-5 6-2 6-1	7-6 7-4 7-3 7-2 7-2 7-1
	α_4	7.8.8.9. 11.12.	1.8. 8.	2. 2.9.	3.	4. 11.	5.12.	6.	7.	8-7 8-4 8-3 8-2 8-2 8-1	9-8 2-1 9-4 9-3 9-2	3-2	4-3 4-2 11-6 11-5	12-11 12-6 12-5	6-5	7-2 7-1

Table J.2 : Hammer -on and pull off possibilities of PDC-trees of $\boldsymbol{\alpha}^{7\text{-}L}$ **-** type PDCs.

LH		RH	Hammer -On Possibilities							Pull -Off Possibilities						
			I	II	III	IV	V	VI	VII	VIII	IX or II	X or III	XI or IV	XII or V	VI	VII
	α^{7-L}	3.4.4.5. 7.8.	1. 8.	2. 2.	3. 3.	4. 4.	 5. 5.	 6.	 7.	8-7 8-6 8-5	2-1	3-2 3-2 3-1	4-3 4-3 4-2 4-2 4-1	5-2 5-3 5-4	6-5	7-6 7-5
	α_1^{7-L}	4.5.5.6. 8.9.	1. 8.	2. 2. 9.	 3.	4. 4.	5. 5. 5.	 6. 6.	 7.	8-6 8-5	9-8 2-1 9-6 9-5	3-2	4-3 4-2 4-2 4-1	5-4 5-4 5-3 5-2 5-2 5-1	6-5 6-5 6-4 6-3 6-2	7-6 7-5
1.2.5.6.7. (2.3.4.)	α_2^{7-L}	5.6.6.7. 9.10.	1.	2. 2. 9.	 3. 10.	 4.	5. 5.	6. 6. 6.	 7. 7.		2-1 9-6 9-5	10-9 3-2 10-6 10-5	4-3 4-2	5-2 5-1	6-5 6-5 6-2 6-1	7-67-6 7-5 7-4 7-3 7-2
	α_3^{7-L}	6.7.7.8. 10.11.	1. 8.	2. 2.	 3. 10.	 4. 11.	 5.	6. 6.	7. 7. 7.	8-7 8-4 8-3 8-2	2-1	3-2 10-6 10-5	11-10 4-3 11-6 4-2 11-5		6-5 6-2 6-1	7-6 7-6 7-5 7-4 7-3 7-2 7-2 7-1
	α_4^{7-L}	7.8.8.9. 11.12.	1. 8. 8.	2. 2.9.	 3.	 4. 11.	 5.12.	 6.	7. 7.	8-7 8-4 8-3 8-2 8-2 8-1	9-8 2-1 9-4 9-3 9-2	3-2	4-3 4-2 11-6 11-5	12-11 12-6 12-5	6-5	7-6 7-5 7-2 7-1

Table J.3 : Hammer -on and pull off possibilities of PDC-trees of $\alpha^{3\text{-}L}$-type PDCs.

LH	RH		Hammer -On Possibilities							Pull -Off Possibilities						
			I	II	III	IV	V	VI	VII	VIII	IX or II	X or III	XI or IV	XII or V	VI	VII
	α^{3-L}	3.4.4.5. 7.8.	1. 8.	2. 2.	3. 3.	4. 4.	5. 5.	6.	7.	8-7 8-6 8-5	2-1	3-2 3-2 3-1	4-3 4-3 4-2 4-2 4-1	5-2 5-3 5-4	6-5	7-6 7-5
	α_1^{3-L}	4.5.5.6. 8.9.	1. 8.	2. 2. 9.	3. 3.	4. 4.	5. 5. 5.	6. 6.		8-6 8-5	9-8 2-1 9-6 9-5	3-2 3-2 3-1	4-3 4-3 4-2 4-2 4-1	5-4 5-4 5-3 5-3 5-2 5-2 5-1	6-56-5 6-4 6-3 6-2	
1.2.3.5.6. (2.3.4.)	α_2^{3-L}	5.6.6.7. 9.10.	1.	2. 2. 9.	3. 3. 10.	4.	5. 5.	6. 6. 6.	7.		2-1 9-6 9-5	10-9 3-2 3-2 3-1 10-6 10-5	4-3 4-2	5-3 5-2 5-1	6-5 6-5 6-4 6-3 6-3 6-2 6-2 6-1	7-6 7-4 7-3 7-2
	α_3^{3-L}	6.7.7.8. 10.11.	1. 8.	2. 2.	3. 3. 10.	4. 11.	5.	6. 6.	7. 7.	8-7 8-4 8-3 8-2	2-1	3-2 3-2 3-1 10-6 10-5	11-10 4-3 4-2 11-6 11-5		6-5 6-2 6-1	7-6 7-4 7-3 7-2 7-2 7-1
	α_4^{3-L}	7.8.8.9. 11.12.	1.8 8.	2. 2.9 .	3. 3.	4. 11.	5.1 2.	6.	7.	8-7 8-4 8-3 8-3 8-2 8-2 8-1	9-8 2-1 9-4 9-3 9-2	3-2 3-2 3-1	4-3 4-2 11-6 11-5	12-11 12-6 12-5	6-5	7-3 7-2 7-1

Table J.4 : Hammer -on and pull off possibilities of PDC-trees of β-type PDCs.

LH	RH		Hammer -On Possibilities							Pull -Off Possibilities						
			I	II	III	IV	V	VI	VII	VIII	IX or II	X or III	XI or IV	XII or V	VI	VII
1.2.3.5.6. 7. (2.3.4.)	β	4.5.5.6. 8.9.	1. 8.	2. 2. 9.	3. 3.	4. 4.	5. 5. 5.	 6. 6.	 7.	8-7 8-6 8-5	9-8 2-1 9-7 9-6 9-5	3-2 3-2 3-1	4-3 4-3 4-2 4-2 4-1	5-4 5-4 5-3 5-3 5-2 5-2 5-1	6-5 6- 5 6-4 6-3 6-2	7-6 7-5
	$β_1$	5.6.6.7. 9.10.	1.	2. 2. 9.	3. 3. 10.	 4.	5. 5.	6. 6. 6.	 7. 7.		2-1 9-7 9-6 9-5	10-9 3-2 3-2 3-1 10-7 10-6 10-5	4-3 4-2	5-3 5-2 5-1	6-5 6-5 6-4 6-3 6-3 6-2 6-2 6-1	7-6 7-6 7-5 7-4 7-3 7-2
	$β_2$	6.7.7.8. 10.11.	1. 8.	2. 2.	3. 3. 10.	 4. 11.	 5.	6. 6.	7. 7. 7.	8-7 8-4 8-3 8-2	2-1	3-2 3-2 3-1 10-7 10-6 10-5	11-10 4-3 4-2 11-7 11-6 11-5		6-5 6-3 6-2 6-1	7-6 7-6 7-5 7-4 7-3 7-3 7-2 7-2 7-1
	$β_3$	7.8.8.9. 11.12.	1.8 . 8.	2. 2. 9.	3. 3.	 4. 11.	 5.12.	 6.	7. 7.	8-7 8-4 8-3 8-2 8-2 8-1	9-8 2-1 9-4 9-3 9-2	3-2 3-2 3-1	4-3 4-2 11-7 11-6 11-5	12-11 12-7 12-6 12-5	6-5	7-6 7-5 7-3 7-2 7-1

Table J.5 : Hammer -on and pull off possibilities of PDC-trees of $\beta^{3\text{-}3}$-type PDCs

LH		RH	Hammer -On Possibilities							Pull -Off Possibilities						
			I	II	III	IV	V	VI	VII	VIII	IX or II	X or III	XI or IV	XII or V	VI	VII
1.2.3.5.6.7. (4.)	β	4.5.5.6. 8.9.	1. 8.	2. 9.	3.	4. 4.	5. 5. 5.	6. 6.	7.	8-7 8-6 8-5	9-8 2-1 9-7 9-6 9-5		4-3 4-2 4-1	5-4 5-4 5-3 5-2 5-1	6-5 6-5 6-4 6-3	7-6 7-5
	β_1^{3-3}	5.6.6.7. 9.10.	1.	2. 9.	3. 10.	4.	5. 5.	6. 6. 6.	7. 7.		9-7 2-1 9-6 9-5	10-9 10-7 10-6 10-5	4-3	5-2 5-1	6-5 6-5 6-4 6-3 6-2 6-1	7-6 7-6 7-5 7-4 7-3
	β_2^{3-3}	6.7.7.8. 10.11.	1. 8.	2.	3. 10.	4. 11.	5.	6. 6.	7. 7. 7.	8-7 8-4 8-3 8-2	2-1	10-7 10-6 10-5	11-10 4-3 11-7 11-6 11-5		6-5 6-2 6-1	7-6 7-6 7-5 7-4 7-3 7-2 7-1
	β_3^{3-3}	7.8.8.9. 11.12.	1.8 . 8.	2. 9.	3.	4. 11.	5.12.	6.	7. 7.	8-7 8-4 8-3 8-2 8-1	9-8 2-1 9-4 9-3 9-2		11-7 4-3 11-6 11-5	12-11 12-7 12-6 12-5	6-5	7-6 7-5 7-2 7-1

APPENDIX K: SOME PROPOSED METHODS FOR CREATING DRMP

$$[\Uparrow \mathbf{2}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{1}]$$

Figure K.1 : Sample pattern on A Phrygian

Table K.1 : Proposed performance methods for $[\Uparrow \mathbf{2}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{1}]$

Methods	Pattern Formulas
Method 1	$\boldsymbol{fPDC}\ (1, 2, 3, 4) + \boldsymbol{TPU_1} + \boldsymbol{fPDC}\ (2, 3, 4, 5, 6)@\boldsymbol{Mode5}$
Method 2	$\boldsymbol{fPDC}\ (1, 2, 3, 4, 5) + \boldsymbol{TPU_2} + \boldsymbol{fPDC}\ (2, 3, 4, 5)@\boldsymbol{Mode6}$
Method 3	$\boldsymbol{fPDC}\ (1, 2, 3, 4, 5) + (\boldsymbol{RPU_1}) \times \boldsymbol{n}$
Method 4	$\boldsymbol{fPDC}\ (1) + (\boldsymbol{RPU_2}) \times \boldsymbol{n_1} + \boldsymbol{fPDC}\ (2, 3, 4, 5)@\boldsymbol{Mode}(\boldsymbol{n_1}) + (\boldsymbol{RPU_1}) \times \boldsymbol{n_2}$

Table K.2 : PGTOP&SOP&PDC formulas of structures in Table K.1

Units	Structure Formulas
$\boldsymbol{fPDC_1}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R} + \genfrac{}{}{0pt}{}{2}{L^R}\middle\vert\genfrac{}{}{0pt}{}{3}{R} + \genfrac{}{}{0pt}{}{2}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L} + \genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L} + \genfrac{}{}{0pt}{}{1}{L^L}\middle\vert\genfrac{}{}{0pt}{}{1}{R} + \genfrac{}{}{0pt}{}{1}{L^R}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_p^s}^{\propto}$
$\boldsymbol{RPU_1}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{1}{L^R}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_p^s}^{\bar{\bar{\propto}}}$
$\boldsymbol{RPU_2}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L^R}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\right\}_p^s}^{\bar{\bar{\propto}}}$
$\boldsymbol{TPU_1}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{1}{L^L}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\right\}}^{\propto_4}$
$\boldsymbol{TPU_2}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{1}{L^R}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\right\}}^{\propto_5}$

$$[\Uparrow 3, (\Downarrow 2)] - [\Uparrow 1]$$

Figure K.2 : Sample pattern on G# melodic minor .

Table K.3. : Proposed performance methods for $[\Uparrow \mathbf{3}, (\Downarrow \mathbf{2})] - [\Uparrow \mathbf{1}]$.

Methods	Formulas
Method 1	$\boldsymbol{fPDC_1(1,2,3,4) + fPDC_1(1,2,3,4,5)@Mode5}$
Method 2	$\boldsymbol{fPDC_1(1,2,3,4,5) + TPU + fPDC_1(2,3,4,5)@Mode6}$
Method 3	$\boldsymbol{fPDC_1(1,2,3,4,5) + (RPU_1) \times n}$
Method 4	$\boldsymbol{IPU + (RPU_2) \times n_1 + fPDC_1(2,3,4,5)@Mode(n_1+1) + (RPU_1) \times n_2}$
Method 5 (For β)	$\boldsymbol{fPDC_2(1,2,3,4,5,6) + (RPU_1) \times n}$

Table K.4. : PGTOP&SOP&PDC formulas of structures in Table K.3 .

Units	Structure Formulas
$\boldsymbol{fPDC_1}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{3}{R} + \genfrac{}{}{0pt}{}{3}{L^R}\middle\vert\genfrac{}{}{0pt}{}{1}{L} + \genfrac{}{}{0pt}{}{2}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L} + \genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{R} + \genfrac{}{}{0pt}{}{1}{L^L}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_p^s}^{\propto}$
$\boldsymbol{fPDC_2}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R} + \genfrac{}{}{0pt}{}{2}{L^R}\middle\vert\genfrac{}{}{0pt}{}{3}{L} + \genfrac{}{}{0pt}{}{3}{L^R}\middle\vert\genfrac{}{}{0pt}{}{1}{L} + \genfrac{}{}{0pt}{}{2}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L} + \genfrac{}{}{0pt}{}{1}{L^L}\middle\vert\genfrac{}{}{0pt}{}{1}{R} + \genfrac{}{}{0pt}{}{1}{L^R}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_p^s}^{\beta}$
$\boldsymbol{IPU}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\right\}_p^s}^{\propto}$
$\boldsymbol{RPU_1}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{1}{L^R}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_p^s}^{\bar{\bar{\propto}}}$
$\boldsymbol{RPU_2}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L^R}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\right\}_p^s}^{\bar{\bar{\propto}}}$
$\boldsymbol{TPU}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{1}{L^L}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\right\}}^{\propto_4}$

$$[\Uparrow \mathbf{3}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{2}]$$

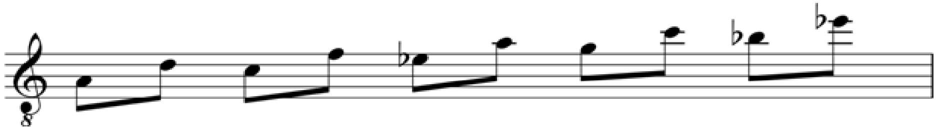


Figure K.3 : Sample pattern on A Locrian.

Table K.5 : Proposed performance methods for $[\Uparrow \mathbf{3}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{2}]$.

Methods	Formulas
Method 1	$\boldsymbol{fPDC_1(1,2) + TPU_1 + fPDC_1(2,3)@Mode5}$
Method 2	$\boldsymbol{fPDC_1(1,2,3) + (RPU_1) \times n}$
Method 3	$\boldsymbol{fPDC(1) + (RPU_2) \times n_1 + TPU_2 + fPDC_1(2,3)@Mode(2n_1+3) + (RPU_1) \times n_2}$
Method 4 (For β)	$\boldsymbol{fPDC_2(1,2,3) + (RPU_1) \times n}$

Table K.6 : PGTOP&SOP&PDC formulas of structures in Table K.5.

Units	Structure Formulas
$\boldsymbol{fPDC_1}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L}\Big\vert\genfrac{}{}{0pt}{}{3}{R}+\genfrac{}{}{0pt}{}{2}{R}\Big\vert\genfrac{}{}{0pt}{}{1}{L}+\genfrac{}{}{0pt}{}{1}{L^L}\Big\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_p^s}^{\propto}$
$\boldsymbol{fPDC_2}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L}\Big\vert\genfrac{}{}{0pt}{}{2}{R}+\genfrac{}{}{0pt}{}{2}{L^R}\Big\vert\genfrac{}{}{0pt}{}{1}{L}+\genfrac{}{}{0pt}{}{1}{R}\Big\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_p^s}^{\beta}$
$\boldsymbol{RPU_1}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{1}{L^R}\Big\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_p^s}^{\overline{\overline{\propto_1}}}$
$\boldsymbol{RPU_2}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L^R}\Big\vert\genfrac{}{}{0pt}{}{2}{R}\right\}_p^s}^{\overline{\overline{\propto_1}}}$
$\boldsymbol{TPU_1}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{1}{L^L}\Big\vert\genfrac{}{}{0pt}{}{3}{R}\right\}}^{\propto_4}$
$\boldsymbol{TPU_2}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L^R}\Big\vert\genfrac{}{}{0pt}{}{3}{R}\right\}}^{\propto_4}$

$$[\Uparrow \mathbf{1}, \Uparrow \mathbf{1}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{1}]$$

Figure K.4 : Sample pattern on A Dorian.

Table K.7 : Proposed performance methods for $[\Uparrow \mathbf{1}, \Uparrow \mathbf{1}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{1}]$.

Methods	Formulas
Method 1	$\boldsymbol{fPDC}\ (\mathbf{1}, \mathbf{2}, \mathbf{3}, \mathbf{4}) + \boldsymbol{TPU} + \boldsymbol{fPDC}\ (\mathbf{2}, \mathbf{3}, \mathbf{4}, \mathbf{5}, \mathbf{6})@\boldsymbol{Mode}\mathbf{5}$
Method 2	$\boldsymbol{fPDC}\ (\mathbf{1}, \mathbf{2}, \mathbf{3}, \mathbf{4}, \mathbf{5}) + (\boldsymbol{RPU}_{\mathbf{1}}) \times \boldsymbol{n}$
Method 3	$\boldsymbol{fPDC}\ (\mathbf{1}) + (\boldsymbol{RPU}_{\mathbf{2}}) \times \boldsymbol{n} + \boldsymbol{fPDC}\ (\mathbf{2}, \mathbf{3}, \mathbf{4}, \mathbf{5})@\boldsymbol{Mode}(\boldsymbol{n} + \mathbf{1})$
Method 4	$\boldsymbol{fPDC}\ (\mathbf{1}, \mathbf{2}, \mathbf{3}) + (\boldsymbol{RPU}_{\mathbf{3}}) \times \boldsymbol{n} + \boldsymbol{fPDC}\ (\mathbf{5}, \mathbf{6})@\boldsymbol{Mode}(\boldsymbol{n})$
Method 5	$\boldsymbol{fPDC}\ (\mathbf{1}, \mathbf{2}, \mathbf{3}) + (\boldsymbol{RPU}_{\mathbf{4}}) \times \boldsymbol{n} + \boldsymbol{fPDC}\ (\mathbf{5}, \mathbf{6})@\boldsymbol{Mode}(\mathbf{2}\boldsymbol{n})$

Table K.8 : PGTOP&SOP&PDC formulas of units in Table K.7.

Units	Structure Formulas
$\boldsymbol{fPDC}_{\mathbf{1}}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R}+\genfrac{}{}{0pt}{}{2}{L^R}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\middle\vert\genfrac{}{}{0pt}{}{3}{R}+\genfrac{}{}{0pt}{}{3}{L^R}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L}+\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{L}+\genfrac{}{}{0pt}{}{1}{L^L}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{R}+\genfrac{}{}{0pt}{}{1}{L^R}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_p^s}^{\propto}$
$\boldsymbol{RPU_1}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{1}{L^R}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\right\}_p^s}^{\bar{\propto}}$
$\boldsymbol{RPU_2}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L^R}\middle\vert\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\right\}_p^s}^{\bar{\propto}}$
$\boldsymbol{RPU_3}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\right\}_p^s}^{\propto}$
$\boldsymbol{RPU_4}$	$\left\{\overbrace{\genfrac{}{}{0pt}{}{2}{R}\Big\vert\genfrac{}{}{0pt}{}{1}{L}\Big\vert\genfrac{}{}{0pt}{}{1}{L}}^{\propto_1}+\overbrace{\genfrac{}{}{0pt}{}{3}{R}\Big\vert\genfrac{}{}{0pt}{}{1}{L}\Big\vert\genfrac{}{}{0pt}{}{1}{L}}^{\propto}\right\}_p^s$
$\boldsymbol{TPU}$	$\overbrace{\left\{\genfrac{}{}{0pt}{}{1}{L^L}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\right\}_p^s}^{\propto_4}$

$$[\Uparrow \mathbf{1}, \Downarrow \mathbf{2}, (\Uparrow \mathbf{2})] - [\Uparrow \mathbf{1}]$$

Figure K.5 : Sample pattern on G# Phrygian.

Table K.9 : Proposed performance methods for $[\Uparrow \mathbf{1}, \Downarrow \mathbf{2}, (\Uparrow \mathbf{2})] - [\Uparrow \mathbf{1}]$.

Methods	**Formulas**
Method 1	$\boldsymbol{fPDC(1,2,3,4,5) + fPDC(2,3,4,5,6)@Mode5}$
Method 2	$\boldsymbol{fPDC(1,2,3,4,5,6) + fPDC(2,3,4,5)@Mode6}$
Method 3	$\boldsymbol{fPDC(1,2,3,4) + (RPU_1) \times n}$
Method 4	$\boldsymbol{fPDC(1,2,3) + (RPU_2) \times n}$
Method 5	$\boldsymbol{fPDC\,(1) + (RPU_3) \times n_3 + fPDC(3,4,5)@Mode(n_3) + (RPU_1) \times n_1}$

Table K.10 : PGTOP&SOP&PDC formulas of units in Table K.9.

Units	**Structure Formulas**
fPDC	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R}\middle\vert\genfrac{}{}{0pt}{}{2}{L^R}+\genfrac{}{}{0pt}{}{2}{R}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{2}{L^R}+\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R}+\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{3}{R}+\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L^R}+\genfrac{}{}{0pt}{}{1}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{R}\middle\vert\genfrac{}{}{0pt}{}{1}{L^R}\right\}_p^s}^{\propto}$
RPU₁	$\overbrace{\left\{\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\right\}_p^s}^{\propto}$
RPU₂	$\left\{\overbrace{\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{2}{R}}^{\propto_1}+\overbrace{\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{1}{L}\middle\vert\genfrac{}{}{0pt}{}{3}{R}}^{\propto}\right\}_p^s$
RPU₃	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{R}\middle\vert\genfrac{}{}{0pt}{}{3}{R}\middle\vert\genfrac{}{}{0pt}{}{2}{L^R}\right\}_p^s}^{\overline{\overline{\propto_{-1}}}}$

$$[\Uparrow 1, \Uparrow 1, \Uparrow 1, (\Downarrow 2)] - [\Uparrow 1]$$

Figure K.6 : Sample pattern on A FTS-1a$_1$.

Table K.11 : Proposed performance methods for $[\Uparrow \mathbf{1}, \Uparrow \mathbf{1}, \Uparrow \mathbf{1}, (\Downarrow \mathbf{2})] - [\Uparrow \mathbf{1}]$.

Methods	**Formulas**
Method 1	$\boldsymbol{fPDC}\,(1,2,3) + \boldsymbol{TPU_1} + \boldsymbol{fPDC}\,(2,3,4,5)@\boldsymbol{Mode5}$
Method 2	$\boldsymbol{fPDC}\,(1,2,3) + \boldsymbol{TPU_2} + \boldsymbol{fPDC}\,(1,2,3,4,5)@\boldsymbol{Mode5}$
Method 3	$\boldsymbol{fPDC}\,(1,2) + (\boldsymbol{RPU_1}) \times \boldsymbol{n} + \boldsymbol{fPDC}\,(4,5)@\boldsymbol{Mode(n+1)}$
Method 4	$\boldsymbol{fPDC}\,(1,2,3,4) + (\boldsymbol{RPU_2}) \times \boldsymbol{n}$

Table K.12 : PGTOP&SOP&PDC formulas of units in Table K.11.

Units	**Structure Formulas**
$\boldsymbol{fPDC_1}$	$\overbrace{\left\{\substack{2\\L}\Big\vert\substack{2\\L}\Big\vert\substack{2\\R}\Big\vert\substack{3\\R} + \substack{2\\L^R}\Big\vert\substack{2\\R}\Big\vert\substack{3\\R}\Big\vert\substack{1\\L} + \substack{2\\R}\Big\vert\substack{3\\R}\Big\vert\substack{1\\L}\Big\vert\substack{1\\L} + \substack{3\\R}\Big\vert\substack{1\\L}\Big\vert\substack{1\\L}\Big\vert\substack{1\\R} + \substack{1\\L^R}\Big\vert\substack{1\\L}\Big\vert\substack{1\\R}\Big\vert\substack{1\\R}\right\}}^{\propto}{}_p^s$
$\boldsymbol{RPU_1}$	$\overbrace{\left\{\substack{2\\R}\Big\vert\substack{3\\R}\Big\vert\substack{1\\L}\Big\vert\substack{1\\L}\right\}}^{\propto}{}_p^s$
$\boldsymbol{RPU_2}$	$\left\{\overbrace{\substack{1\\L^R}\Big\vert\substack{1\\L}\Big\vert\substack{1\\L}}^{\alpha}\Big\vert\overbrace{\substack{1\\R}}^{\propto_1}\right\}_p^s$
$\boldsymbol{TPU_1}$	$\left\{\overbrace{\substack{3\\R}\Big\vert\substack{1\\L}\Big\vert\substack{1\\L}}^{\propto}\Big\vert\overbrace{\substack{2\\R} + \substack{1\\L^R}\Big\vert\substack{1\\L}\Big\vert\substack{2\\R}\Big\vert\substack{3\\R}}^{\propto_4}\right\}_p^s$
$\boldsymbol{TPU_2}$	$\left\{\substack{3\\R}\Big\vert\overbrace{\substack{1\\L}\Big\vert\substack{1\\L}}^{\propto}\Big\vert\overbrace{\substack{2\\R}}^{\propto_4}\right\}_p^s$

$$[\Uparrow 1, \Downarrow 1, \Uparrow 2, (\Downarrow 1)] - [\Uparrow 1]$$

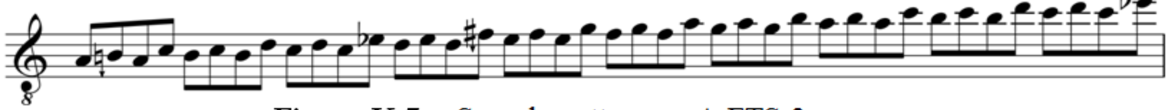


Figure K.7 : Sample pattern on A FTS-3a$_4$.

Table K.13 : Proposed performance methods for $[\Uparrow 1, \Downarrow 1, \Uparrow 2, (\Downarrow 1)] - [\Uparrow 1]$.

Methods	Formulas
Method 1	$fPDC\ (1,2,3,4) + TPU + fPDC\ (2,3,4,5,6)@Mode5$
Method 2	$fPDC\ (1,2,3,4,5) + (RPU_1) \times n$
Method 3	$IPU + (RPU_2) \times n + fPDC\ (3,4,5)@Mode(n+1) + (RPU_1) \times n_2$
Method 4	$(RPU_3) \times n_1 + fPDC\ (2,3,4)@Mode(n_1) + (RPU_1) \times n_2$

Table K.14 : PGTOP&SOP&PDC formulas of units in Table K.13.

Units	Structure Formulas
$fPDC$	$\overbrace{\left\{\substack{2\\L} \vert \substack{2\\L} \vert \substack{2\\L^L} \vert \substack{2\\R} + \substack{2\\L^R} \vert \substack{2\\R} \vert \substack{2\\L^R} \vert \substack{3\\R} + \substack{3\\L^R} \vert \substack{3\\R} \vert \substack{3\\L^R} \vert \substack{1\\L} + \substack{3\\R} \vert \substack{1\\L} \vert \substack{3\\R} \vert \substack{1\\L} + \substack{1\\L^L} \vert \substack{1\\L} \vert \substack{1\\L^L} \vert \substack{1\\R} + \substack{1\\L^R} \vert \substack{1\\R} \vert \substack{1\\L^R} \vert \substack{1\\R}\right\}_p^s}^{\propto}$
IPU	$\overbrace{\left\{\substack{2\\L} \vert \substack{2\\R} \vert \substack{2\\L^R} \vert \substack{3\\R}\right\}_p^s}^{\propto_{-1}}$
RPU_1	$\left\{\overbrace{\substack{1\\L^R} \vert \substack{1\\L} \vert \substack{1\\L^L}}^{\propto_{-1}} \vert \overbrace{\substack{1\\R}}^{\propto} \vert\right\}_p^s$
RPU_2	$\left\{\overbrace{\substack{3\\L^R}}^{\propto_{-1}} \vert \overbrace{\substack{2\\R} \vert \substack{2\\L^R} \vert \substack{3\\R}}^{\propto} \vert\right\}_p^s$
RPU_3	$\left\{\overbrace{\substack{2\\L^R} \vert \substack{2\\L} \vert \substack{2\\L^L}}^{\propto_{-1}} \vert \overbrace{\substack{2\\R}}^{\alpha}\right\}_p^s$
TPU	$\overbrace{\left\{\substack{1\\L^R} \vert \substack{1\\L} \vert \substack{1\\L^R} \vert \substack{2\\R}\right\}_p^s}^{\propto_4}$

$$[\Uparrow \mathbf{1}, \Downarrow \mathbf{2}, \Uparrow \mathbf{1}, (\Uparrow \mathbf{1})] - [\Uparrow \mathbf{1}]$$

Figure K.8 : Sample pattern on G# Ionian.

Table K.15 : Proposed performance methods for $[\Uparrow \mathbf{1}, \Downarrow \mathbf{2}, \Uparrow \mathbf{1}, (\Uparrow \mathbf{1})] - [\Uparrow \mathbf{1}]$.

Methods	Formulas
Method 1	$\boldsymbol{fPDC}(1, 2, 3, 4) + \boldsymbol{fPDC}(2, 3, 4, 5)@\boldsymbol{Mode5}$
Method 2	$\boldsymbol{fPDC}(1, 2, 3) + (\boldsymbol{RPU_1}) \times \boldsymbol{n} + \boldsymbol{fPDC}(4, 5, 6)\ @\boldsymbol{Mode}(\boldsymbol{n}+\mathbf{1})$
Method 3	$(\boldsymbol{RPU_2}) \times \boldsymbol{n} + \boldsymbol{fPDC}(3, 4, 5)\ @\boldsymbol{Mode}(\boldsymbol{n})$
Method 4	$(\boldsymbol{RPU_3}) \times \boldsymbol{n} + \boldsymbol{fPDC}(2, 3, 4, 5)@\boldsymbol{Mode}(\boldsymbol{n})$

Table K.16 : PGTOP&SOP&PDC formulas of units in Table K.15.

Units	Structure Formulas
$\boldsymbol{fPDC_1}$	$\overbrace{\left\{ \genfrac{}{}{0pt}{}{2}{L} \middle| \genfrac{}{}{0pt}{}{2}{R} \middle| \genfrac{}{}{0pt}{}{2}{L^R} \middle| \genfrac{}{}{0pt}{}{2}{L} + \genfrac{}{}{0pt}{}{2}{R} \middle| \genfrac{}{}{0pt}{}{3}{R} \middle| \genfrac{}{}{0pt}{}{3}{L^R} \middle| \genfrac{}{}{0pt}{}{2}{R} + \genfrac{}{}{0pt}{}{3}{R} \middle| \genfrac{}{}{0pt}{}{1}{L} \middle| \genfrac{}{}{0pt}{}{2}{R} \middle| \genfrac{}{}{0pt}{}{3}{R} + \genfrac{}{}{0pt}{}{1}{L} \middle| \genfrac{}{}{0pt}{}{1}{L} \middle| \genfrac{}{}{0pt}{}{3}{R} \middle| \genfrac{}{}{0pt}{}{1}{L} + \genfrac{}{}{0pt}{}{1}{L} \middle| \genfrac{}{}{0pt}{}{1}{R} \middle| \genfrac{}{}{0pt}{}{1}{L^R} \middle| \genfrac{}{}{0pt}{}{1}{L} + \genfrac{}{}{0pt}{}{1}{R} \middle| \genfrac{}{}{0pt}{}{1}{R} \middle| \genfrac{}{}{0pt}{}{1}{L^R} \middle| \genfrac{}{}{0pt}{}{1}{R} \right\}_p^s}^{\propto}$
RPU_1	$\overbrace{\left\{ \genfrac{}{}{0pt}{}{1}{L} \middle| \genfrac{}{}{0pt}{}{1}{L} \middle| \genfrac{}{}{0pt}{}{2}{R} \middle| \genfrac{}{}{0pt}{}{3}{R} \right\}_p^s}^{\propto_1}$
RPU_2	$\overbrace{\left\{ \genfrac{}{}{0pt}{}{2}{R} \middle| \genfrac{}{}{0pt}{}{3}{R} \middle| \genfrac{}{}{0pt}{}{2}{L^R} \middle| \genfrac{}{}{0pt}{}{3}{L^R} \right\}_p^s}^{\propto_{-1}}$
RPU_3	$\overbrace{\left\{ \genfrac{}{}{0pt}{}{2}{L} \middle| \genfrac{}{}{0pt}{}{2}{R} \middle| \genfrac{}{}{0pt}{}{2}{L^R} \middle| \genfrac{}{}{0pt}{}{2}{L^\gamma} \right\}_p^s}^{\propto_1}$

$$[\Uparrow 2, \Downarrow 1, \Downarrow 1, (\Uparrow 1)] - [\Uparrow 1]$$

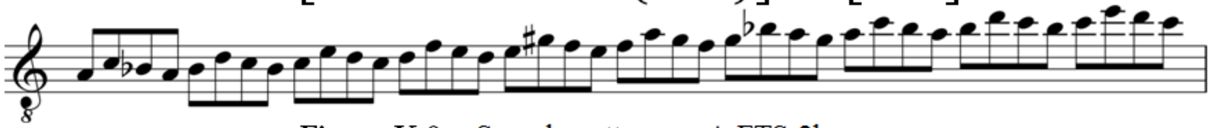


Figure K.9 : Sample pattern on A FTS-2b$_1$.

Table K.17 : Proposed performance methods for $[\Uparrow \mathbf{2}, \Downarrow \mathbf{1}, \Downarrow \mathbf{1}, (\Uparrow \mathbf{1})] - [\Uparrow \mathbf{1}]$.

Methods	Formulas
Method 1	$\boldsymbol{fPDC}\ (1,2,3,4,5) + \boldsymbol{TPU} + \boldsymbol{fPDC}\ (2,3,4,5)@\boldsymbol{Mode6}$
Method 2	$\boldsymbol{fPDC}\ (1,2,3,4) + (\boldsymbol{RPU_1}) \times \boldsymbol{n}$
Method 3	$\boldsymbol{IPU} + (\boldsymbol{RPU_2}) \times \boldsymbol{n} + \boldsymbol{fPDC}\ (2,3,4,5)@\boldsymbol{Mode(n+1)}$
Method 4	$\boldsymbol{fPDC}\ (1,2,3) + (\boldsymbol{RPU_3}) \times \boldsymbol{n} + \boldsymbol{fPDC}\ (4,5,6)@\boldsymbol{Mode(n+1)}$
Method 5	$\boldsymbol{IPU} + (\boldsymbol{RPU_4}) \times \boldsymbol{n} + \boldsymbol{fPDC}\ (4,5,6)@\boldsymbol{Mode(n+1)}$

Table K.18 : PGTOP&SOP&PDC formulas of units in Table K.17.

Units	Structure Formulas
fPDC	$\left\{\overbrace{\genfrac{}{}{0pt}{}{2}{L}\vert\genfrac{}{}{0pt}{}{2}{R}\vert\genfrac{}{}{0pt}{}{2}{L^R}\vert\genfrac{}{}{0pt}{}{2}{L^L}+\genfrac{}{}{0pt}{}{2}{L}\vert\genfrac{}{}{0pt}{}{3}{R}\vert\genfrac{}{}{0pt}{}{2}{R}\vert\genfrac{}{}{0pt}{}{2}{L^R}+\genfrac{}{}{0pt}{}{2}{R}\vert\genfrac{}{}{0pt}{}{1}{L}\vert\genfrac{}{}{0pt}{}{3}{R}\vert\genfrac{}{}{0pt}{}{3}{L^R}+\genfrac{}{}{0pt}{}{3}{R}\vert\genfrac{}{}{0pt}{}{1}{L}\vert\genfrac{}{}{0pt}{}{1}{L^R}\vert\genfrac{}{}{0pt}{}{3}{R}+\genfrac{}{}{0pt}{}{1}{L}\vert\genfrac{}{}{0pt}{}{1}{R}\vert\genfrac{}{}{0pt}{}{1}{L^R}\vert\genfrac{}{}{0pt}{}{1}{L^L}+\genfrac{}{}{0pt}{}{1}{L}\vert\genfrac{}{}{0pt}{}{1}{R}\vert\genfrac{}{}{0pt}{}{1}{R^R}\vert\genfrac{}{}{0pt}{}{1}{L^R}}^{\propto}\right\}_p^s$
IPU	$\overbrace{\left\{\genfrac{}{}{0pt}{}{2}{L}\vert\genfrac{}{}{0pt}{}{3}{R}\vert\genfrac{}{}{0pt}{}{2}{R}\vert\genfrac{}{}{0pt}{}{2}{L^R}\right\}_p^s}^{\propto_{-1}}$
RPU₁	$\overbrace{\left\{\genfrac{}{}{0pt}{}{1}{L}\vert\genfrac{}{}{0pt}{}{1}{R}\vert\genfrac{}{}{0pt}{}{1}{L^R}\vert\genfrac{}{}{0pt}{}{1}{L^L}\right\}_p^s}^{\overline{\overline{\propto}}}$
RPU₂	$\left\{\overbrace{\genfrac{}{}{0pt}{}{2}{L^R}\vert\genfrac{}{}{0pt}{}{3}{R}\vert\genfrac{}{}{0pt}{}{2}{R}\vert}^{\propto}\overbrace{\genfrac{}{}{0pt}{}{2}{L^R}}^{\propto_{-1}}\right\}_p^s$
RPU₃	$\left\{\overbrace{\genfrac{}{}{0pt}{}{3}{R}\vert\genfrac{}{}{0pt}{}{1}{L}\vert\genfrac{}{}{0pt}{}{1}{L^L}\vert}^{\propto}\overbrace{\genfrac{}{}{0pt}{}{2}{R}}^{\propto_1}\right\}_p^s$
RPU₄	$\left\{\overbrace{\genfrac{}{}{0pt}{}{3}{L}\vert\genfrac{}{}{0pt}{}{3}{R}\vert\genfrac{}{}{0pt}{}{2}{R}}^{\propto_1}\vert\overbrace{\genfrac{}{}{0pt}{}{3}{L^R}}^{\propto}\right\}_p^s$
TPU	$\left\{\overbrace{\genfrac{}{}{0pt}{}{1}{L}\vert\genfrac{}{}{0pt}{}{2}{R}\vert}^{\propto_5}\overbrace{\genfrac{}{}{0pt}{}{2}{L}\vert\genfrac{}{}{0pt}{}{2}{L}}^{\propto}\right\}_p^s$

$$[\Downarrow \mathbf{3}, \Uparrow \mathbf{2}, \Downarrow \mathbf{1}, (\Uparrow \mathbf{2})] - [\Uparrow \mathbf{1}]$$

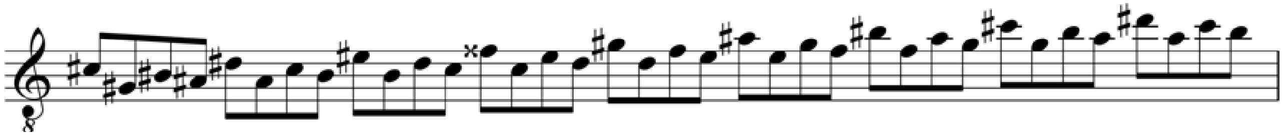


Figure K.10 : Sample pattern on G# Ionian.

Table K.19 : Proposed performance methods for $[\Downarrow \mathbf{3}, \Uparrow \mathbf{2}, \Downarrow \mathbf{1}, (\Uparrow \mathbf{2})] - [\Uparrow \mathbf{1}]$.

Methods	Formulas
Method 1	$\boldsymbol{fPDC}\ (1,2,3,4) + (\boldsymbol{RPU_1}) \times \boldsymbol{n}$
Method 2	$(\boldsymbol{RPU_2}) \times \boldsymbol{n} + \boldsymbol{fPDC}\ (2,3,4)@\boldsymbol{Mode}(\boldsymbol{n})$
Method 3	$\boldsymbol{fPDC}\ (1) + (\boldsymbol{RPU_3}) \times \boldsymbol{n} + \boldsymbol{fPDC}\ (3,4)@\boldsymbol{Mode}(\boldsymbol{n})$
Method 4	$\boldsymbol{fPDC}\ (1,2,3,4) + \boldsymbol{TPU} + \boldsymbol{fPDC}\ (1,2,3,4)@\boldsymbol{Mode6}$

Table K.20 : PGTOP&SOP&PDC formulas of units in Table K.19.

Units	Structure Formulas
fPDC	$\overbrace{\left\{ {}^{3}_{R} \middle\| {}^{2}_{L} \middle\| {}^{2}_{R} \middle\| {}^{3}_{L^R} + {}^{1}_{L} \middle\| {}^{2}_{L^R} \middle\| {}^{3}_{R} \middle\| {}^{2}_{R} + {}^{1}_{L} \middle\| {}^{2}_{R} \middle\| {}^{1}_{L^L} \middle\| {}^{3}_{R} + {}^{1}_{R} \middle\| {}^{3}_{R} \middle\| {}^{1}_{L^R} \middle\| {}^{1}_{L^L} \right\}_{p}^{s}}^{\propto}$
RPU₁	$\overbrace{\left\{ {}^{1}_{R} \middle\| {}^{3}_{R} \middle\| {}^{1}_{L^R} \middle\| {}^{1}_{L^L} \right\}_{p}^{s}}^{\propto}$
RPU₂	$\overbrace{\left\{ {}^{3}_{R} \middle\| {}^{2}_{L} \middle\| {}^{2}_{R} \middle\| {}^{3}_{L^R} \right\}_{p}^{s}}^{\propto}$
RPU₃	$\overbrace{\left\{ {}^{1}_{L} \middle\| {}^{2}_{L} \middle\| {}^{3}_{R} \middle\| {}^{2}_{R} \right\}_{p}^{s}}^{\propto}$
TPU	$\overbrace{\left\{ {}^{3}_{R} \middle\| {}^{1}_{L} \middle\| {}^{2}_{R} \middle\| {}^{1}_{L} \right\}_{p}^{s}}^{\propto_4}$

$$[\Uparrow \mathbf{6}, \Downarrow \mathbf{2}, \Downarrow \mathbf{2}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{1}]$$

Figure K.11 : Sample pattern on A Mixolydian.

Table K.21 : Proposed performance methods for $[\Uparrow \mathbf{6}, \Downarrow \mathbf{2}, \Downarrow \mathbf{2}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{1}]$.

Methods	Formulas
Method 1	$\boldsymbol{IPU_1} + (\boldsymbol{RPU_1}) \times \boldsymbol{n}$
Method 2	$\boldsymbol{IPU_2} + (\boldsymbol{RPU_2}) \times \boldsymbol{n}$

Table K.22 : PGTOP&SOP&PDC formulas of units in Table K.21.

Units	Structure Formulas
IPU₁	$\left\{\overbrace{\overset{2}{L}\Big\|\overset{1}{R}\Big\|\overset{1}{L^R}\Big\|\overset{2}{R}}^{\propto}\right\}_p^s$
IPU₂	$\left\{\overbrace{\overset{2}{L}\Big\|\overset{1}{R}\Big\|\overset{1}{L^R}}^{\propto}\Big\|\overbrace{\overset{3}{R^L}}^{\propto_{-1}}\right\}_p^s$
RPU₁	$\left\{\overbrace{\overset{2}{L^R}}^{\propto_{-1}}\;\overbrace{\Big\|\overset{1}{R}\Big\|\overset{1}{L^R}\Big\|\overset{2}{R^L}}^{\propto}\right\}_p^s$
RPU₂	$\left\{\overbrace{\overset{2}{L}}^{\propto_{-2}}\;\overbrace{\Big\|\overset{1}{R}\Big\|\overset{1}{L^R}}^{\propto}\Big\|\overbrace{\overset{3}{R^L}}^{\propto_{-1}}\right\}_p^s$

$[\Downarrow \mathbf{1}, \Uparrow \mathbf{6}, \Downarrow \mathbf{1}, (\Downarrow \mathbf{3})] - [\Uparrow \mathbf{1}]$

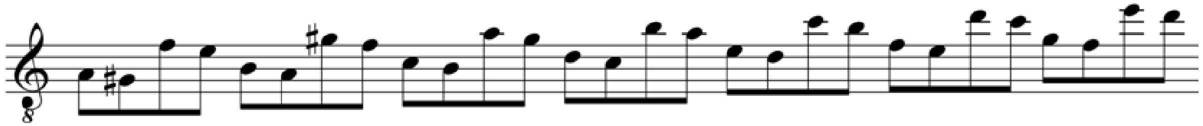


Figure K.12 : Sample pattern on G# harmonic altered.

Table K.23 : Proposed performance methods for $[\Downarrow \mathbf{1}, \Uparrow \mathbf{6}, \Downarrow \mathbf{1}, (\Downarrow \mathbf{3})] - [\Uparrow \mathbf{1}]$.

Methods	**Formulas**
Method 1	$(\boldsymbol{RPU_1}) \times \boldsymbol{n}$
Method 2	$(\boldsymbol{RPU_1}) \times \boldsymbol{n}_{\mathbf{1}} + (\boldsymbol{RPU_2}) \times \boldsymbol{n_2}$

Table K.24 : PGTOP&SOP&PDC formulas of units in Table K.23.

Units	**Structure Formulas**
RPU₁	$\left\{ \overbrace{\begin{matrix}2\\R\end{matrix}\Big|\begin{matrix}2\\L^{R}\end{matrix}}^{\propto_{-1}} \Big| \overbrace{\begin{matrix}1\\R\end{matrix}\Big|\begin{matrix}1\\L^{R}\end{matrix}}^{\propto} \right\}_{p}^{s}$
RPU₂	$\overbrace{\left\{\begin{matrix}3\\R\end{matrix}\Big|\begin{matrix}2\\R\end{matrix}\Big|\begin{matrix}1\\L\end{matrix}\Big|\begin{matrix}1\\L^{L}\end{matrix}\right\}_{p}^{s}}^{\propto_{-3}}$

$$[\Uparrow \mathbf{3}, \Downarrow \mathbf{1}, \mathbf{0}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{1}]$$

Figure K.13 : Sample pattern on A Dorian #4.

Table K.25 : Proposed performance methods for $[\Uparrow \mathbf{3}, \Downarrow \mathbf{1}, \mathbf{0}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{1}]$.

Methods	**Formulas**
Method 1	$\boldsymbol{IPU + (RPU_1) \times n_1 + TPU + RPU_2 \times n_2 + RPU_3 \times n_3}$
Method 2	$\boldsymbol{IPU + (RPU_4) \times n_4 + TPU + RPU_2 \times n_2 + RPU_3 \times n_3}$

Table K.26 : PGTOP&SOP&PDC formulas of units in Table K.25.

Units	**Structure Formulas**
IPU	$\overbrace{\left\{\substack{2\\ \mathrm{L}} \middle\vert \substack{3\\ \mathrm{R}} \middle\vert \substack{3\\ \mathrm{L^R}} \middle\vert \substack{2\\ \mathrm{R}}\right\}_p^s}^{\propto}$
RPU₁	$\left\{\overbrace{\substack{2\\ \mathrm{L^R}}}^{\propto_{-1}} \overbrace{\left\vert \substack{3\\ \mathrm{R}} \right\vert \substack{3\\ \mathrm{L^R}} \left\vert \substack{2\\ \mathrm{R}}\right.}^{\propto}\right\}_s^p$
RPU₂	$\left\{\overbrace{\left\vert \substack{2\\ \mathrm{R}} \right\vert \substack{1\\ \mathrm{L}} \left\vert \substack{1\\ \mathrm{L^L}}\right.}^{\propto} \overbrace{\left\vert \substack{3\\ \mathrm{R}}\right.}^{\propto_1}\right\}_s^p$
RPU₃	$\overbrace{\left\{\substack{2\\ \mathrm{R}} \middle\vert \substack{1\\ \mathrm{L}} \middle\vert \substack{1\\ \mathrm{L^L}} \middle\vert \substack{1\\ \mathrm{L^{LP}}} + \substack{3\\ \mathrm{R}} \middle\vert \substack{1\\ \mathrm{L}} \middle\vert \substack{1\\ \mathrm{L^L}} \middle\vert \substack{1\\ \mathrm{L^{LP}}}\right\}_p^s}^{\propto}$
RPU₄	$\left\{\overbrace{\substack{2\\ \mathrm{L^R}}}^{\propto_{-1}} \overbrace{\left\vert \substack{3\\ \mathrm{R}} \right\vert \substack{2\\ \mathrm{R}} \left\vert \substack{3\\ \mathrm{L^R}}\right.}^{\propto}\right\}_s^p$
TPU	$\left\{\overbrace{\substack{2\\ \mathrm{L^R}}}^{\propto_{-1}} \overbrace{\left\vert \substack{3\\ \mathrm{R}} \right\vert \substack{2\\ \mathrm{R}}}^{\propto} \left\vert \overbrace{\substack{1\\ \mathrm{L}}}^{\propto_2}\right.\right\}_s^p$

$$[\Uparrow \mathbf{1}, \mathbf{0}, \Uparrow \mathbf{1}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{1}]$$

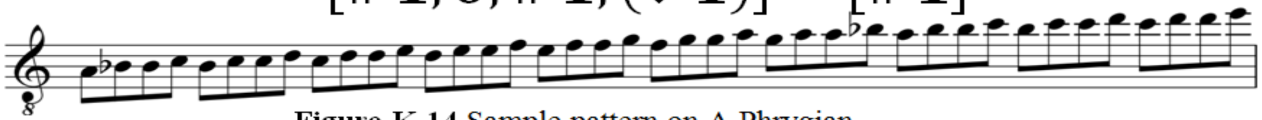


Figure K.14 Sample pattern on A Phrygian.

Table K.27 : Proposed performance methods for $[\Uparrow \mathbf{1}, \mathbf{0}, \Uparrow \mathbf{1}, (\Downarrow \mathbf{1})] - [\Uparrow \mathbf{1}]$.

Methods	Formulas
Method 1	$\boldsymbol{IPU_1 + (RPU_1) \times n_1 + TPU_1 + RPU_2 \times n_2 + RPU_3 \times n_3}$
Method 2	$\boldsymbol{IPU_2 + (RPU_4) \times n_4 + TPU_2 + RPU_2 \times n_2 + RPU_3 \times n_3}$

Table K.28 : PGTOP&SOP&PDC formulas of units in Table K.27.

Units	Structure Formulas
IPU₁	$\overbrace{\left\{ {2 \atop \mathrm{L}} \Big\| {2 \atop \mathrm{R}} \Big\| {3 \atop \mathrm{L}} \Big\| {3 \atop \mathrm{R}} \right\}}^{\propto_{-1}}{}_{p}^{s}$
IPU₂	$\left\{ \overbrace{\Big\| {2 \atop \mathrm{L}} \Big\| {2 \atop \mathrm{L}} \Big\| {3 \atop \mathrm{R}}}^{\propto_{-2}} \overbrace{\Big\| {2 \atop \mathrm{L}}}^{\propto_{-3}} \right\}$
RPU₁	$\overbrace{\left\{ {3 \atop \mathrm{L^R}} \Big\| {3 \atop \mathrm{L}} \Big\| {2 \atop \mathrm{R}} \Big\| {3 \atop \mathrm{R}} \right\}}^{\propto}{}_{p}^{s}$
RPU₂	$\left\{ \overbrace{\Big\| {1 \atop \mathrm{L^L}} \Big\| {1 \atop \mathrm{L}} \Big\| {3 \atop \mathrm{R}}}^{\propto_{2}} \overbrace{\Big\| {1 \atop \mathrm{L}}}^{\propto_{1}} \right\}$
RPU₃	$\left\{ \overbrace{\Big\| {1 \atop \mathrm{L^L}} \Big\| {1 \atop \mathrm{R}}}^{\propto_{-1}} \overbrace{\Big\| {1 \atop \mathrm{R^{LP}}} \Big\| {1 \atop \mathrm{L}}}^{\propto_{-2}} \right\}$
RPU₄	$\left\{ \overbrace{\Big\| {2 \atop \mathrm{L^R}} \Big\| {2 \atop \mathrm{L}} \Big\| {3 \atop \mathrm{R}}}^{\propto_{-2}} \overbrace{\Big\| {2 \atop \mathrm{L}}}^{\propto_{-3}} \right\}$
TPU₁	$\left\{ \overbrace{\Big\| {1 \atop \mathrm{L}} \Big\| {1 \atop \mathrm{L}} \Big\| {3 \atop \mathrm{R}}}^{\propto_{2}} \overbrace{\Big\| {1 \atop \mathrm{L}}}^{\propto_{1}} \right\}$
TPU₂	$\left\{ \overbrace{\Big\| {2 \atop \mathrm{L^R}} \Big\| {2 \atop \mathrm{L}} \Big\| {3 \atop \mathrm{R}}}^{\propto_{-2}} \overbrace{\Big\| {1 \atop \mathrm{L}}}^{\propto_{1}} \right\}$

$$[\Downarrow \mathbf{1}, \Downarrow \mathbf{1}, \Downarrow \mathbf{1}, (\Uparrow \mathbf{2})] - [\Downarrow \mathbf{1}]$$

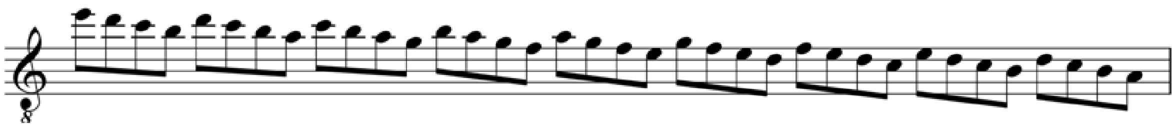


Figure K.15 Sample pattern on E Phrygian.

Table K.29 : Proposed performance methods for $[\Downarrow \mathbf{1}, \Downarrow \mathbf{1}, \Downarrow \mathbf{1}, (\Uparrow \mathbf{2})] - [\Downarrow \mathbf{1}]$.

Methods	Formulas
Method 1	$\boldsymbol{fPDC_1(1,2,3,4,5) + fPDC\ _1(2,3,4,5)@Mode4}$
Method 2	$\boldsymbol{fPDC_1(2,3) + (RPU_1) \times n + fPDC\ _1(4,5)@Mode(n)}$
Method 3	$\boldsymbol{fPDC_1(2,3,4,5) + (RPU_2) \times n}$

Table K.30 : PGTOP&SOP&PDC formulas of units in Table K.29.

Units	Structure Formulas
$\boldsymbol{fPDC_1}$	$\overbrace{\left\{\begin{array}{c\|c\|c\|c} 1 & 1 & 1 & 1 \\ R & R^R & L^R & L^L \end{array} + \begin{array}{c\|c\|c\|c} 1 & 1 & 1 & 3 \\ R & L^R & L^L & R \end{array} + \begin{array}{c\|c\|c\|c} 1 & 1 & 3 & 2 \\ L & L^L & R & R \end{array} + \begin{array}{c\|c\|c\|c} 1 & 3 & 2 & 3 \\ L & R & R & L^R \end{array} + \begin{array}{c\|c\|c\|c} 3 & 2 & 3 & 2 \\ R & R & L^R & L^R \end{array}\right\}_p^s}^{\propto}$
RPU_1	$\overbrace{\left\{\begin{array}{c\|c\|c\|c} 1 & 1 & 3 & 2 \\ L & L^L & R & R \end{array}\right\}_p^s}^{\propto}$
RPU_2	$\overbrace{\left\{\begin{array}{c\|c\|c\|c} 3 & 2 & 3 & 2 \\ R & R & L^R & L^R \end{array}\right\}_p^s}^{\propto}$

$$[\Uparrow \mathbf{2}, \Downarrow \mathbf{1}, \Uparrow \mathbf{2}, (\Downarrow \mathbf{4})] - [\Downarrow \mathbf{1}]$$

Figure K.16 : Sample pattern on E Dorian $\flat 2$.

Table K.31 : Proposed performance methods for $[\Uparrow \mathbf{2}, \Downarrow \mathbf{1}, \Uparrow \mathbf{2}, (\Downarrow \mathbf{4})] - [\Downarrow \mathbf{1}]$.

Methods	Formulas
Method 1	$\boldsymbol{IPU + (RPU_1) \times n_1 + TPU + (RPU_2) \times n_2}$
Method 2	$\boldsymbol{(RPU_3) \times n_3 + TPU + (RPU_2) \times n_2}$

Table K.32 : PGTOP&SOP&PDC formulas of units in Table K.29.

Units	Structure Formulas
IPU₁	$\overbrace{\left\{\begin{array}{c\|c\|c\|c} 3 & 1 & 1 & 1 \\ R & L & L^{L} & R \end{array}\right\}}^{\propto}{}^{s}_{p}$
RPU₁	$\overbrace{\left\{\begin{array}{c\|c\|c\|c} 2 & 1 & 1 & 1 \\ L & L^{R} & L^{L} & R \end{array}\right\}}^{\propto}{}^{s}_{p}$
RPU₂	$\left\{\overbrace{\begin{array}{c} 3 \\ L \end{array}}^{\propto_1} \middle\| \overbrace{\begin{array}{c\|c} 3 & 2 \\ R & R \end{array}}^{\propto} \middle\| \overbrace{\begin{array}{c} 1 \\ L \end{array}}^{\propto_1}\right\}^{s}_{p}$
RPU₃	$\left\{\overbrace{\begin{array}{c\|c\|c} 2 & 3 & 2 \\ L & R & R \end{array}}^{\propto} \middle\| \overbrace{\begin{array}{c} 1 \\ L \end{array}}^{\propto_{-1}}\right\}^{s}_{p}$
TPU	$\left\{\overbrace{\begin{array}{c\|c\|c} 2 & 3 & 2 \\ L & R & R \end{array}}^{\propto} \middle\| \overbrace{\begin{array}{c} 1 \\ L \end{array}}^{\propto_1}\right\}^{s}_{p}$

$$[\Downarrow \mathbf{2}, \mathbf{0}, \Downarrow \mathbf{2}, (\Uparrow \mathbf{3})] - [\Downarrow \mathbf{1}]$$

Figure K.17 : Sample pattern on E Locrian.

Table K.33 : Proposed performance methods for $[\Downarrow \mathbf{2}, \Downarrow \mathbf{0}, \Downarrow \mathbf{2}, (\Uparrow \mathbf{3})] - [\Downarrow \mathbf{1}]$.

Methods	Formulas
Method 1	$(\boldsymbol{RPU_1}) \times \boldsymbol{n_1} + \boldsymbol{TPU} + (\boldsymbol{RPU_2}) \times \boldsymbol{n_2}$
Method 2	$(\boldsymbol{RPU_1}) \times \boldsymbol{n_1} + (\boldsymbol{RPU_3}) \times \boldsymbol{n_3} + (\boldsymbol{RPU_2}) \times \boldsymbol{n_2}$

Table K.34 : PGTOP&SOP&PDC formulas of units in Table K.29.

Units	Structure Formulas
RPU₁	$\overbrace{\left\{\begin{matrix}1\\R\end{matrix}\middle|\begin{matrix}1\\L^{R}\end{matrix}\middle|\begin{matrix}1\\L^{LP}\end{matrix}\middle|\begin{matrix}1\\R\end{matrix}\right\}}^{\propto}{}^{s}_{p}$
RPU₂	$\left\{\overbrace{\begin{matrix}3\\R\end{matrix}\middle|\begin{matrix}3\\L^{R}\end{matrix}}^{\propto_1}\middle|\overbrace{\begin{matrix}2\\R\end{matrix}\middle|\begin{matrix}2\\L^{R}\end{matrix}}^{\propto}\right\}^{s}_{p}$
RPU₃	$\left\{\overbrace{\begin{matrix}1\\R\end{matrix}\middle|\begin{matrix}1\\L^{R}\end{matrix}}^{\propto}\middle|\overbrace{\begin{matrix}3\\R\end{matrix}\middle|\begin{matrix}3\\L^{R}\end{matrix}}^{\propto_1}\right\}^{s}_{p}$
TPU	$\overbrace{\left\{\begin{matrix}1\\R\end{matrix}\middle|\begin{matrix}1\\L^{R}\end{matrix}\middle|\begin{matrix}1\\L^{LP}\end{matrix}\middle|\begin{matrix}3\\L\end{matrix}\right\}}^{\propto}{}^{s}_{p}$

APPENDIX L: GLOSSARY

Alevi: Heterodox Sh'ii related communities of Anatolia

Anatolia: Asia Minor. Asian part of Turkey.

Âşık: Anatolian poet-musicians who play *saz*

***Bağlama*:** An Anatolian long necked lute

***Bağlama* Düzeni:** One of the mjor tuning system of *saz*.

Boğaz Havası: A special music form from South-western Anatolian music repertoire.

Chordophone: A chordophone is a musical instrument that makes sound by way of a vibrating string or strings stretched between two points. It is one of the four main divisions of instruments in the original Hornbostel-Sachs scheme of musical instrument classification

Çekme: A Turkish term used for pull-off technique

Dem: Drone, Pedal. Bourdon.

Dombra: A Kazakh lute.

Dutar: A Central Asian lute. There are different types of dutar as Uzbek, Turkmen and Uyghur.

Düzen: Tuning. Tuning systems for open strings or frets.

Edvar: Theory books that has been written for makam music.

Fasıl : Suite in Ottoman/Turkish makam music. All musical pieces are played in same makam in fasıls.

Karar: The finish fret/note of a makam in makam music.

Komus: A Kyrgyz lute.

Makam: Position. A concept that describes melodic motion styles of makam-based melody in terms of concepts like fret centralizations, fret tunings, fretting system etc.

Mızrap: Pick, Plectrum

Nim Perde (*Incomplete note*) : The frets that constitute after tuning change of a *tam perde*

Ozan: Asian/Anatolian poet-musicians who play *saz* type instruments.

Parmak vurma: Two hand tapping. One of subtechniques of pickless *saz* playing styles.

Pençe : Strumming variations. Playing with striking to all strings. One of subtechniques of pickless *saz* playing styles.

Sap: Handle. A Turkish term used for fretboard.

***Saz*:** A colloquial term for *bağlama*. Instrument.

Seyir: Melodic route/journey

Şelpe: An Anatolian term used for pençe technique. Today, this term is understood as pickless playing technique.

Tam Perde (Complete note) : The frets/pitches/notes on Traditional Fret System.

Tanbur: A *saz*-type Ottoman stringed instrument with many frets.

Tavır: Musical characteristics (of a region or song)

Tekne: Body of *saz* or an instrument.

Tel: String

Tel Çekme: Plucking variaitons. One of subtechniques of pickless *saz* playing styles.

Tezene: Pick, Plectrum.

Türkü: A term for Anatolian folk songs.

Vurma: A Turkish term used for hammer-on technique

Zakir: The musician that plays *saz* and sign sacred lyrics in Cem ceremony of Alevis.

Zeybek : A folk dance found mostly in Western Anatolia. A term for used dancing tunes of same dance.

BIOGRAPHY

Name Surname : Sinan Ayyıldız
Place and Date of Birth : Ankara, 16.04.1980
E-mail : info@sinanayyildiz.com

EDUCATION :

- B.Sc. : 2003, Istanbul Technical University, Chemistry-Metalurgy Faculty, Chemical Engineering Department.

- M. Sc. : 2013, Istanbul Technical University, Social Sciences Institute, Turkish Music State Conservatory, Turkish Music Department. ,

PROFESSIONAL EXPERIENCE AND REWARDS

- 17.10.2017. Solo Performance, University of Music and Performing Arts, Vienna, Austria.
- 09.06.2017. Solo Performance, The Second International Ronda Guitar Festival, Ronda, Spain.
- 04.04.2017. Group Performance, "II.CRR Academic *Bağlama* Days" (as Erol Parlak-Sinan Ayyıldız *Bağlama* Duo), CRR Concert Hall, Istanbul, Turkey.
- 20.05.2016. Group Performance, "Nomad Way" Concert (as Erol Parlak-Sinan Ayyıldız *Bağlama* Duo ft. Elena Hadjiafxendi), Union Chapel, London, United Kingdom.
- 02.04.2016. Solo Performance, Orientalische-musicakademie, Mannheim, Germany.
- 13.02.2016. Group Performance, "Ghent *Bağlama* Festival" (as Sinan Ayyıldız - Emre Kuzuloğlu *Bağlama*- Flamenco Guitar Duo), Decentrale , Ghent, Belgium.
- 12.02.2016. Group Performance, "Ghent *Bağlama* Festival" (as Erol Parlak-Sinan Ayyıldız *Bağlama* Duo), Decentrale, Ghent, Belgium.
- 04.11.2015. Group Performance, "Nour Festival" (as MESEL), Royal Albert Hall, London, United Kingdom.
- 26.09.2015. Solo Performance, Berlin Mandolin upgrade Festival, Berlin, Germany.
- 23.08.2014. Group Performance, "The Sixth Krutushka Ethnic Music Festival" (as MESEL), Kazan, Russia.
- 28.08.2013. Group Performance, "Stereognosis Concert" (as Stereognosis), Portland, U.S.A..
- 11.04.2013. Solo Performance, İTÜ *Bağlama* Days, Istanbul, Turkey.
- 2014 MESEL *Getme* Single [Performed by MESEL; electronic publish] is published by Artvizyon-İstanbul, Turkey.
- 2010 *The Hybrid* Album [Performed by Stereognosis; CD] is published by Eshtesh3ar Records-Portland, OR, U.S.A.

- 2009 Etni-ka *Pangea* Album [Performed by Etni-ka; CD] is published by Artvizyon-İstanbul, Turkey.
- 2018 Sabah Yıldızları Prizes : "Young Talent of Folk Music" by Sabah-ATV
- 2013 Troy Cultural and Art Prizes : "Best musicianship on Modern Folk Music" by Troy Folklore Organization

PUBLICATIONS, PRESENTATIONS ON THE THESIS :

- **Ayyıldız S.,** 2018 : Tezenesiz Bağlama Çalım (Şelpe) Tekniklerinde Yenilikçi Uygulamalar, İ.T.Ü. TMDK Bised Events, March, 6, 2018.
- **Ayyıldız, S., Parlak, E.** 2018. The Origin Of Parmak Vurma (Two-Hand Tapping) Technique Of *Saz* (*Bağlama*), *Uluslararası Sosyal Araştırmalar Dergisi*, *(11)* 57, 889-894.

OTHER PUBLICATIONS AND PRESENTATIONS :

- **Ayyıldız, S., Baysal A.O.** 2017. Matrix System: A New Analytical Approach for Adapting the Use of Chords into Performing Techniques of the *Bağlama* without Plectrum, *Proceedings of the 4st International Conference on New Music Concepts (ICNMC 2017),*87-92, Treviso, Italy.
- **Baysal A.O. , Ayyıldız S.** 2016 : New Performance Approaches to Urban Bağlama Music: Theoretical Suggestions Towards Traditional Şelpe Techniques of Bağlama, Fourth International Conference On Analytical Approaches To World Music (AAWM 2016), June, 8-11, 2016, New York, NY, U.S.A..