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A SMART MULTIMEDIA FRAMEWORK FOR LANGUAGE LEARNING

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by

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APPROVAL PAGE

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Aree MUHAMMED

M.S. Thesis – Computer Engineering
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Thesis Supervisor: Prof. Dr. Mohamed HAMADA

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ABSTRACT

Technology has affected every aspect in our lives. We got remarkable achievements in term of education and learning processes especially after smart devices inventions. After inventing computers, they being used for simple computational process, towards three decade from this invention, people can do numerous works on computers, they being used in airports, hospitals, universities to name a few. Computers helped out the researchers to find the better approaches for education and learning process.

By involving computer the CALL (Computer-Assisted Learning Language) came out, which helps users to learning a particular language through computers abilities. As technology keeps developing, some other approaches are suggested such as MALL (Mobile-Assisted Learning Language) by using MALL users can learning language by using their handheld devices. Moreover by the beginning of this millennium the smart devices came out, which are more sophisticated than ordinary mobile or table devices.

In this work we are interested in learning language and we are trying to develop a comprehensive multimedia framework system for learning language on smart devices such as iPhone and iPad, and after that we apply this framework to a particular language as a test for our framework, we are considering this language to be Kurdish.

This framework consists of two main parts, first part LSI (Learning Style Index), multimedia learning system with a facial recognition. LSI is used to find you appropriate preferences in term of learning; we use a cloud server to store preferences from users and manipulate those data. An instructor can use this LSI to find his/her students' preferences for a particular class, whereas students/users can find theirs preferences separately

.

The second part includes a comprehensive multimedia language learning system, along with one of the facial recognition, which is smile recognition.

Keywords: Artificial intelligence, Smart Devices, Learning Style Index, Multimedia, Language learning, Kurdish Language, Objective-C.

ÖĞRENİM DİLİ İÇİN AKILLI MULTİMEDYA ÇERÇEVE

Aree MUHAMMED

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ÖZ

Teknoloji hayatımızı her yönüyle etkiledi. Özellikle, akıllı cihazların keşfinden sonra Eğitim ve öğrenim süreçleri yönünden önemli başarılar elde ettik. Bilgisayarların icadından sonra, ilk başta bilgisayarlar basit hesaplamalar için kullanıldılar, o günden bugüne bilgisayarlar ile hayatımızın içinde sayılamayacak farklı alanlarda kullanılmaya başlamıştır, örneğin havaalanları, hastaneler, üniversiteler gibi. Onlar araştırmacılar için eğitim ve öğretim süreçleri adına daha iyi yaklaşımlar sürmeleri noktasında yardımcı olmaktalar.

Bilgisayarların dahil olmasıyla, insanların bilgisayar üzerinden dil öğrenmesine yardımcı olan Bilgisayar Destekli Dil Eğitimi (CALL) ortaya çıktı. Yeni gelişen mobil teknolojiler sayesinde mobil cihazlar üzerinden Mobil Destekli Dil Eğitim (MALL) yaklaşımları ortaya sürüldü.

Bu çalışmada, İPhone ve İPod için geniş kapsamlı bir multimedia dil öğrenimi yapısı geliştirdik. Bu geliştirdiğimiz yapıyı test etmek için Kürtçe dilini kullandık.

Bu yapı iki kısımdan oluşmakta, ilk kısım LSI (Stil Öğrenme indeksi), Yüz tanımalı, multimedia öğrenim sitemi. LSI öğrenme için uygun ayarlamaları sizin için bulmakta. Kullanıcıların ayarları ve dataları bulut (cloud) system üzerinde tutulmakta ve manipüle edilmekte. Eğitici öğrencileri için uygun ayarlamaları kullanabilir veya öğrenci kendi ayarlamalarını bulabilir.

İkinci kısım ise geniş kapsamlı dil öğretim sistemini ve bununla birlikte bir yüz tanıma sistemi olan gülümseme algılamasınıdda barındırmakta.

Anahtar Kelimeler: Yapay zeka, Akıllı Cihazlar, Öğrenme Stili Endeksi, Multimedya, Dil öğrenme, Kürt Dili, Objective-C.

To my parents, those without their unconditional and continuous love, helps, and supports, this work might have not been existed.

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LIST OF ABBREVIATIONS

ABBREVIATION	
CALL	Computer Assisted Learning Language
CBIM	Computer Based Interactive Multimedia
D-Learning	Distance Learning
E-Learning	Electronic Learning
ICT	Information Communication Technology
IDE	Integrated Developed Environment
ILT	Instructor led training
LSI	Learning Style Index
M-Learning	Mobile Learning
MALL	Mobile Assisted Learning Language
PDA	Personal Digital Assistant
SDK	Software Developed Kit
SLA	Second Language Acquisition

CHAPTER 1

INTRODUCTION

The main purpose of this research is to study the developing of comprehensive framework for language learning. In this chapter we introduce the content of this research and the tools that are used.

1.1 OVERVIEW

In the end of the previous Millennium, technology revolution was considered to be one of the best achievements, it led to another revolution be born which was mobile revolution. In the very beginning of this Millennium, and more specifically in the end of first decade of twenty first century smart devices produced.

Mobilization has become an essential part of human life. Computer, phones and media devices affordable and can connect us to a variety of information sources and enable communication nearly everywhere we go. Nowadays smart devices are undistinguishable in our lives, they are used almost in every single aspect, and they influenced every part of human life, Users can stay home and conduct almost any type of activity like entertainment, movies and shopping, without physically being at the appropriate place.

The digital and information revolutions and the proliferation and information communication technologies (ICT) have facilitated faster communication, information sharing, and collaboration among people (Akour, 2009).

What is the most important property should smart devices have, in order to sort out them with the ordinary phones? Being a smart device or not is not just relies on the features and even designs, but it is all about functionalities. How they behave, are the useful for multi tasks and purposes. Do they function like an alive thing or it's just less-use device and all it does is calling and sending SMS, or it is capable to recognize your emotions, your voice, and even tacks your hands, your location by using GPS device, and some other useful internal hardware such as gyroscope, manometer, accelerometer and so forth, which previously each of those built-in hardware was designed separately and their sizes were quite big.

1.2 RESEARCH CONTENTS

In this section we introduce the contents of this research, which includes Kurdish language, Kurdish alphabet, LSI (Learning System Index), and finally one of the emotional status recognition, which is smile recognition.

1.2.1 Kurdish Language

Despite of having a large number of speakers, currently Kurdish is among the less-resourced alive language. Kurdish language belongs to Indo-European family of languages. Its dialects are member of the northwestern subdivision of the Indo-Iranian languages, Iranian branch of this largest family of language in the world. Kurdish language is an independent language, has its own historical development, continuity, grammatical system and rich up-to-date vocabularies. Kurdish language was derived from the ancient "Median" language or "Poto-Kurdish" (Kurdish Academy, 2014). Nearly 35 million people are native speaker of Kurdish language (Princeton University, 2014).

1.2.2 Kurdish Alphabets

Kurdish language consists of 34 characters, which were derived from Arabic alphabets except some of them are not used at all, whereas some other of them either were invented or derived from somewhere else. Another property of Kurdish is its writing direction that is from right to left. Hence, it makes the learning process more difficult for those learners whose native languages are written from left to right.

Table 1.1 indicates Kurdish alphabets beside common letters among Kurdish, Arabic, and Persian.

Unlike Latin based alphabets such as English, French, and Spanish etc., most of the letters in Kurdish alphabet have more than one way to write, they have various shapes according to their places in the word such as initial, medial, final and isolated (alone) as it is shown in the Table 1.2.

Table 1.1 Kurdish alphabets with Arabic and Persian alphabets.

#	Kurdish Alphabet	Shared with Arabic	Shared with Persian
1	ئ	✓	✓
2	ا	✓	✓
3	ب	✓	✓
4	پ	✗	✓
5	ت	✓	✓
6	ج	✓	✓
7	چ	✗	✓
8	ح	✓	✓
9	خ	✓	✓
10	د	✓	✓
11	ر	✓	✓
12	ڕ	✗	✗
13	ز	✓	✓
14	ژ	✗	✓
15	س	✓	✓
16	ش	✓	✓
17	ع	✓	✓
18	غ	✓	✓
19	ف	✓	✓
20	ڤ	✗	✗
21	ق	✓	✓
22	ک	✓	✓
23	گ	✗	✗
24	ل	✓	✓
25	ڵ	✗	✗
26	م	✓	✓
27	ن	✓	✓
28	و	✓	✓
29	ۆ	✗	✗
30	وو	✗	✗
31	ه	✗	✗
32	ھ	✓	✓
33	ی	✓	✓
34	ێ	✗	✗

Table 1.2 Kurdish alphabets are shown with their possible positions in a particular word.

	IPA	Isolated (Alone)	Initial	Medial	Final
1	[a:]	-	ئـ	ـئـ	ـ
2		ا	ـ	ـ	ـا
3	[b]	ب	بـ	ـبـ	ـب
4	[p]	پ	پـ	ـپـ	ـپ
5	[t]	ت	تـ	ـتـ	ـت
6	[dʒ]	ج	جـ	ـجـ	ـج
7	[tʃ]	چ	چـ	ـچـ	ـچ
8	[ħ]	ح	حـ	ـحـ	ـح
9	[x]	خ	خـ	ـخـ	ـخ
10	[d]	د	ـ	ـ	ـ
11	[ɾ]	ر	ـ	ـ	ـر
12	[r]	ڕ	ـ	ـ	ـڕ
13	[z]	ز	ـ	ـ	ـز
14	[ʒ]	ژ	ـ	ـ	ـژ
15	[s]	س	سـ	ـسـ	ـس
16	[ʃ]	ش	شـ	ـشـ	ـش
17	[ʔ]	ع	عـ	ـ	ـ
18	[ʁ]	غ	غـ	ـ	ـ
19	[f]	ف	فـ	ـفـ	ـف
20	[v]	ڤ	ڤـ	ـڤـ	ـڤ
21	[q]	ق	قـ	ـقـ	ـق
22	[k]	ک	کـ	ـکـ	ـک
23	[g]	گ	گـ	ـگـ	ـگ
24	[l]	ل	لـ	ـلـ	ـل
25	[ɬ]	ڵ		ـڵـ	ـڵ
26	[m]	م	مـ	ـمـ	ـم
27	[n]	ن	نـ	ـنـ	ـن
28	[u]	و	ـ	ـ	ـو
29	[o]	ۆ	ـ	ـ	ـۆ
30	[u:]	وو	ـ	ـ	ـوو
31	[æ]	ه	ـ	ـ	ـه
32	[h]	ـ	ھـ	ـ	ـ
33	[i:]	ی	یـ	ـیـ	ـ
34	[ɛ]	ێ	ـ	ـێـ	ـێ

Kurdish language similar to the most other languages in the world has several dialects such as (Gorani, Hawrami, Kurmanci, and Sorani) which were sorted alphabetically (Kurdish Academy, 2014), and each of them has its own properties from many perspectives such as grammar, syntax, and so forth. In this thesis the dialect that we apply to our framework is Sorani, and when we name Kurdish language from now on, we intended it to be Sorani not the other dialects.

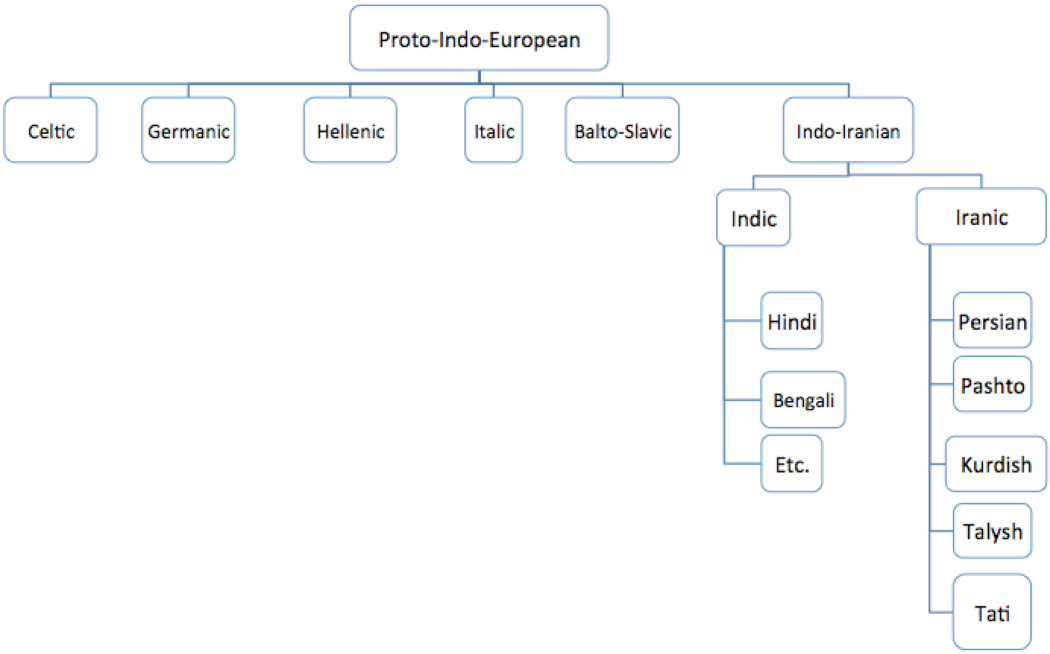


Figure 1.1 Indo-Iranian branch tree of the Indo-European language family.

1.2.3 Learning Style Index

Learning System Index (LSI) is an instrument used to access preferences on five dimensions (active/reflective, sensing/intuitive, visual/verbal, and sequential/global) of a learning style model developed by Richard M. Felder and Linda K. Silverman, with an extension (social/emotional) A student's learning style profile provides an indication of possible strengths and tendencies or habits that might lead to difficulty in academic setting. More explanations will be shown in the chapter three.

1.3 RESEARCH TOOLS

In this section which contains some explanations about those tools that we deal with in order to develop and conduct this research successfully.

1.3.1 Objective-C

Objective-C is a general-purpose, object-oriented programming language that adds Smalltalk-style messaging to the C programming language (Wikipedia). That is why having previous knowledge about C is crucial. It is the prime and the only official language for design and developing apps for both iOS and OS X systems.

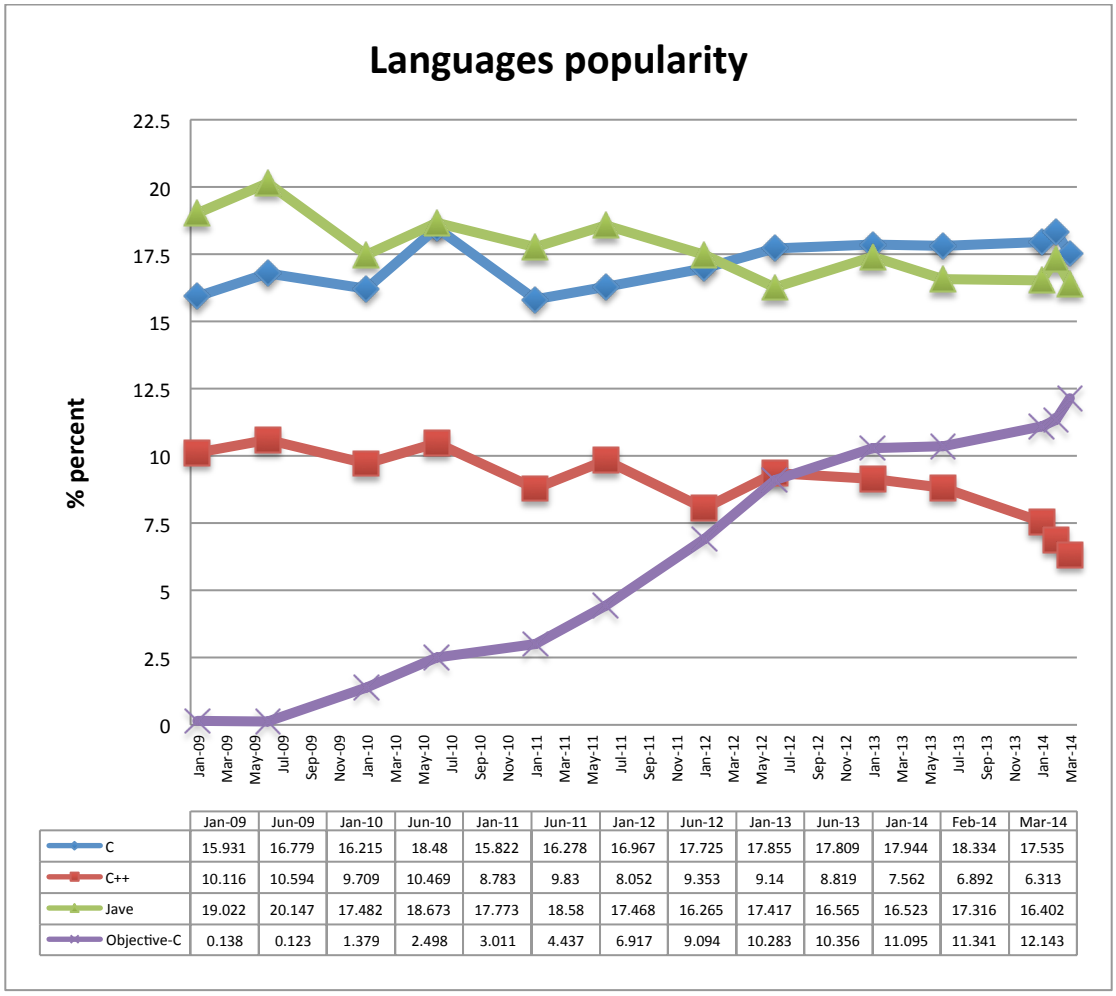
After its development in the early 1980's it was not as popular to use as C, but after releasing the first generation iPhone on 29 of June 2007 the curve of its use increased, and the remarkable change of its use occurred, and its rank became third position in 2014, which was thirty eighth in the 2009, as its use and rank are shown in the Table 1.3 and Table 1.4 respectively (TIOBE, 2014).

Table 1.3 The list of programming languages beside their ranks, which are average for a period of 12 months.

#	Programming Language	2014	2009	2004	1999	1994	1989
1	C	1	2	2	1	1	1
2	Java	2	1	1	12	-	-
3	Objective-C	3	38	48	-	-	-
4	C++	4	3	3	2	2	3
5	C#	5	8	8	29	-	-
6	PHP	6	5	6	-	-	-
7	Visual Basic	7	4	5	3	3	7
8	Python	8	6	11	31	22	-
9	JavaScript	9	9	9	20	-	-
10	Perl	10	7	4	5	17	23
11	Lisp	14	19	15	14	6	2

As we can understand from Table 1.4, TIOBE indicates the popularity of programming languages, but a worthy note is that those ratings are not neither based on the best programming language nor the language in which most lines of code have been written. But the number of skilled engineers, popularity rate of search in the search engines such as Google, Bing, Yahoo, and even YouTube are used to calculate the ratings (TIOBE, 2014).

As it is indicated none of those four language where able to record a rising in their curve in March 2014 comparing with their previous rates in February 2014 except Objective-C, as it is shown in figure 1.2.



	Jan-09	Jun-09	Jan-10	Jun-10	Jan-11	Jun-11	Jan-12	Jun-12	Jan-13	Jun-13	Jan-14	Feb-14	Mar-14
C	15.931	16.779	16.215	18.48	15.822	16.278	16.967	17.725	17.855	17.809	17.944	18.334	17.535
C++	10.116	10.594	9.709	10.469	8.783	9.83	8.052	9.353	9.14	8.819	7.562	6.892	6.313
Jave	19.022	20.147	17.482	18.673	17.773	18.58	17.468	16.265	17.417	16.565	16.523	17.316	16.402
Objective-C	0.138	0.123	1.379	2.498	3.011	4.437	6.917	9.094	10.283	10.356	11.095	11.341	12.143

Figure 1.2 The four programming languages with their percentage popularity.

The other part of TOIBE which we want it to be shown in here is “Hall of Fame” which selects the Programming Language of the Year and awards the winner, and so far none of the language was able to win that award more than one time successively except Objective-C, it won it in 2011 and 2012. This award is given to any programming language that has the highest increase in rating in that year.

Table 1.4 Award from TOIBE for the programming language of year.

Year	Winner
2003	C++
2004	PHP
2005	Java
2006	Ruby
2007	Python
2008	C
2009	Go
2010	Python
2011	Objective-C
2012	Objective-C
2013	Transact-SQL

1.3.2 Xcode

In the previous section we were acquainted with Objective-C, which is the native language for developing apps for both iOS and OS X. whereas Xcode is the native IDE, but in this section we give some explanations about Xcode.

Xcode is an integrated development environment (IDE) by Apple for developing apps for iOS and OS X, first released was in 2003, and the latest released is version 5.0.x.

Apple's development software, Xcode, was used to develop the application. The programming language is Objective-C. To install Xcode one also needs to install the iOS Software Development Kit (SDK). Together, Xcode and the iOS SDK allow developers to use the Xcode Integrated Development Environment (IDE), the iOS Simulator, and access the application testing software called Instruments (Alan Wahl, 2013).

Although Xcode is not the only SDK for developing apps for Apple, there is other possibility to develop apps for Apple such as Titanium appcelerator platform (Titanium 2014). By using Titanium once you write the program by JavaScript and designed a particular app, in the way that that platform compiles the designed program is different

from the other IDE, it allows you to compile the app for various platforms such as Blackberry, iPhone and Samsung, ordered alphabetically. But neither a plenty of developer use it nor it is sophisticated or popular as much as Xcode and Objective-C are.

1.3.3 Smart Devices

Smart devices such as (iPhone, iPad, etc.) are one of the most popular smart devices in the world, the first generation of iPhone and iPad were released in 29 June, 2007 and 13 April, 2010 respectively; and by the time this thesis written the seventh-generation iPhone 5C and iPhone 5S is the most resent iPhone which were introduced in 10 September 2013. It uses iOS7, which is the last version of iOS mobile operating system.

Recent statistics in the end of 2013 in the U.S. show that Android has reached the higher number of subscriber in the market than the iPhone (comScore, 2014). Table 1.5 shows the 5 top smartphone platforms in August 2013 vs. November 2013, although Apple platforms are in the second position in both month, but the remarkable point here is the highest increase was recorded by Apple's platforms. But another research implies that Android users are slowly turning back to use the iPhone (Woollaston, 2013).

Table 1.5 Shows the number of subscribers for smartphones (comScore 2014).

	August 2013	November 2013	Point change
Android	51.6	51.9	0.3
Apple	40.7	41.2	0.5
BlackBerry	4.0	3.5	-0.5
Microsoft	3.2	3.1	-0.1
Symbian	0.3	0.2	-0.1

The way that we explained Objective-C, Xcode and iPhone, there was not any intention to label a language or an IDE or mobile operating system to be better than the other. Once we were trying to conduct this thesis, we were interested in iOS programming for implementing our system.

Whereas among the tables iPad still on top of them, more than half of tablets' owner in the U.S. have iPad (Richter, 2013) as it is shown in the figure 1.3.

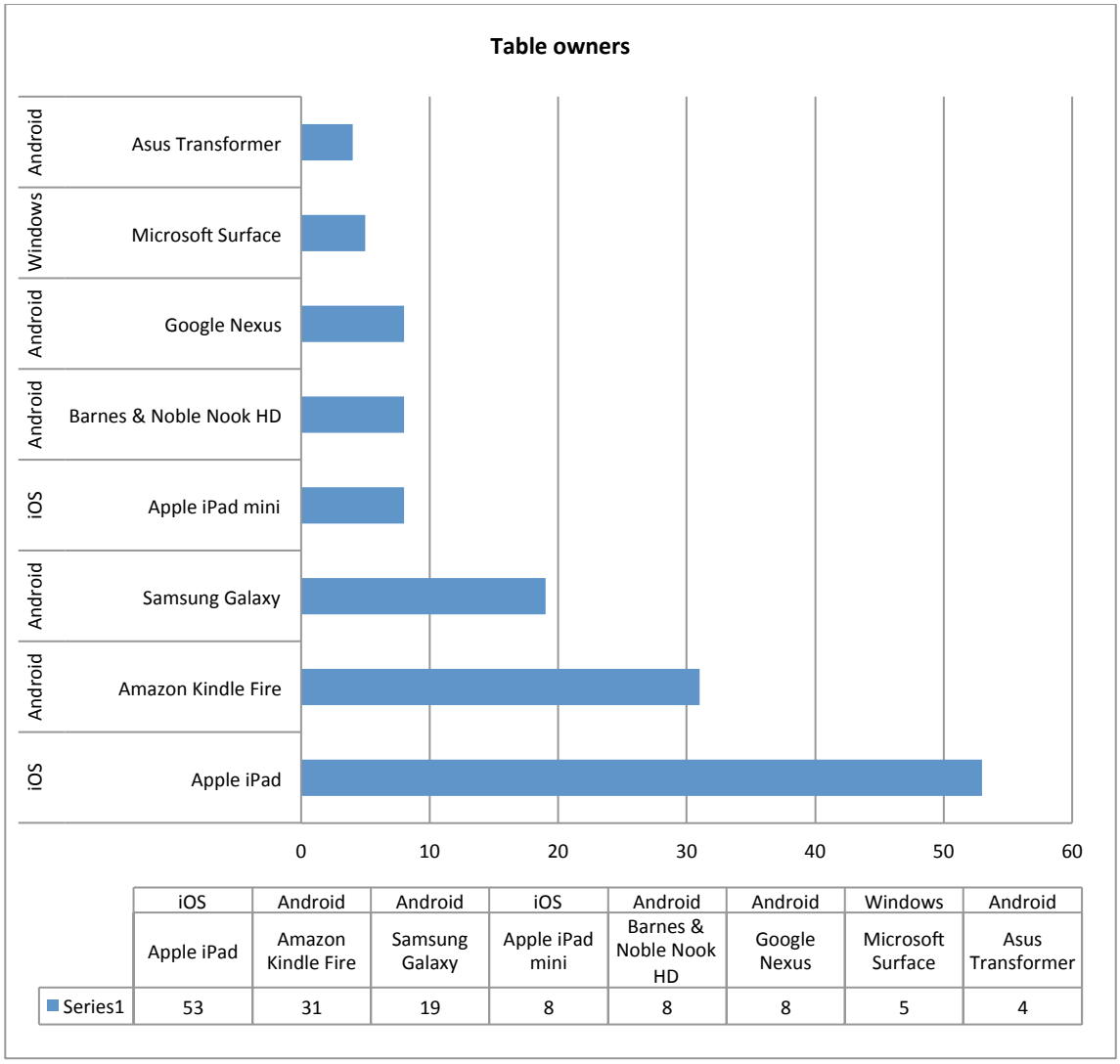


Figure 1.3 Tablet owners in the U.S. as of May 2013.

Characteristics for both newest iPad and iPhone are shown in table 1.6.

Table 1.6 General characteristics for both latest Apple smart devices (iPad and iPhone).

Feature	**iPad**	**iPhone**
Announced date	October, 22, 2013	
Released date	November, 1, 2013	September, 20, 2013
Motion coprocessor	Apple A7	Apple A7 with M7
CPU	1.4GHz dual core	1.3 GHz dual core
RAM	1GB LPDDR3 RAM	1GB LPDDR2 DRAM
Storage	16, 32, 64, or 128 GB	16, 32, or 64 GB
Display	2048*1536 pixels at 264 ppi (Retina Display)	
Camera	**Back:** 1080 HD still and video camera 5MP.	1080 HD video (30 fps), 8MP photo
	Front: 1.2 MP still, 720p video	1.2MP photo and 720p HD video (30 fps)
Operating System	iOS7	iOS7
Dimensions	9.4*6.6*0.295 inches (238.8*167.6*7.5 mm)	4.87*2.31*0.30 inches (123.8*58.6*7.6 mm)
Weight	**Wi-Fi model:** 479 g	112 g
	Wi-Fi + Cellular model: 478g	

App Store, which is an online market for iOS and OS X apps, is considered as the largest and richest compare to the rest of online markets, just in 2013 customers spent 10 billion dollars in the App Store, including over 1 billion dollar in December alone (Apple, 2014).

1.4 PURPOSE OF THE STUDY

So far a plenty of works has been done related to M-Learning, and facial or emotional recognition separately. But a quite few work were done which combined those two approaches together and made a better achievement, since there is no such an

M-Learning system for learning Kurdish language by the time when this thesis was written.

Therefore, we came up with an idea to combine a particular M-Learning system for Kurdish language with a facial recognition attached to it, in order to make the system as efficient as possible, for the facial recognition we mainly deal with smile recognition as one of the possibility of emotional status, it was difficult and closed to impossible to take care about all other possibilities of emotional status such as angry, temper, sadness to name a few.

1.5 THESIS ORGANIZATION

This thesis consists of five chapters. Chapter one, the introduction, has given a brief information on Kurdish language, Objective-C programming language, which is the main language for developing apps in iOS and OS X, and in the end of the chapter a brief explanations are given about Xcode and iPhone.

Chapter Two, the literature review, explains what has being done about M-Learning subjectively, and which points were missing in those studies, then what are our motivations to conduct this work, and what is the distinctive point between our work and those that have done before.

Chapter Three, the methodology, reviews those methodologies that are covering in this thesis, form facial recognition algorithms to Language Style Index approach which used to find appropriate learning references for learners.

Chapter Four, the Contribution, explains the way that this system was developed some detailed and the development steps.

Chapter Five, contains the conclusions, and future research recommendations.

CHAPTER 2

LITERATURE REVIEW

A part from positive effects of technologies on various aspects of science such as medicine, physic, chemistry and economy, it is also helpful means for language learning as well. For instance, learning by computer and mobile have served a lot and passed through many methods. Similar to other learning tools, computer and/or mobile have/has some weak points relating to language learning in some fields.

General comprehensive feature should be existed in a smart learning language system:

a) Ability of producing speech.
b) Ability of producing text.
c) Ability of analyzing from speech.
d) Ability of analyzing from text.
e) Ability of recognizing/analyzing users' facial status.

Computer and/or mobile serve(s) a great services to (a, b and d) sections. Section (c and d) cannot get benefit from computer as much as required. It can be said that section (a) has an essential ability to be use due to using CDs, audio files, or anything related to sound function. On the other hand, section (b) can be benefit by using eBooks, or anything related to text aspect. Moreover, section (c) has the ability to analyze learners' speech when it is added to a computer-based language learning program.

It must be pointed out that apart from the above mentions, good services (a-b-c), but there are still barriers in front of utilizing section (e) properly. In spite of hard attempts by the researchers but they have not yet arrived a resolution to the problem; that is to say recognizing the emotional statues and mixing them with language learning by smart devices.

Facial recognition projects might have done for some other purposes so far. But combining it with educational and learning process will be quite new. Hence our work may be one the first step that has done in this area of learning process.

Communication technologies has grown faster than any other aspect of technologies, and influenced our lives positively rather than negatively. People can reach the furthest coverage area on this planet just in a second or so by handheld device. In some countries around the globe such as Brazil, Indonesia, and Japan to name a few, numbers of mobile subscribers are more than the country's population (CIA, 2014).

One of the very first projects for language learning was designed in Stanford Lab, ever since researcher were focusing on this new approach for learning and teaching, a lot of researches were done on mobile learning or related to it. With the advance in mobile and communication M-Learning systems are getting smarter and more efficient. They reached to peak in terms of being smart when today's known smart devices are born.

Inventors always care about mobility when they are thinking about making something new, try to make it movable as much as possible, in order to rise its usability. Mobile learning is one of such technology. The first M-Learning tool appears in Watson & White, 2006. It is quite remarkable what have been achieved, because you can have a big library full of various books, and a studio full of CDs to name a few, in the palm of your hand.

Mobile language learning came out a little bit after M-Learning. It considered as a sub-branch of M-Learning. In the very beginning of this new approach the smartphones has not been invented yet, so they were designed for handheld devices such as Personal Digital Assistants (PADs), ordinary mobile phones, laptops, and tablets.

Since smartphone and learning language systems for them are relatively new approach, plus due to not having enough developer and specialist on M-Learning for learning Kurdish language, and a few of them have acquaintance about designing an M-Learning system and developed it for Apple devices such as iPhone, iPad, and iPod. Moreover there some common missing points among those learning language systems on AppStore®. Therefore, we want to address some of those points out:

1. Missing implementation for facial recognition, this would be true even for similar English learning systems.
2. User interfaces are poor compare to similar English learning systems.
3. Poverty of materials.
4. Some mistranslations are occurred.

On the other hand, our system a facial recognitions is implemented, which are smiling recognition. The facial recognition automatically interacts with learners and provides useful recommendations based on their current situations.

CHAPTER 3

METHODOLOGIES

3.1 INTRODUCTION

In this chapter we introduce some methodologies that we use for this work, such as D-Learning, E-Learning, and M-Learning with explanations.

3.2 MULTIMEDIA

The term of multimedia was used by the 1950s and referred to combinations of various still and motion media as well as live demonstrations. In computer-based instruction the term multimedia has been widely used in the field of education in the last 15 to 20 years. The idea of hypermedia, a distinct feature of multimedia, comes about by the merging two distinct fields: one is the field of multimedia and the other is the field of hypertext (Burton, Moore, & Holmes, 1995). Due to the merging of these two fields, the definition of multimedia is often the combination of the two fields. Using terms like multimedia, interactive video, hypermedia and hypertext are often synonymous in much of the literature (Burton, Moore, & Holmes, 1995).

These two different ideas associated with multimedia have two elements in common and seem to be defining the same term. Both possess two essential concepts; the concept that hypermedia involves multiple representation of information, and multimedia involves an interactive relationship between users and the information presented (Blanco, 2007).

Multimedia is an exciting area that spans many disciplines within computer science; it is a computer-based communications system that integrates and delivers a complete package of audio, video, animation, graphic, and text to the end-users (Mitsui, 2014).

A particular multimedia system contains five elements (Smith, 2014).

1. **Text**: It may be an easy content type to forget when considering multimedia systems, but text content is by far the most common media type in computing applications. Most multimedia systems use a combination of text and other media to deliver functionality. Text multimedia systems can express specific information, or it can act as reinforcement for information contained in other items.
2. **Graphic Images:** Graphic images are digital representations of none-text information such as drawing, chart, or photographs which play an important role in the learning process and which is worth a thousand words. Graphics are especially useful when there is a need to illustrate something or compare information.
3. **Video:** Video appears in many learning system which facilities the learning process, especially for language learning. Video is made up of series of frame of slightly varied still images, when shown in rapid succession, gives the impression of movement. Shooting video requires video skills and an understanding of the special demands of multimedia and picture.
4. **Audio/Sound:** Audio/Sound is music, speech, or any other sound that the computer converts from analog sound/waves into a digital format. Audio files and streams play a major role in some multimedia systems.
5. **Animation:** it is actually a series of images, presented very quickly. Animation components are common within web, desktop, and mobile applications. Animations can also include interactive effects, allowing users to engage with animation action using their mouse, keyboard, and touch taps.

Figure 3.1 explains the five multimedia elements. It also indicates the elements which are belonging to either static or dynamic.

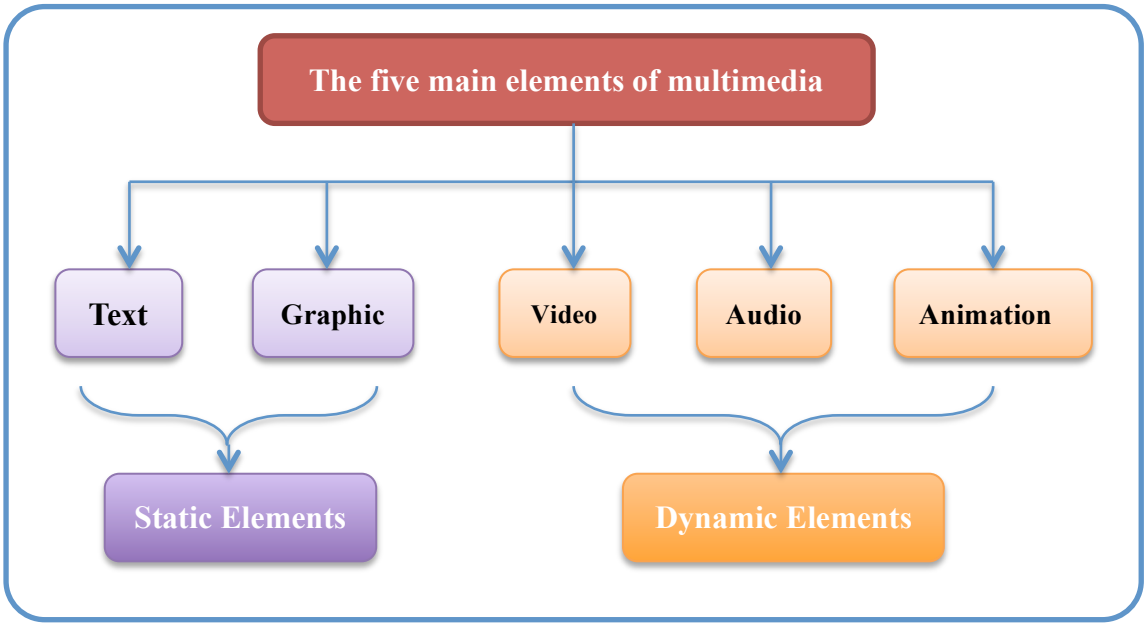


Figure 3.1 Multimedia elements.

3.3 COMPUTER ASSISTED LEARNING LANGUAGE (CALL)

After invention of the Computer numerous definitions have been given to CALL (Computer Assisted Language Learning), one of the very first definition for CALL is the definition of Suppes (1966), which he defines it as a way to individualize educational curriculum to adapt the individual learners, but according to today's understandings of CALL this definition is outdated. The current philosophy of CALL puts a strong emphasis on student-centered materials that allow learners to work on their own (Wikipedia, 2014). Stockwell (2012, p.i) defines CALL as "as approach to teaching and learning languages that uses computer and other technologies to present, reinforce, and assess material to be learned, or to create environments where teachers and learners can interact with one another and the outside world".

CALL has been greeted with attention in the field of foreign language learning since the introduction of computer technology to education. Computer-based interactive

multimedia (CBIM), a delivery system that combines computer-assisted instruction and interactive multimedia, lies at the core of language learning technology because it can integrate audiovisual capabilities with materials presentation and storage, which adds more power to traditional CALL program (Chang, 2002).

Because of the features such as learner control, instant feedback, and use of authentic materials, CBIM provides learners with an environment that can satisfy the needs for exploration, manipulations, simulation, knowledge to resolve problems, and self-enhancement (Change, 2002). Researchers also have pointed out that language learners can benefit from the audiovisual and textual resources found within computer application to develop the various competencies used in communication (Change, 2002).

There are seven hypotheses relevant for developing multimedia CALL in regard to Second Language Acquisition (SLA) theory (Chapelle, 1998).

(a) The linguistic characteristics of target language input need to be made salient by highlighting input materials to make them more noticeable.
(b) Learners should receive help in comprehending semantic and syntactic aspects of linguistic input. This can modification of the output such as repetition, simplification, elaboration, reference materials or added redundancy.
(c) Learners need to opportunities to produce target language output. It is important for learners to have an audience for their output so they construct meanings for communication rather than solely for practice.
(d) Learners need to notice errors in their own output and have the opportunity to recheck the question before entering it.
(e) Learners need to correct their linguistic output. Corrections can come from the learner's own hypothesis testing, from other learners, or from explicit correction.
(f) Learners need to engage in target language interaction whose structure can be modified for negotiation of meaning. When the student engages with the computer they need to move toward a task goal and stop progress along the way to focus on the language. And lastly
(g) Learners should engage in tasks designed to maximize opportunities for good interaction. The task must focus on accomplishing a goal through the use of language rather than solving linguistic problems (Moroz, 2013).

Despite having advantageous use of CALL, Park and Son (2009) point out some disadvantages of CALL in classroom education. First disadvantage is lack of time, since teachers spent a large amount of time for preparing appropriate materials because they needed to modify, and combine the resources they had found from the web with textbook content. Second, a lack of computer skills and facilities to use computers during class.

In addition, computers have a lack of mobility, and we are not open-handy to apply teaching method especially when you are far away from teaching lab or your personal computer, that is how the of MALL (Mobile Assisted Language Learning) has born.

3.4 MOBILE ASSISTED LEARNING LANGUAGE (MALL)

The development of mobile and wireless technologies has opened up a huge array of possibilities in the domain of language learning (Joseph & Uther, 2009). There is numerous mobile-assisted language learning (MALL) applications since 2001 for instance the very first MALL application is Stanford Learning Lab. Nearly after passing four decades of using CALL approaches on computer, the other learning language was come to use, its idea almost was the same with CALL, but the major difference was instead of using computers as a base place to implement and design a learning language system, the mobiles are used, despite having a couple limitations of handheld devices in the beginning of their inventions, their uses are dramatically increasing. Moreover, their limitations can be combined in two points;

a) Having small screen size;
b) b) Lack of mouse and keyboard. As development keeps continuing, almost those two limitations were solved; by saying, "solved" we mean nowadays smartphones have a bigger screen size and the work based-on touch input, which sometimes make them faster in interacting compare to computer, iPhone 5s and Galaxy 4s which are the latest version of smartphones for Apple and Samsung, got (13*43 cm) and (23*23cm) screen.

Tables PCs such as PDAs are a good environment to practice the MALL and to improve and achieve better result. Because those abilities that a PDA had, so they widely being used for multiple purpose in the late of 2007. But instead of continuing on improving those PDAs, another human-made device came out, and they are much more applicable and sophisticated that PDAs, they are carrying “Smart devices” as their names. Several big companies were participating to achieve this goal independently. Such as Apple, Google, Microsoft, Nokia to name a few.

3.5 EDUCATION CLASSIFICATION

Today there are two forms of education and training: conventional education and distance education. And distance education can comprise: distance learning (D-Learning), electronic learning (E-Learning), and mobile learning (M-Learning), see figure 3.2.

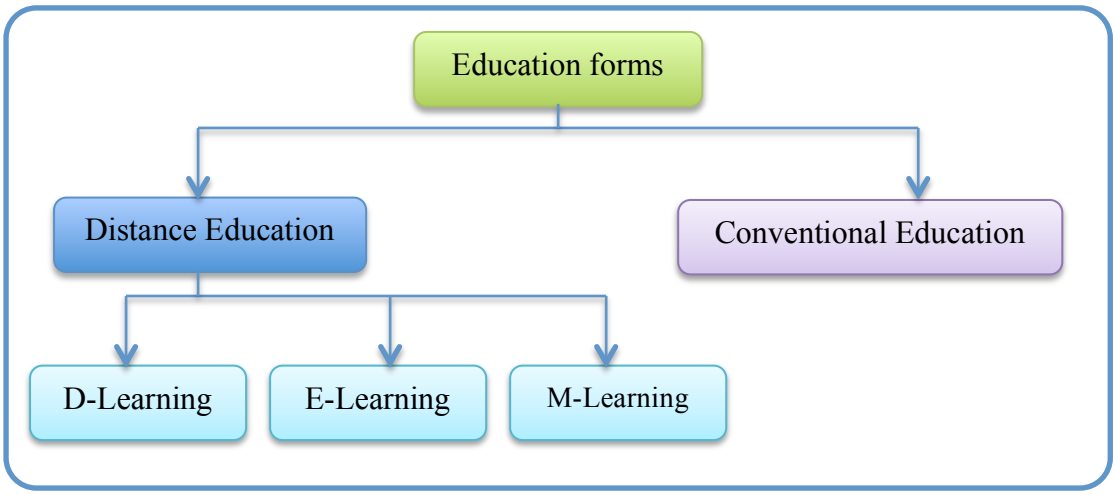


Figure 3.2 Explanation of the education forms.

3.5.1 Conventional Education

Conventional education is also known as face-to-face education or ILT (instructor led training), as Keegan (2005), in his book claims that conventional education has three fundamental characteristics:

- The teacher and the learning group are assembled at a fixed time in a fixed place for the purpose of learning.
- The learner forms part of the learning group.
- Interpersonal communication is the means by which the process of education and training takes place.

Since this work is not related to this type of education and learning, so there will not be any further information about the conventional education.

3.5.2 Distance Education

The wondrous developments of technology during the Industrial Revolution brought about, for the first time in history the possibility of distance education, in the middle of the last century; distance broke the structure of the learning group and treated its student as individuals (Keegan, 2005).

The first distance educators:

- Separated the teacher and the learner.
- Separated the learner from the learning group.
- Used a form of communication mediated by technology.

In distance learning, gathering in fixed time and fixed place are neglected. And the distance learning system used technology to separate the learner from the teacher, and the learner from the learning group, while maintaining the integrity of the education process (Keegan, 2005).

3.5.2.1 D-Learning

In a very simple definition, D-Learning is a type of learning, by which some technologies equipment is used in learning process. Popular D-Learning technologies may include:

- One-way audio/video. (Such as: CDs, DVDs, audio and video files)
- Two-way audio/video. (Such as: voice and videoconferences)

3.5.2.2 E-Learning

E-Learning (electronic learning) is the next stage of distance education after D-Learning. It simply means using technology especially computer in the learning and teaching process It showed up in the end of previous century, exactly after the use of computer became essential. As Keegan (2005) indicates that E-Learning combines and integrates text, audio and video with interaction amongst participants.

In the early days it received a bad press, as many people thought bringing computers into the classroom would remove that human element that some learners need, but as time has progressed technology has developed, and now we embrace smartphones and tablets in the classroom and office, as well as using a wealth of interactive designs that makes distance learning not only engaging for the users, but valuable as a lesson delivery medium.

There are several benefits of E-Learning such as follow:

- It is cost effective and save time.
- Learning 24/7, anywhere (anytime, anywhere)

3.5.2.3 M-Learning

Mobile learning (M-Learning) has multiple definitions in the literature. Definitions range from simple device-level descriptions to its being an extension of E-Learning to more sophisticated definitions relating to mobile learner preferences and pedagogy (Akour, 2009). Nowadays we are in the golden age of M-Learning because of the smart devices. M-Learning has a broader definition than before, we can define a learning process on any mobile device such as smartphones, tables, PDAs and so on; it is not like before the invention of smartphone that M-Learning learning is considered to be just on ordinary mobile devices. According to several researchers' definition, M-Learning has a various definitions as given in table 3.1. A comparison between E-Learning and M-Learning is given in table 3.2.

Table 3.1 Mobile-learning definition (Akour, 2009).

Mobile Learning Definitions	
E-Learning through mobile computational devices called information appliances (IAs) – Palms, Windows CE machines, digital cell phones	Quinn, 2000
The delivery of learning content to learners utilizing mobile computing devices	Parsons & Ryu, 2006
A new stage of e-learning having the ability to learn everywhere at every time through use of mobile and portable devices	Georgiev et al., 2004
E-learning that uses mobile devices and wireless transmission	Pinkwart et al., 2003
Any educational provision where the sole or dominant technologies are handheld or palmtop device	Traxler, 2005
A process of coming to know, by which learners in cooperation with their peers and teachers construct transiently stable interpretations of their world	Sharples, 2005
Learning supported by mobile devices, Ubiquitous communications and intelligent user interfaces	Sharma & Kitchens, 2004
Any form of learning (studying) and teaching that occurs through a mobile device, or in a mobile environment	Trifonova, 2003
A next stage or a new form of e-learning through the use of mobile and portable devices and wireless network and communication technologies for teaching and learning	Doneva et al., 2006

Table 3.2 Comparison between M-Leraning and E-Learning.

Ability	**M-Learning**	**E-Learning**
Freedom to learn?	Everywhere at every time.	Not everywhere at every time.
Device costs?	Mobile devices are cheaper.	Desktops are much expensive.
Easy to carry?	Mobile devices are portable.	Desktops are not portable.
Can provide location education?	Yes it Can. By using GPS technology.	No, it cannot.
Flexible or not?	Yes	No
Human-computer interaction	One learner to more than one mobile device.	One learner to one computer.

Figure 3.3 depicts Gerogiev et al.'s (2004) view of the relationship among D-Learning, E-Learning, and M-Learning. The authors indicate that M-Learning is a subset of E-Learning and the E-Learning is a subset of D-Learning. Thus any M-Learning event is an E-Learning event and any E-Learning event is a D-Learning event.

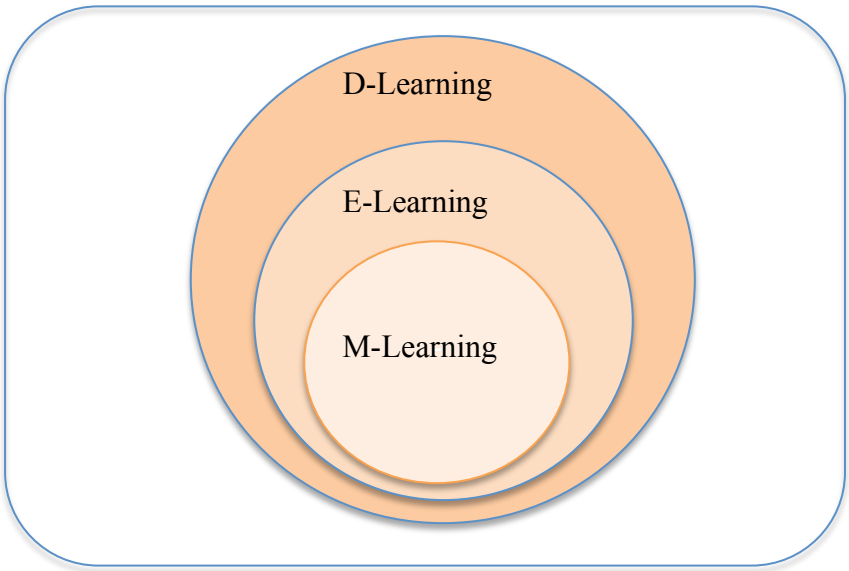


Figure 3.3 Set theory perspective of learning paradigms (Gergiev et al., 2004).

Tcik (2006) presents a different picture of the relationship among the three learning paradigms: D-Learning is slowly transforming to E-Learning because of ICT innovations but Tick argues that E-Learning is not always D-Learning. In addition mobile learning provides flexibility of timing and autonomy for the learner (Akour, 2009). This relationship is shown in figure 3.4.

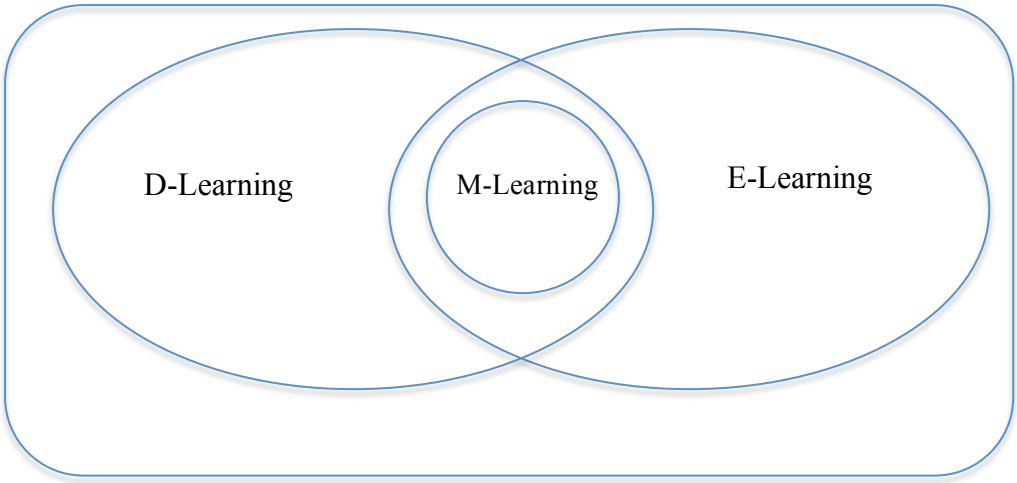


Figure 3.4 The interrelationship of D-Learning, M-Learning, and E-Learning (Tick, 2006).

Figure 3.5 represents this view in term of range of learning space. M-Learning space is the largest learning space compare to E-Learning, D-Learning, and traditional learning as well.

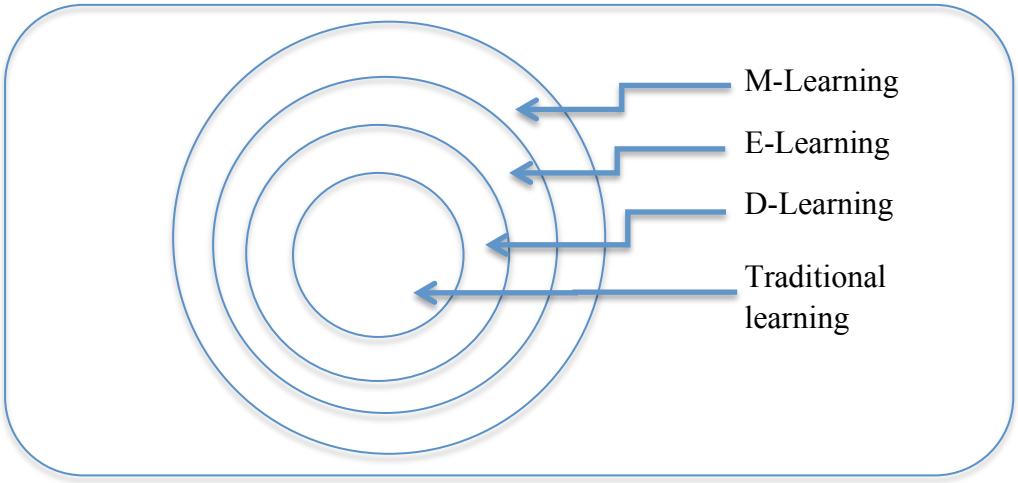


Figure 3.5 Learning space ranges and ease of access for learning paradigms (Akour, 2009).

Figure 9 explains the location of E-Learning, D-Learning and M-Learning in CALL and MALL settings.

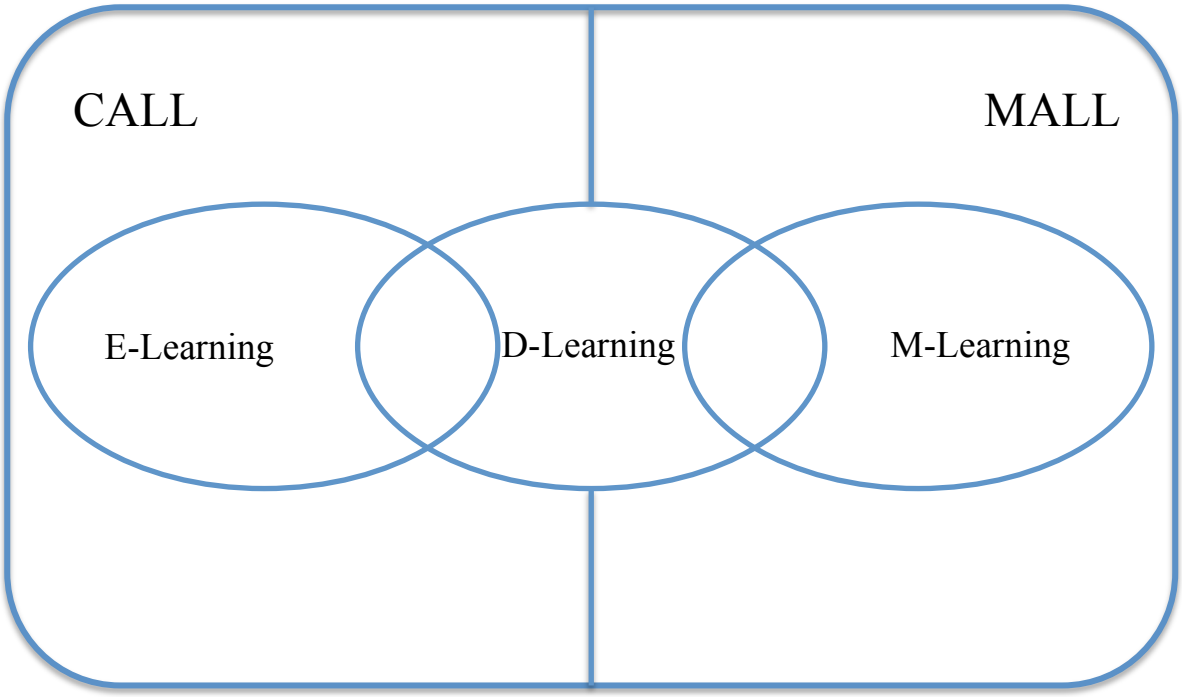


Figure 3.6 Explanation CALL and MALL area.

CHAPTER 4

CONTRIBUTION

4.1 INTRODUCTION

In this chapter we explain the system that we develop. As mentioned in the first chapter, our tools are Objective-C as a programming language, Xcode as an IDE (Integrated Development Environment), and choosing iPhone and iPad platform as a smart devices tool.

Our system consists three prime modules. The first module is a comprehensive multimedia learning system framework, which we apply to Kurdish language as practice of the framework. The second module is an LSI (Learning Style Index) for both platforms. The third module is the development of facial recognition algorithms such as smile recognition. The architecture of our system is given in figure 4.1.

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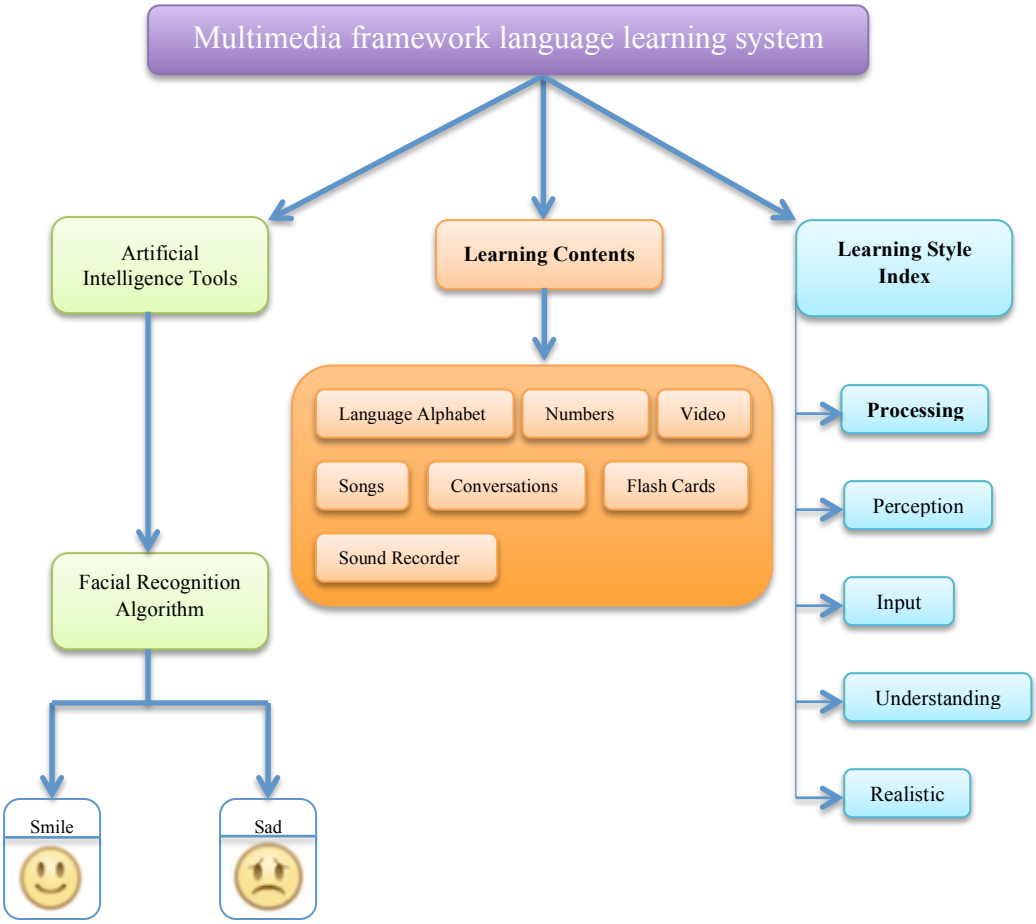

Figure 4.1 Multimedia Learning System.

The learning contents module contains a rich set of multimedia learning contents such as: animated alphabets, animated numbers, video classes, educational songs, various conversations, flash cards, voice recording and learning games. This module enables the learners to select among a rich set of learning materials to enhance the learning process.

The artificial intelligent (AI) module contains the implementation of some facial such as smile recognition. This module works in the background in order to not bother the users; it recognizes the learners' condition and interaction with appropriate feedback.

The LSI module helps learners to understand his/her learning preferences and recommends a suitable learning materials and learning path. Our system also utilizes a cloud-based server to store and retrieve learning data.

Our system uses a set of built-in and external frameworks as shown in figure 4.2.

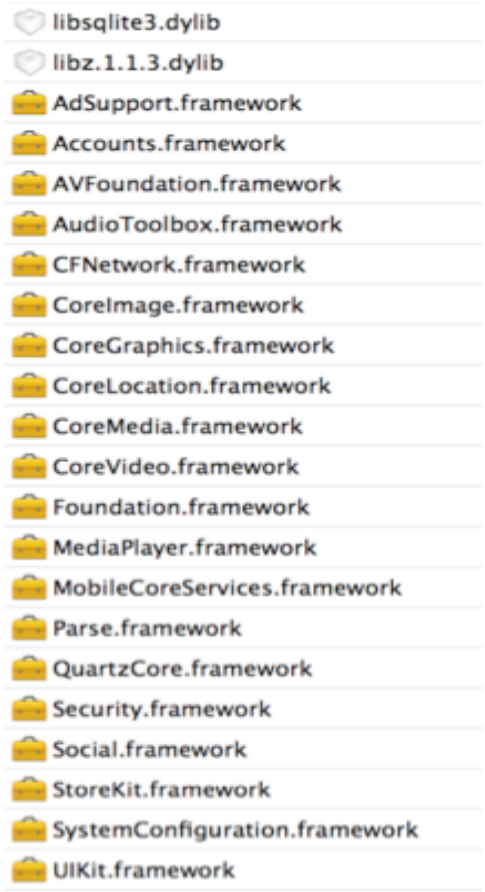

Figure 4.2 List of the frameworks.

The storyboard of our multimedia learning (content) module is shown in figure 4.3. It contains several views and scenarios each of which has its own functionalities

Figure 4.3 The snapshot of our multimedia learning system.

4.2 MULTIMEDIA LEARNING CONTENT MODULE

In this section we introduce the components in our learning system such as animated alphabets and numbers, learning videos, educational songs, daily conversations, flash cards, and leaning games.

4.2.1 Alphabets and Numbers Learning

The Kurdish alphabets and numbers are presented with an animation and practice options. The pronunciations of a native speaker for each of them are attached. Each alphabet and number is explained in animated image, instead of still image, in order to be attractive and more efficient, they been designed the same way that they are written in daily life activities. After taking a tour to alphabet and number sections, there is a

friendly drawing view, which users can easily practice what he/she have learned, and it leads them to be efficient in the Kurdish writing system.

4.2.2 Flash Cards

The second component part of the learning content module is the animated flash cards. Flash cards are an essential learning tool for both absolute beginners and young children. Because it does not need any thinking and writing procedure, it is just a fingertip process. We provide a swipe type of the flash card instead of flip one; it contains 58 flash cards, classified into 5 different categories:

- Animals
- Birds
- Food
- Fruit
- Places

Flash cards for absolute beginners and/or young children are intended to be active right brain side by turning the card at high speed. In addition, learners change the cards by themselves. By this way it becomes a suitable tool for learning language. This component draws learners' attention by showing many different images and their sound simultaneously. This can help them to learn better and continue in the learning process.

4.2.3 Conversation

The third part of our learning content module is a set of daily life conversations. Learners can learn daily life conversations and common phrases by this module. Users can change the Kurdish text and its translation in English easily by a switch. Moreover, we provide audio for each conversation in order to facilitate the learning process for this part, and users can easily pick them up. In addition, list of both Kurdish and English words are provided separately for each conversation, which helps learners to pick-up those words more easily along meaning for both Kurdish and English words.

4.2.4 Recorder

The fifth part of our learning content module is the recording module. This module is to record the learner's voice to compare his/her pronunciation with native speaker audios, which provided along with related component. Learners can start recording by touching the related button and finish recording by touching same button, and playback the recorded sound easily. This component enables learner to hear his/her voice while he/she reads Kurdish words and/or phrases, and compare it with the native speaker's reading. Hence it helps user to improve reading skills.

4.2.5 Games

Games are one of the crucial components in our multimedia learning system. Because it helps to facilitate learning process for learners. Our system has two simple games. Image quiz and the well-known hangman game. In image quiz, serial image-based quizzes are provided. Along images are associated with related sound in order to help in remembering in order to remember the word in its spoken and written form. The hangman game gives an arbitrary word with a particular length, (for instance a word consisting of 3, 4, 5 … letters). Then the player hypothetically selects letters that may complete the word. He/she has only 7 attempts to accomplish a particular word, if he/she fails in the seventh attempt, he/she will lose the game, and he/she must restart the game again.

4.2.6 Videos

Video tutorials are considered to be one of the well-known and effective methods in the learning process. It provides alive lecture about a particular topic, and it provides a class-like environment for the learner. We added several video lectures, which are explaining the Kurdish language in English by native speaker.

4.3 LEARNING STYLE INDEX

In this section we introduce the Learning Style Index (LSI) module in detailed explanation. Among the existing learning systems we chose Felder-Silverman model, with some enhancements. Felder-Silverman has a scale of four dimensions; processing, perception, input, and understanding. Each of these dimensions has their own

contrastive attributes. At the end we add the fifth dimension, which is realistic. See table 4.1.

LSI system consists of a total 55 questions, which are divided into five dimensions, and each dimension has 11 questions separately. It can classify leaners according to scale 5 dimensions; processing, perception, input, understanding, and realistic.

Table 4.1 Learning and teaching styles.

Learning Style		Teaching Style	
Process	Active	Student participation	Active
	Reflective		Passive
Perception	Sensing	Content	Concrete
	Intuitive		Abstract
Input	Visual	Presentation	Visual
	Verbal		Verbal
Understanding	Sequential	Understanding	Sequential
	Global		Global
Realistic	*Social*	Realistic	*Social*
	Emotional		*Emotional*

The LSI system computes the learning preferences of a learner on along any of the 5 dimensions.

- Strong preference
- Moderate preference
- Some preference
- Well balanced

4.3.1 LSI Score Calculation

As we explained before, each dimension in LSI has two attributes and the result for both of them together either is Strong or Moderate or Some preference for learner or Well balanced. The following example explains how the result of a particular dimension is calculated. Suppose that degree 1 is closest to active and 5 closest to reflective. If you choose 1 in this question, +1 point will be added to the attribute of active.

If you select 2, +0.75 will be added to the attribute of active and also +0.25 will be added to the attribute of reflective, whereas if you select 3, +0.5 will be added to both active and reflective. If you select 4, +0.25 will be added to active and +0.75 to reflective. And if you select 5, +1 will be added to the attribute of reflective. A result regarding learning preference in one dimension will be calculated by subtracting the total value given in reflective from that in active.

For instance, if you answer five questions with choices as “1”, “3”, “4”, “2”, “1” for the first to fifth questions respectively, then the result for active/reflective dimension is as follow.

Active = 1.0 + 0.5 + 0.25 + 0.75 + 1.0 = 3.5

Reflective = 0.0 + 0.5 + 0.75 + 0.25 + 0.0 = 1.5

Total = Active – Reflective = 2.0.

or **Total** = Reflective – Active = -2.0.

As we explain it in the following section, there is no any difference between a result with minus sign and plus sign, all does it matter is the output value itself. Hence first attribute – second equals to second attribute – first attribute.

4.3.2 Procedure for calculating the result

The maximum score that is possible to get is +11 whereas the minimum score is -11, because we have 11 questions for each dimension. If the score is between +11 and +7.5, or between -11 and -7.5, the result will be classified as strong preference. If the score is between +7.5 and +3.5, or between -7.5 and -3.5, the result will be classified as moderate preference. If the score is between +3.5 and +2, or between -3.5 and -2, the

result will be classified as some preference, and lastly, if the result is between +2.0 and -2.0, the result will be classified as well balanced preference.

The score for each dimension is calculated by the following equation.

$$i_{DIM} = \sum_{i=1}^{11} q_i^{DIM}$$

Where DIM = {A/R, S/I, V/V, S/G, and S/E} refers to each attribute of the five dimensions. (A/R for Active/Reflective, S/I for Sensing/Intuitive, V/V for Visual/Verbal, S/G for Sequential/Global, and S/E for Social/Emotional). The vector of indexes I = {} describes attributes in each dimension. Q = {} is the sum of questions belonging to each dimension, and each q_i indicates the contribution given by i-th question within the eleven questions for each DIM to detect preference. 1 or -1 is substituted into q_i. Results are divided into four groups (Strong, Moderate, Some, and Well balanced) preference as explained in above, and figure 4.4 demonstrates it clearly.

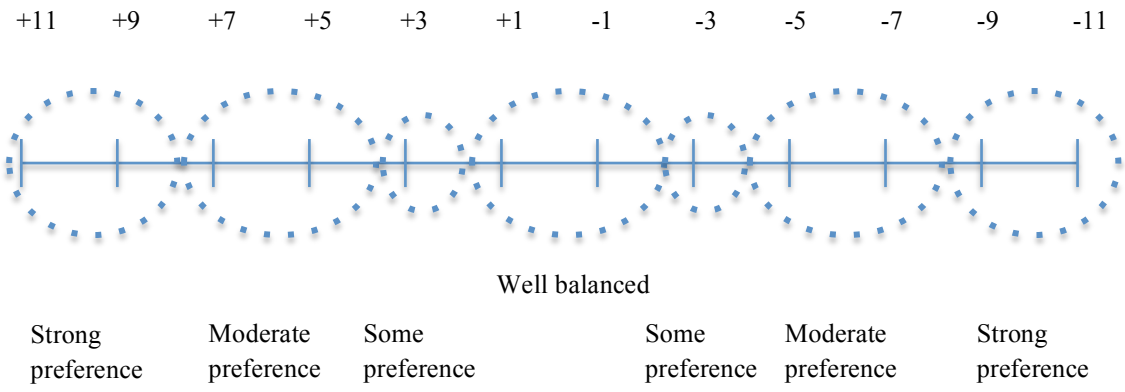

Figure 4.4 The LSI evaluation system.

Another enhancement in the traditional Felder-Silverman model is changing the answering style from a Boolean (yes/no) to a multi-choice style. Because sometimes users cannot make the right decision to select a Yes or No, when they have like five choices, it is much or easier to select the closet answer to the question. Hence it makes the whole system much more accurate than before.

4.3.3 LSI Dimensions

In this section more detailed information and explanations are given about the five dimensions.

a) Active/Reflective learners

Active learners understand and memorize better what they went through. They tend to retain and understand information best by doing something active. "Let's try it out and see how it works" is an active learner's phrase. Reflective learners understand better what they quietly think about it first. "Let's think it through first" is the reflective learner's phrase.

b) Sensory/Intuitive learners

Sensory learners tend to be interested in facts and solve the problem with well-established methods. It means that they dislike solving problem with complicated methods. In addition, they tend to be patient with details and good at memorizing facts and doing hands-on work. Intuitive learners tend to discover relationship to actual world and possibilities and be good at finding new concepts and understand abstract contents better. Besides, they can solve problem faster than sensory learners and often make mistakes.

c) Visual/Verbal learners

Visual learners are good at remembering what they see; pictures, graphs, charts, movies, and demonstrations. Verbal learners tend to understand information best by progressing verbal instruction or using words from instructor. In addition, if they talk with someone to study, they can understand more effectively. They prefer to study in a group.

d) Sequential/Global learners

Sequential learners prefer presentations that proceed step by step and are good at understanding the relationship to things they have already studied. They tend to solve problems logically and piece by piece. It means that they figure out things like heaping up books. Global learners tend to learn in large jumps, absorbing material almost randomly without seeing connections and the suddenly "getting it."

In sum, they understand many small parts and then suddenly they have a brainstorm and understand the big picture. Once they have grasped the big picture, they may be able to solve complex problems quickly or put things together in novel ways.

e) Social/Emotional learners

Social learners have a strong believe in a following the rules, and they have a strong sense of responsibility. Therefore others trust them. They do not hesitate to assume important roles, and they can also make a realistic decision on what they should do. Emotional learners behave in a straightforward manner. They do not hide their psycho physiological feelings when they talk to others. They show incredible power for something, which they are interested in. Emotional learners are very sensitive, due to such sensitivity; they understand others' feelings and are often affected by them.

4.3.4 Design and Implementation for LSI

Our LSI system has three modules; the first one is guest module where a user can find out what are the appropriate preferences. The second modules is student modules, students supposed to register first (if not register already) then log in to the system, the next step is to selecting which instructor and course then answering the whole 55 questions. If a student log in for the next time he/she will see his/her previous result, if satisfied with this result it is not needed to answer those questions again, unless he/she wants to make it for different instructor and/or course. The result shows up directly and meanwhile it will be stored in a web-server. The third module is instructor model, in which all students' name and their preferences for logged in instructor will show up, in another words a student's data will not be shown for other instructor, because before a particular student can be able to see his/her result he/she should fill out the instructor's text field. The last part of the system is administrator module, where an

administrator can see information about the instructors. The architecture of the LSI system is shown in the figure 4.5.

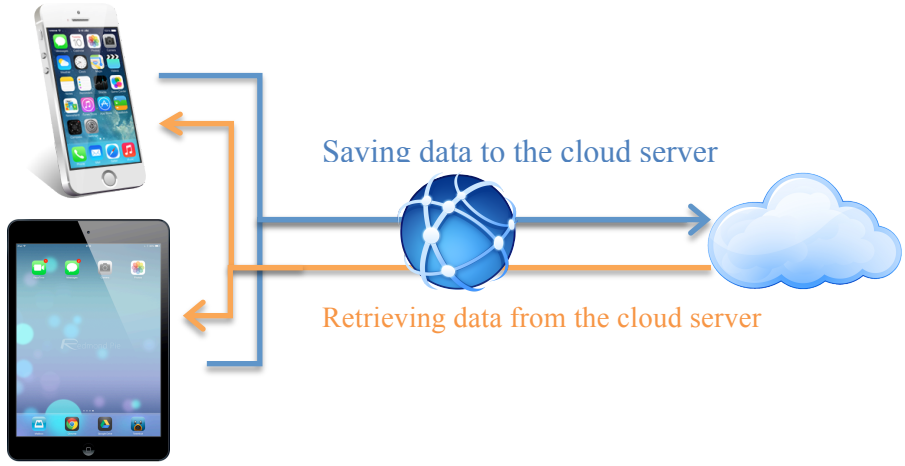

Figure 4.5 Configuration of our LSI.

The storyboard of our learning style index model is shown in figure 4.6, it contains several views, where each of them has its own functionalities.

Figure 4.6 The snapshot of our LSI model.

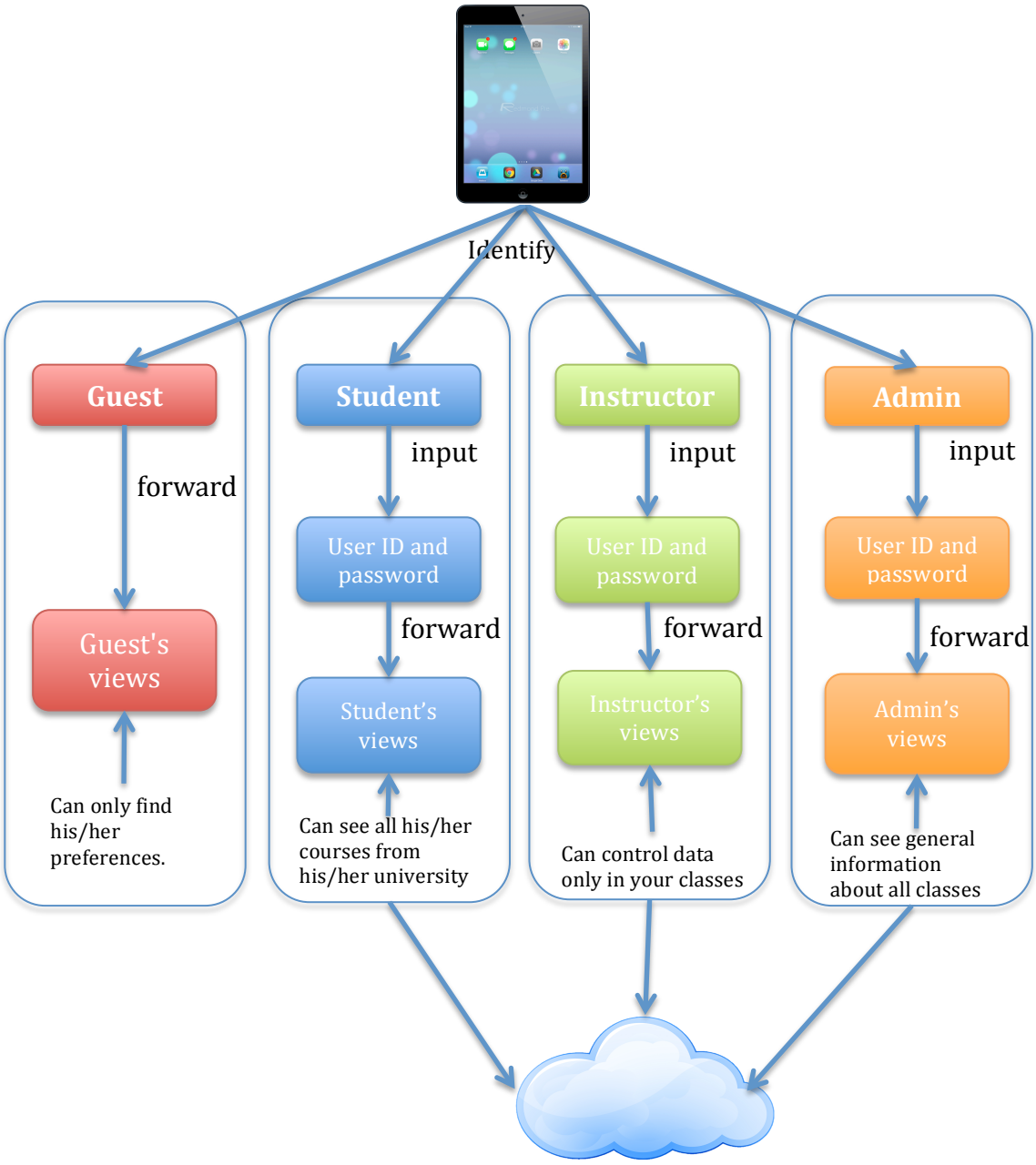

Figure 4.7 models configuration.

As in figure 4.7 is shown, general configuration for all four models (Guest, Student, Instructor and Admin) are explained. Except guest mode, the other needs to be registered in order to use the system, and none of the data will be saved in guest mode as well. Moreover the other modes has its own properties and functionalities, for instance in student mode, users are allowed to save their preferences into the cloud sever, and see every opened courses from his/her university. In the instructor mode an instructor can see his/her students' preferences and add/remove a particular course, once

an instructor wants to delete an already opened course every data which related to this course will be deleted in addition to the course addition, this process can not be redo.

Table 4.2 Users table of our system.

username ...	password ...	firstName String	secondName String	gender Str...	type String	email String	country String	phone String	uName String	age Number
am	(hidden)	Ahmed	Muhammed	Male	Instructor	am@am.com	Turkey	855588	Fatih University	35
s19	(hidden)	FirstName#19	SecondName#19	Male	Student	s19@student.com	Iraq	333	Fatih University	12
s18	(hidden)	FirstName#18	SecondName#18	Male	Student	s18@student.com	Iraq	455	Fatih University	10
s17	(hidden)	FirstName#17	SecondName#17	Female	Student	s17@student.com	Iraq	43222	Fatih University	33
s15	(hidden)	FirstName#15	SecondName#15	Female	Student	s15@student.com	Iraq	232	Fatih University	19
s16	(hidden)	FirstName#16	SecondName#16	Female	Student	s16@student.com	Iraq	4424	Fatih University	12
s20	(hidden)	FirstName#20	SecondName#20	Male	Student	s10@student.com	Iraq	382	Fatih University	10
s9	(hidden)	FirstName#9	SecondName#9	Female	Student	mn@mn.com	Japan	932	Aizu University	23
s12	(hidden)	FirstName#12	SecondName#12	Female	Student	op@op.com	Iraq	999	Fatih University	20
s10	(hidden)	FirstName#10	SecondName#10	Male	Student	new@new.com	Iraq	9090	Fatih University	21
s7	(hidden)	FirstName#7	SecondName#7	Male	Student	is@is.com	Japan	4543	Aizu University	29
s11	(hidden)	FirstName#11	SecondName#11	Male	Student	o@o.com	Iraq	908	Fatih University	22
hamada	(hidden)	Mohamed	Hamada	Male	Instructor	ar@ar.com	Japan	12	Aizu University	40
s3	(hidden)	FirstName#3	SecondName#3	Female	Student	sk@sk.com	Japan	98	Aizu University	19
s14	(hidden)	FirstName#14	SecondName#14	Female	Student	e@e.com	Iraq	444	Fatih University	20
s4	(hidden)	FirstName#4	SecondName#4	Male	Student	t@t.com	Japan	456	Aizu University	20
s5	(hidden)	FirstName#5	SecondName#5	Male	Student	i@i.com	Japan	4356	Aizu University	21
s13	(hidden)	FirstName#13	SecondName#13	Female	Student	aree2@aree2.com	Iraq	9332	Fatih University	19
s1	(hidden)	FirstName#1	SecondName#1	Male	Student	s1@s1.com	Japan	435	Aizu University	21
s2	(hidden)	FirstName#2	SecondName#2	Male	Student	s2@s2.com	Japan	252	Aizu University	19
s8	(hidden)	FirstName#8	SecondName#8	Male	Student	m@m.com	Japan	123	Aizu University	23
a	(hidden)	(undefined)	(undefined)	(undefined)	Admin	admin@admin.com	Iraq	0990	Fatih University	25
aree	(hidden)	Aree	Muhammed	Male	Instructor	aareeal@gmail.com	Iraq	5547	Fatih University	25
s	(hidden)	FirstName#0	SecondName#0	Male	Student	1@1.com	Iraq	90	Fatih University	23
s6	(hidden)	FirstName#6	SecondName#6	Female	Student	a@a.com	Japan	2563	Aizu University	22

The whole system consists of three primary tables, first table is user table which includes all users' information will be saved into this table, as table 4.2 shows list of sample users who use the system, additional information such as email, age, country, and etc. are provided that we created those account for testing the system.

Table 4.3 Main table of our system.

firstName String	secondName String	instructorName String	course String	uName String	feedbackField String	actRef String	snsIni String	visVrb String	seqGlb String	scoEmo String
FirstName#18	SecondName#18	aree	Computer Information	Fatih University	YES	ModerateActive	WellBalanced	WellBalanced	WellBalanced	ModerateSocial
FirstName#13	SecondName#13	aree	Computer Information	Fatih University	YES	ModerateReflective	SomeIntuitive	StrongVerbal	StrongGlobal	WellBalanced
FirstName#0	SecondName#0	ahmed	Web Programming	Fatih University	YES	SomeActive	WellBalanced	WellBalanced	WellBalanced	WellBalanced
FirstName#19	SecondName#19	aree	iOS Programming	Fatih University	YES	SomeActive	ModerateSensing	StrongVerbal	SomeGlobal	WellBalanced
FirstName#16	SecondName#16	aree	Image Processing	Fatih University	YES	SomeActive	WellBalanced	WellBalanced	WellBalanced	WellBalanced
FirstName#17	SecondName#17	aree	iOS Programming	Fatih University	YES	SomeReflective	WellBalanced	WellBalanced	WellBalanced	WellBalanced
FirstName#12	SecondName#12	aree	iOS Programming	Fatih University	YES	StrongActive	WellBalanced	WellBalanced	SomeSequential	ModerateEmoti...
FirstName#9	SecondName#9	hamada	Compiler Design	Aizu University	YES	ModerateActive	StrongSensing	ModerateVerbal	StrongGlobal	WellBalanced
FirstName#10	SecondName#10	aree	iOS Programming	Fatih University	YES	StrongActive	ModerateSensing	ModerateVerbal	ModerateGlobal	StrongEmotional
FirstName#8	SecondName#8	hamada	Compiler Design	Aizu University	YES	StrongReflective	ModerateIntuitive	StrongVisual	ModerateSequ...	StrongSocial
FirstName#7	SecondName#7	hamada	Compiler Design	Aizu University	YES	StrongActive	ModerateSensing	ModerateVisual	ModerateGlobal	StrongEmotional
FirstName#5	SecondName#5	hamada	Network Design	Aizu University	YES	WellBalanced	WellBalanced	ModerateVerbal	WellBalanced	WellBalanced
FirstName#6	SecondName#6	hamada	AI	Aizu University	YES	WellBalanced	WellBalanced	ModerateVerbal	WellBalanced	WellBalanced
FirstName#2	SecondName#2	hamada	AI	Aizu University	YES	ModerateActive	WellBalanced	WellBalanced	WellBalanced	WellBalanced
FirstName#1	SecondName#1	hamada	Compiler Design	Aizu University	YES	StrongActive	ModerateSensing	ModerateVerbal	WellBalanced	ModerateSocial
FirstName#11	SecondName#11	aree	Computer Information	Fatih University	NO	StrongReflective	WellBalanced	StrongVisual	ModerateGlobal	ModerateSocial
FirstName#0	SecondName#0	aree	Computer Information	Fatih University	NO	SomeActive	WellBalanced	WellBalanced	WellBalanced	WellBalanced
FirstName#20	SecondName#20	aree	iOS Programming	Fatih University	NO	SomeActive	ModerateSensing	StrongVerbal	SomeGlobal	ModerateSocial
FirstName#15	SecondName#15	aree	iOS Programming	Fatih University	NO	ModerateReflective	WellBalanced	WellBalanced	StrongGlobal	WellBalanced
FirstName#14	SecondName#14	aree	iOS Programming	Fatih University	NO	WellBalanced	WellBalanced	WellBalanced	WellBalanced	WellBalanced
FirstName#4	SecondName#4	hamada	Network Design	Aizu University	NO	ModerateActive	StrongSensing	ModerateVerbal	ModerateGlobal	StrongEmotional
FirstName#3	SecondName#3	hamada	AI	Aizu University	NO	ModerateReflective	WellBalanced	ModerateVerbal	ModerateSequ...	ModerateSocial

Second table is main table where every answer submission from students will be saved into this table as it is shown in table 4.3 and third table is course table where all courses will be saved into this table that when an instructor opens them, it shown in table 4.4

Table 4.4 Course table of our system.

firstName String	secondName String	iName String	uName String	courseName String	email String
Ahmed	Muhammed	ahmed	Fatih University	AI	ahmed@gmail.com
Ahmed	Muhammed	ahmed	Fatih University	Web Programming	ahmed@gmail.com
Aree	Muhammed	aree	Fatih University	Computer Information	aree@gmail.com
Aree	Muhammed	aree	Fatih University	iOS Programming	aree@gmail.com
Aree	Muhammed	aree	Fatih University	Image Processing	aree@gmail.com
Aree	Muhammed	aree	Fatih University	Computer Basics	aree@gmail.com
Aree	Muhammed	aree	Fatih University	My Computer Course	aree@gmail.com
Mohamed	Hamada	hamada	Aizu University	Pattern Recognition	(undefined)
Mohamed	Hamada	hamada	Aizu University	Graphic	(undefined)
Mohamed	Hamada	hamada	Aizu University	Network Design	(undefined)
Mohamed	Hamada	hamada	Aizu University	AI	(undefined)
Mohamed	Hamada	hamada	Aizu University	Compiler Design	(undefined)
Mohamed	Hamada	hamada	Aizu University	Computer Network	(undefined)

In order to make the system more active, email services are also added to both student and instructor modes. Since email field in the registration is obligatory, therefore every one will have own emails. Students can send an email to their instructor just by selecting the wanted instructor. On the other hand instructors has more ability in sending emails, they can send emails for individual student which means one by one, or sending emails to every student in a particular course.

In our implementation for Learning Style Index (LSI) we use tools like Xcode, Objective-C, Parse framework with its cloud web services, which is useful for saving/retrieving data. Table 4.6 indicates the objects that have been used.

Table 4.6 List of component for each mode.

Mode	Component Type
Guest Mode	Swipe Gesture
	Label
	Button
	Segment
	Text View
	Alert View
Student Mode	Swipe Gesture
	Long Press Gesture
	Label
	Button
	Segment
	Text View
	Table View
Instructor Mode	Long Press Gesture
	Label
	Button
	Segment
	Text View
	Text Field
	Table View

Parse has compatibility with almost all the wild world mobile platforms such as iOS, Android, etc. In another work it has SDK (Software Development Kit) for the most wildly used programming languages such as: iOS SDK, OS X SDK, Android SDK, JavaScript SDK to name a few.

Our system has three different mods like, guest mode, student mode, and finally instructor mode. Each of them has its own functionalities, for instance in the guest mode, an end-user can find out what are his/her preferences just by answering the questionnaires without any sing in or sign up, but the data will not be saved into our cloud server.

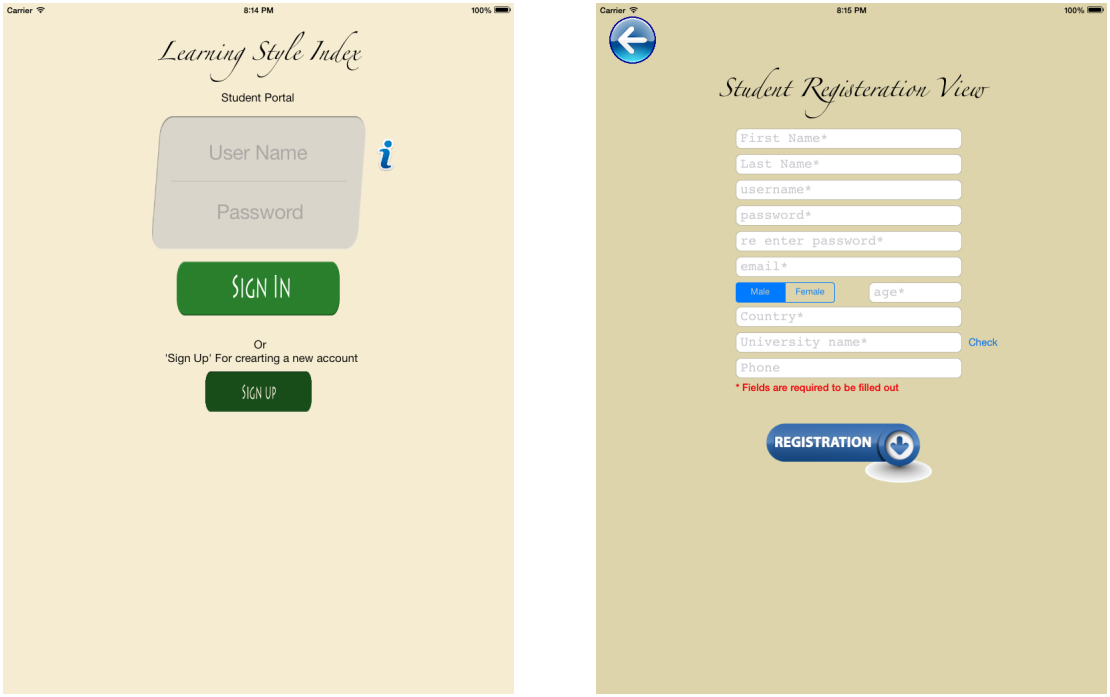

Figure 4.8 Sign in and sign up views for student mode.

In the student mode which has more additional features that the guest mode, users in this mode will be asked to register his/herself once as it is shown in the figure 4.8, in order to be able to sign in to the system. Automatically after login to the system, student will see every course from his/her university, which has opened by far.

There are two curial fields in the registrations form, one is username filed which is case sensitive, once small case is used, so username for login is also supposed to be small case. The second critical point is institute/university name for both student and instructor mode, if you fill this field with different name from the unique name of your institute/university neither instructor sees his/her student from his/her

institute/university nor student sees his/her instructors' courses as it supposed to, because they use different name for institute/university from the official (standard) one, for trying to avoid this issue we put a checker, it returns a list with all university that already someone registered with.

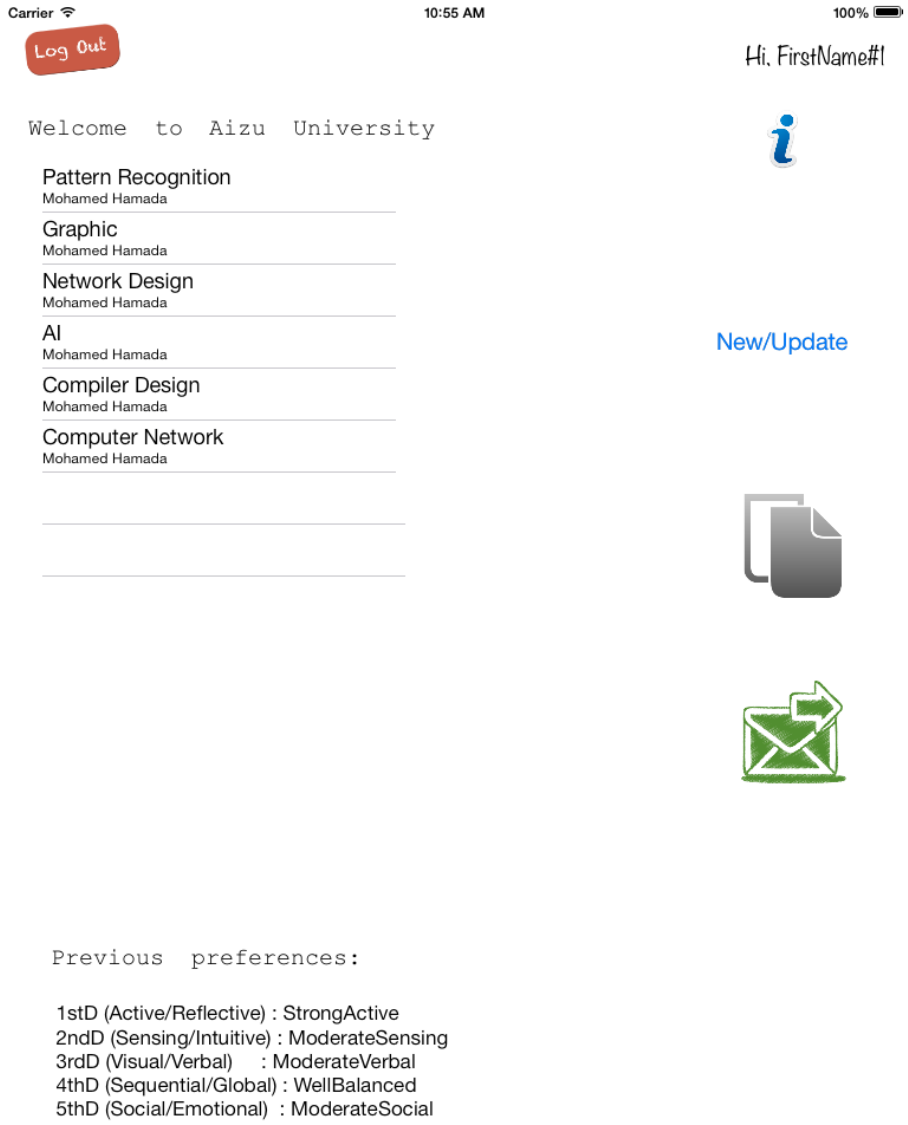

Figure 4.9 First view of student's account.

As it is shown in the figure 4.9, first thing that is show is student's institute/university name; the next indication is list of courses that already opened from instructors in that institute/university. The system is written in the way when a student wants to be register "institute/university" field is one of the requirements. Plus none of the courses will be shown in this list, which are opened by some other instructors from other institutes/universities.

At the button of the view student's current preferences are displayed, this label will keep the latest updated version of student's preferences and it always shown right away when a student sign in into his/her account, unless the account is open for the first time or not submission for none of the courses

When student wants to answers the questionnaire for a particular course should go to its view by tapping on New/Update then answer the 55 questions, when he/she wants to submit it to another course. Once he/she submits his/her answer it will be saved into a could on the Parse side, and anytime that he/she wants to submit his/her preferences to other courses, it does not need to go thought the questionnaire part for the second time unless he/she wants to update the preference. When it is updated for any course, the system will update every course, which is related to that student, the questionnaire view for student mode is shown in the figure 4.10.

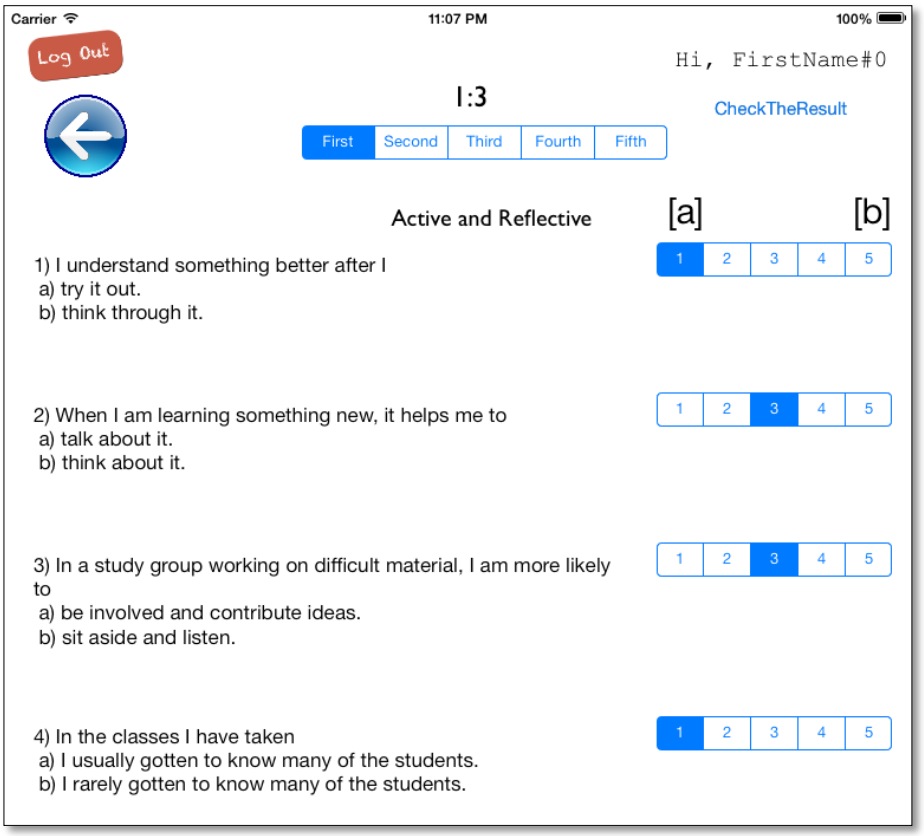

Figure 4.10 The questionnaire view for student mode.

It is almost impossible to have 55 questions in a single view, even in iPad view. Therefore we take advantages from swipe (left and right) gesture and UISegment to go through questions one dimension and go through the dimensions respectively.

The last mode is instructor mode, which has more features. As student mode instructors should register before use this system. Once an instructor login to the system, he/she will see list of his/her courses that already opened (this list will be blank when the instructor logs in).

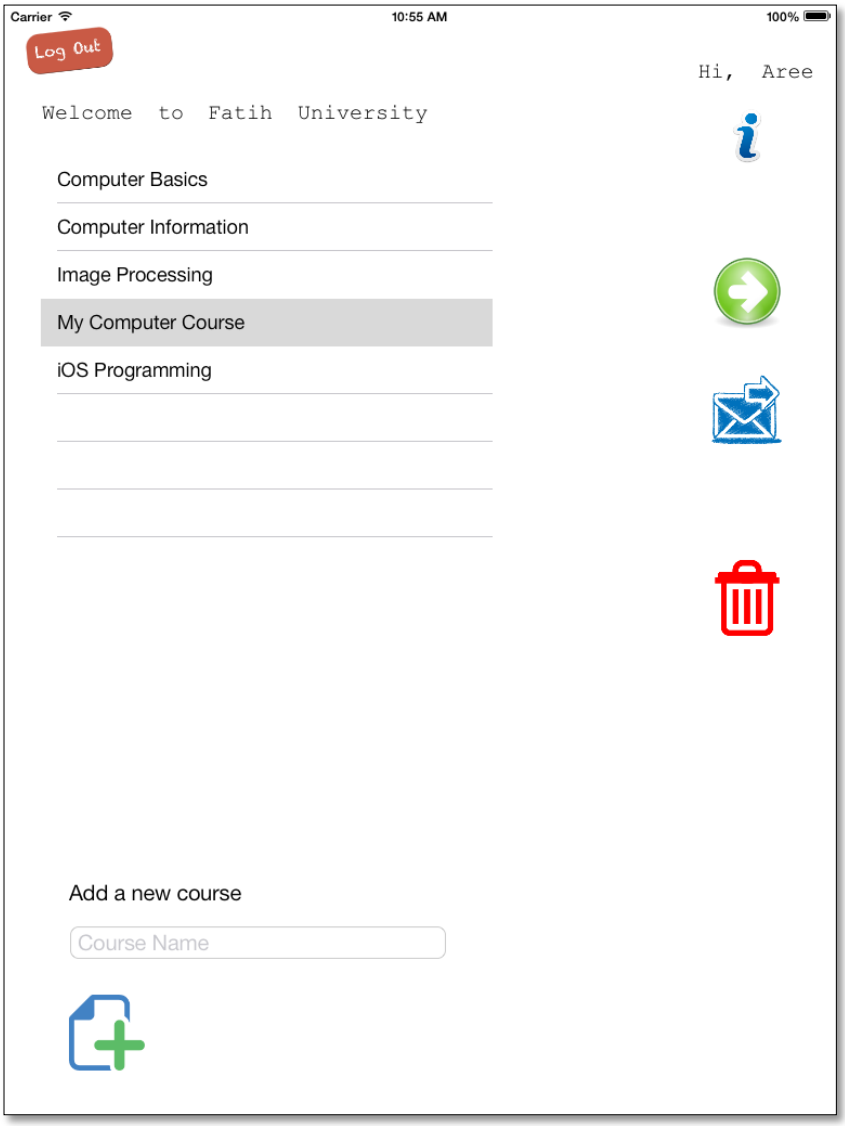

Figure 4.11 Courses view in the instructor mode.

As it is shown in the figure 4.11 list of opened courses is displayed, if the instructor wants to open a new course, will be an easy process it just needs name of the course should write in the "Add a new course" text field, and tap on the "add" button. It checks whether this course is already exist, if it is a warning message will appear that

explains that this course is already exist, if it is not it will be added to the list of course, and the table course reloads and the new course's name will appear instantly.

Another process is deletion, which lets instructors to delete their course(s) just by selecting the wanted course the tap on "delete" button, a confirmation will come, and asks whether you want to delete this course or just cancel the process, it is curial because once you delete a particular course there is no way to undo the deletion process. An important point about the deletion process in the instructor mode is, when instructor deletes a course, the whole data related to this course will be deleted in the background, every student records that they submit their answers to that course.

The last and the most indication is going to "Go" button, instructor can see all records, and statistics and any course that he/she already opened and his/her students submit their answers to that course. It needs a selection of course in the list then tap on the "Go" button. If no student submits hi/her answers to this course, features that held in the next view will be disabled, unless students submit their answers even once.

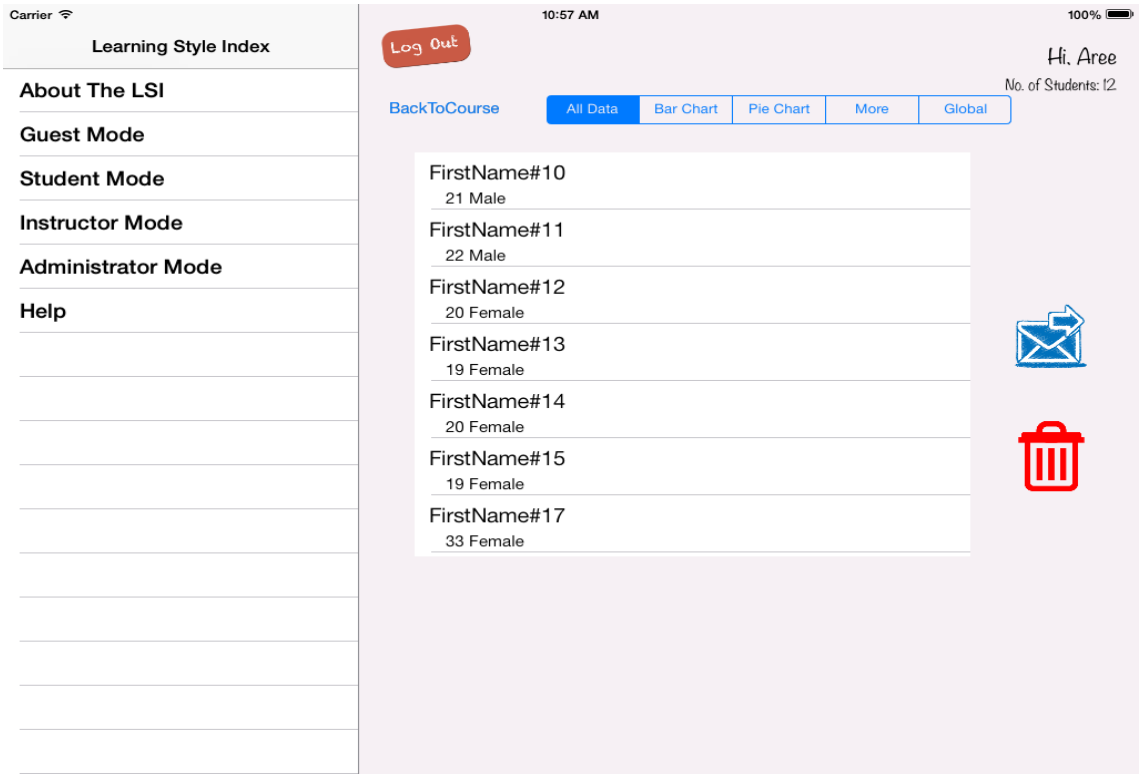

Figure 4.12 List of students who submitted their answers to this course.

As in the figure 4.12 is shown the first feature is under the "All Data" segment, it lists all students name that already submit their answers to this course. And if you want

to see their preferences one by one, just select a name then his/her preference will appear at the bottom of the view. Also the deletion is available in here as well. If you want to delete a particular student, just select his/her name then tap on “delete” button.

The next feature is “Bar Chart” which illustrates the data in the bar char. There are seven bars for “Strong, Moderate, Some, Well-balanced, Some Moderate Strong” for each dimension of LSI system. Bars are touchable when you touch on a particular bar; a customized view comes which indicates the number of students that have this answer plus the percentage of total students number. The process is same for all 5 dimensions.

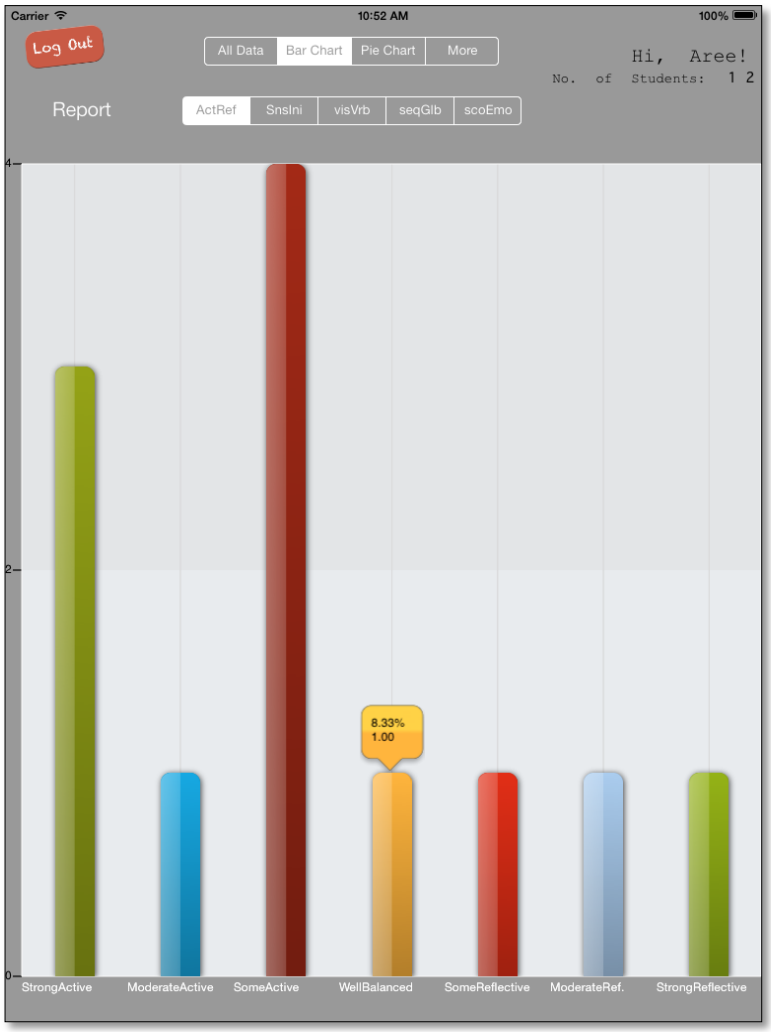

Figure 4.13 Bar chart explanation.

The last expiation is “Report” button, which tells the average result for this course whether it is Strong, Moderate, Some, or Well-balanced for all 5 dimensions, those features are shown in figure 4.13.

To more indication we add pie chart as well as bar chart, as it is shown figure 4.14 illustrates all data for the selected course dimension by dimension.

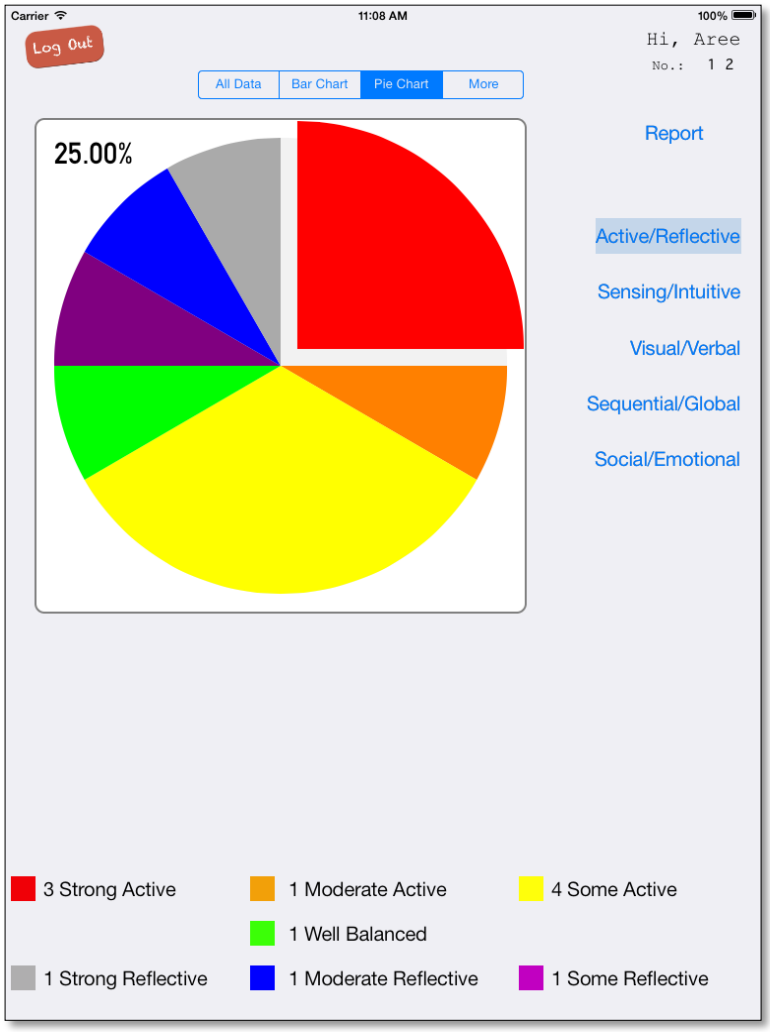

Figure 4.14 Pie chart explanation.

In addition to this illustration there is gender and age explanation figure 4.15, which shows average result in two kinds of classifications. First one is gender classification, which helps the instructor to find the average result for both Male/Female genders in a particular class separately. Moreover the second classification if age classification, which instructor can see the average result for a particular class.

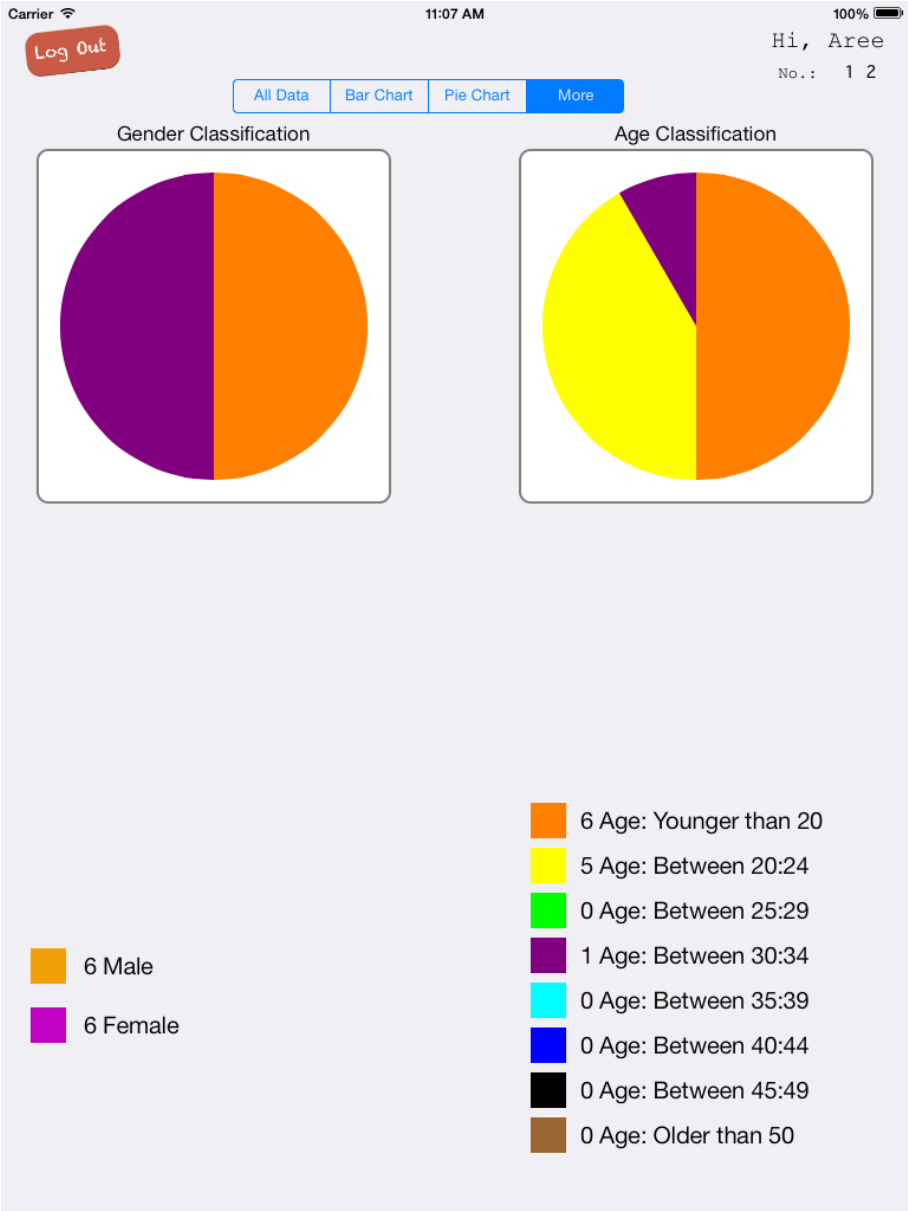

Figure 4.15 Gender and age classifications.

Every part is touchable and their related final reports show up, which clearly tell the average result for a particular class, and they help instructor to choose materials and learning methods that proper for those preferences.

As the last feature for instructor mode, which contains a global statistics, it indicates preferences from all five dimensions in a single chart for a particular course;

instructor can easily see proper preferences and find a better way of leaning and materials for that particular course as it is shown in figure 4.16.

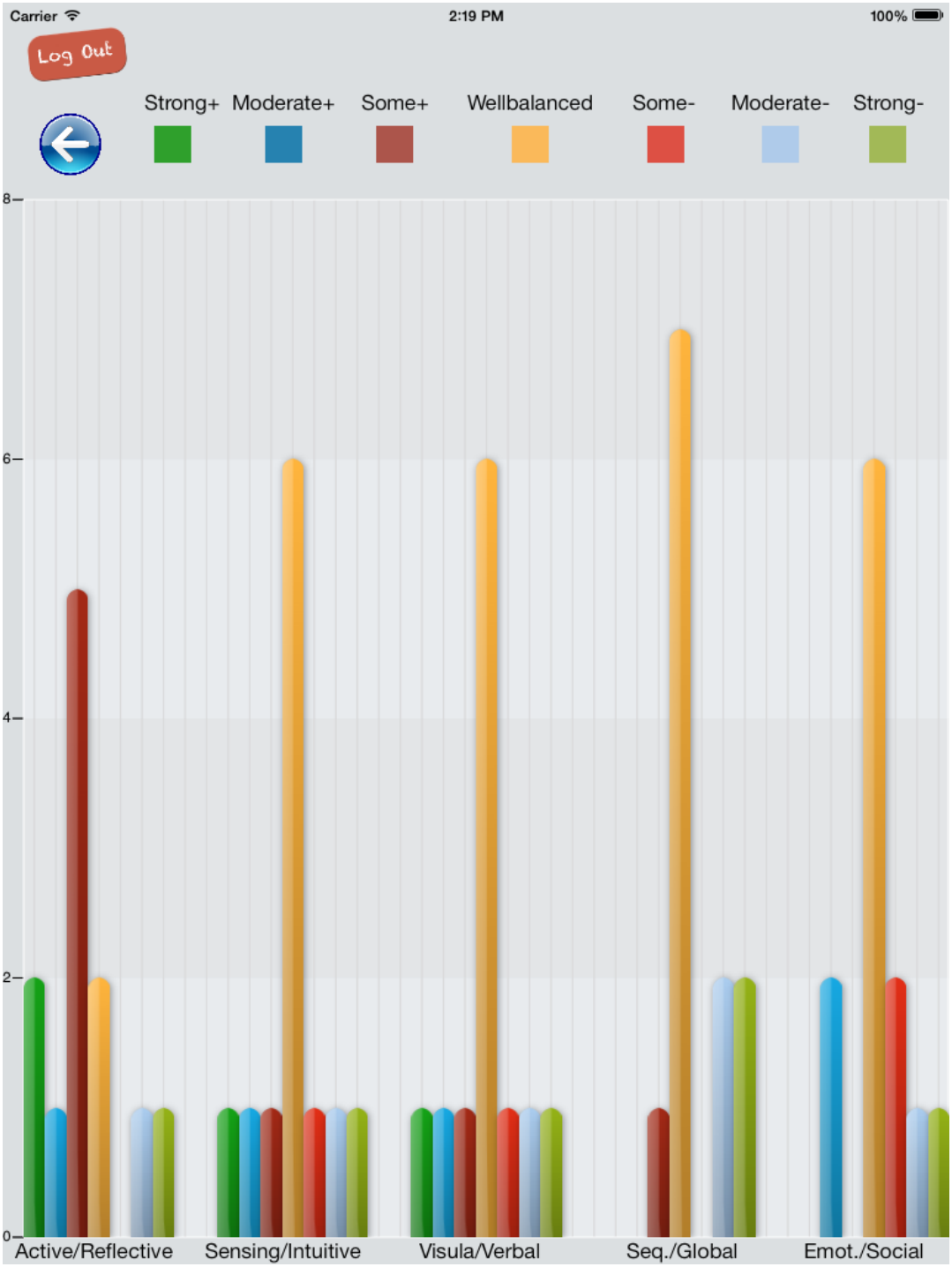

Figure 4.16 Shows the global statists.

Finally, in the instructor mode several statistics and indications are shown. For instance total number of student the currently use the system or at least register to it, in addition to that number of instructors and their names are shown as well as countries that students and/or instructors are come from. Moreover, as a feedback for the system we calculated the result of answering for system reliability, which means how far the preferences that a user gets fits him/her, it helps us to improve the system generally, administration mode is shown in the figure 4.17.

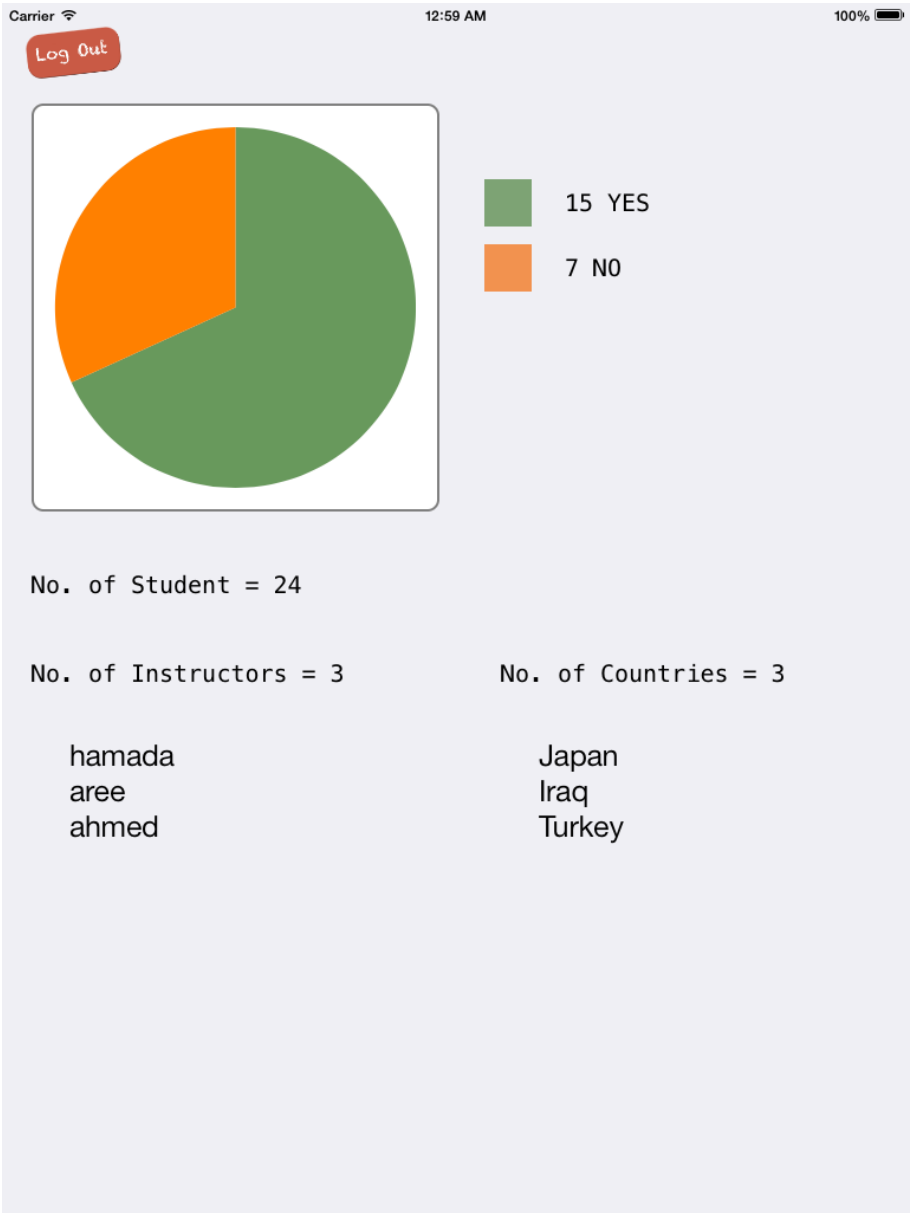

Figure 4.17 Administration Mode.

4.4 FACIAL RECOGNITION SYSTEM

This module is a support method but very important, because it makes the learning system more rich and attractive to users. The ultimate goal of our system is to introduce a smart learning system that makes use of the landmark modularity of smart devices such as iPhone & iPad. We try to make advantage of the front camera of the iPhon and/or iPad. Based on this recognition the system can provide appropriate advice and/or recommendation to the learner.

Our facial recognition system works on the background, so it does not disturb the learning process in any way. This module is epoch-making module compare with other learning systems. By the facial recognition module learners and the whole system can communicate smartly and naturally.

4.4.1 Facial Recognition Algorithm

OpenCV is an open source library in vision computer. One of its usefulness is to recognize humans' facial status such as (Smile (Happy), Sadness, Temper, etc.). By using Haar-like features. Each Haar-like feature consists of two or three jointed "black" and "white" rectangles of the following flaws, as it is shown in figure 4.18.

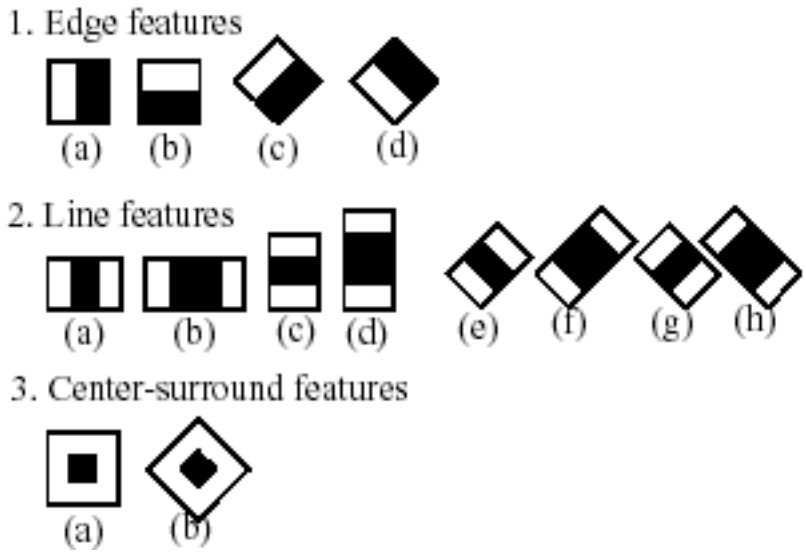

Figure 4.18 A set of basic and extended Haar-like features.

The value of a Haar-like feature is the difference between sums of gray level pixels within the black and white rectangular regions of the following below module.

$$f(x) = Sum_{black\ rectangle} - Sum_{white\ rectangle}\ (Pixel\ gray\ level)$$

In OpenCV, a classifier (working with Haar-like feature) is trained with a few hundred sample views of a particular subjects. A classifier is trained; it can be applied to a region of interest in an input image. The resultant classifier consists of several simpler stages that are applied subsequently to a region of interest until some stage candidate is rejected or all the stages are passed (OpenCV, 2014, Mitsui, 2014).

CHAPTER 5

CONCLUSION

5.1 CONCLUSION

Overall, mobile research is rapidly growing, expanding, and improving. However, there is limited research on designing and developing as comprehensive system for learning language, which based on combing most of the possible components, like facial recognition, and LSI with a particular multimedia learning system. Combing all those aspects makes the system to be more sophisticated, and intelligent before. As we have reached a further distance and obtained a better achievement, by design a combine those elements.

5.2 FUTURE WORKS

There are so much works left to be done, in order to make a learning system to be more intelligent. Such as adding voice recognition, and developing some other facial statuses. One of the works that we consider it to be done in a future works is developing voice recognition. In order to be illustrated this topic; the voice recognition may work in both learning part and practice part. Moreover practice part user dose not supposed to select an option among options by taping or any old fashion ways for selection. All he/she should do is saying the right answer; the system will treat that speech as an input and analyses it, if it is belong to correct answer, and the rest of the procedures will be continuing as in old fashion ways are, as adding points when it is a correct answer, losing points when it is not, and so forth. The second our consideration will go to developing more facial statuses such as angry, temper, and so on.

There will some improvements for the learning style index, such as providing an online chanting not just emailing service. By this feature users of our system can be able to chat with anyone who is online, and sharing data, screenshots, and etc.

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APPENDIX

First Dimension Active and Reflective

Question 1) I understand something better after I

a) try it out.
b) think through it.

Question 2) When I am learning something new, it helps me to

a) talk about it.
b) think about it.

Question 3) In a study group working on difficult material, I am more likely to

a) be involved and contribute ideas.
b) sit aside and listen.

Question 4) In the classes I have taken

a) I usually gotten to know many of the students.
b) I rarely gotten to know many of the students.

Question 5) When I start a homework problem, I am more likely to

a) start working on the solution immediately.
b) try to fully understand the problem first.

Question 6) I prefer to study

a) in a study group.
b) alone.

Question 7) I would rather first

a) try things out.
b) think about how I'm going to do it.

Question 8) I more easily remember

a) something I have done.
b) something I have thought a lot about.

Question 9) When I have to work on a group project, I first want to

a) have “group brainstorming” where everyone contributes ideas.
b) brainstorm individually and then come together as a group to compare idea

Question 10) I'm more likely to be considered.

a) outgoing.
b) reserved

Question 11) The idea of doing homework in groups, with one grade for the entire group,

a) appeals to me.
b) does not appeal to me.

Second Dimension Sensing and Intuitive

Question 12) would rather be considered

a) realistic.
b) innovative.

Question 13) If I were a teacher, I would rather teach a course

a) that deals with facts and real life situations.
b) that deals with ideas and theories.

Question 14) I find it easier

a) to learn facts.
b) to learn concepts.

Question 15) In reading nonfiction, I prefer

a) coming across something that teaches me new facts or tells me how to do something.
b) something that gives me new ideas to think about.

Question 16) I prefer the idea of

a) certainty.
b) theory.

Question 17) I am more likely to be considered

a) careful about the details of my work.
b) creative about how to do my work.

Question 18) When I am reading for enjoyment, I like writers to

a) clearly say what they mean.
b) say things in creative, interesting ways.

Question 19) When I have to perform a task, I prefer to

a) master one way of doing it.
b) come up with new ways of doing it.

Question 20) I consider it higher praise to call someone

a) sensible.
b) imaginative.

Question 21) I prefer courses that emphasize

a) concrete material (facts, data).
b) abstract material (concepts, theories).

Question 22) When I am doing long calculations,

a) I tend to repeat all my steps and check my work carefully.
b) I find checking my work tiresome and have to force myself to do it.

Third Dimension Visual and Verbal

Question 23) When I think about what I did yesterday, I am most likely to get

a) a picture.
b) words.

Question 24) I prefer to get new information in

a) pictures, diagrams, graphs, or maps.
b) written or verbal information.

Question 25) In a book with lots of pictures and charts, I prefer to

a) look over the pictures and charts carefully.
b) focus on the written text.

Question 26) I like teachers

a) who draw a lot of diagrams on the board.
b) who spend a lot of time explaining.

Question 27) I remember best

a) what I see.
b) what I hear.

Question 28) When I get directions to a new place, I prefer

a) a map.
b) written instructions.

Question 29) When I see a diagram or sketch in class, I am most likely to remember

a) the picture.
b) what the instructor said about it.

Question 30) When someone is showing me data, I prefer

a) charts or graphs.
b) text summarizing the results.

Question 31) When I meet people at a party, I am more likely to remember

a) what they looked like.
b) what they said about themselves.

Question 32) For entertainment, I would rather

a) watch television.
b) read a book.

Question 33) I tend to picture places I have been

a) easily and fairly accurately.
b) with difficulty and without much detail.

Fourth Dimension Sequential and Global

Question 34) I tend to

a) understand details of a subject but may be fuzzy about its overall structure.
b) understand the overall structure but may be fuzzy about detail.

Question 35) Once I understand

a) all the parts, I understand the whole thing
b) the whole thing; I see how the parts fit.

Question 36) When I solve math problems

a) I usually work my way to the solutions one step at a time.
b) I often just see the solutions but then have to struggle to figure out the steps to get to them.

Question 37) When I'm analyzing a story or a novel

a) I think of the incidents and try to put them together to figure out the themes.
b) I try to know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.

Question 38) It is more important to me that an instructor should

a) lay out the material in clear sequential steps.
b) give me an overall picture and relate the material to other subjects.

Question 39) I learn

a) at a fairly regular pace. If I study hard, I'll get it.
b) in fits and starts. I'll be totally confused and then suddenly it all clicks.

Question 40) When considering a body of information, I prefer to

a) focus on details and miss the big picture.
b) try to understand the big picture before getting into the details.

Question 41) When writing a paper, I am more likely to

a) work on (think about or write) the beginning of the paper and progress forward.
b) work on (think about or write) different parts of the paper and then order them.

Question 42) When I am learning a new subject, I prefer to

a) stay focused on that subject, learning as much about it as I can.
b) try to make connections between that subject and related subjects.

Question 43) Some teachers start their lectures with an outline of what they will cover. Such outlines are

a) somewhat helpful to me.
b) very helpful to me.

Question 44) When solving problems in a group, I would be more likely to

a) think of the steps in the solution process.
b) think of possible consequences or applications of the solution in a wide range of areas.

Fifth Dimension Social and Emotional

Question 45) When I study in a group/team,

a) I like to lead other members.
b) I like to follow other members.

Question 46) When I feel my colleague is wrong,

a) I can point it out
b) I can't point it out.

Question 47) When I set my goal,

a) I decide it based on others' opinions and my experience.
b) I change my goal depending on my feelings at that time.

Question 48) When I make a presentation or express my opinions at a conference/meeting in front of many audience,

a) I keep calm and clearly express any opinion/presentation verbally.
b) I feel nervous and my emotions are clear on my face and try to use gestures and other body languages.

Question 49) When I face a serious situation stemming from my mistake,

a) I try to find what to do and take an immediate action.
b) I keep thinking about my unluckiness for a long time.

Question 50) After I have decided my schedule,

a) I feel obliged to carry out everything according to the schedule.
b) I often change it depending on my mood and do something different.

Question 51) When someone tells me an opinion,

a) I consider whether the opinion is right and makes sense.
b) I am influenced by the opinion.

Question 52) When I start something new,

a) I can do it systematically.
b) I get excited at the idea in the beginning, but I soon get bored with it.

Question 53) When something didn't go well,

a) I also continue making my effort to complete it.
b) I immediately feel like giving off.

Question 54) When I'm given an interesting assignment,

a) before working it on, I carefully think of its feasibility.
b) I immediately work and devote myself to it.

Question 55) When I study more than one subject,

a) I study them systematically taking into account my schedule.
b) I study interesting subjects when I am in the mood for studying.