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DATA ACCESS LAYER DEVELOPMENT FOR INTEROPERABLE GIS SOLUTIONS USING NHIBERNATE MAPPER

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DEDICATION

A huge appreciation to almighty god for supporting me in finishing my thesis. The one who gave me gave me everything I wish for, and was my main inspiring to get to the top. And a big thanks to my dad who I ask god to give him a long healthy life who supported me in everything that he possibly can. He was my main inspiring in this life and my first school. And also a big thanks to my mother who cared about me in anything and from everything. And she always wished me the best. She was just like home to me. And to my brothers and sisters who supported me in everything in my life. And also I give my appreciation to Asst. Prof. Dr. Sefer Kurnaz who was my light in the darkness and was library of knowledge and my support in information. And to all the professors and teachers in computer and electronics engineering department. And to everyone who believed in me and my ability in doing this thesis.

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ABSTRACT

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In this study the NHibernate Mapper is presented, which is a tool for database mapping, which can automatically transverse the schema and database library in order to provide correspondence suggestions and match the database provided by this NHibernate Object mapper framework. Suggested mapping can be accepted or rejected by means of the GUI, which can also manually define the mapping as final. NHibernate can offer great support for GIS solutions due to their ability to support the development of data access layers through the database schema analysis enabled for DBM. The NHibernate mapper is able to enable the development of quick data access layout, in particular with the GIS solution generated Domain Class library.

Keywords: MVC, NHibernate, Database relationships, Scheme, GIS, permission.

ÖZET

NHIBERNATE MAPPER KULLANILAN GİRİŞİMCİLİK CBS ÇÖZÜMLERİ İÇİN VERİ ERİŞİM KATMANIN GELİŞTİRİLMESİ

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Bu çalışmada, yazışma önerileri sağlamak ve bu NHibernate Nesne eşleştiricisi çerçevesi tarafından sağlanan veritabanını eşleştirmek için otomatik olarak şema ve veritabanı kitaplığını geçebilen bir veritabanı eşleştirme aracı olan NHibernate Eşleştiricisi sunulmuştur. Önerilen haritalama, haritalamayı el ile nihai olarak da tanımlayabilen GUI aracılığıyla kabul edilebilir veya reddedilebilir. NHibernate, DBM için etkinleştirilmiş veritabanı şeması analizi yoluyla veri erişim katmanlarının geliştirilmesini destekleme yeteneklerinden dolayı GIS çözümleri için büyük destek sağlayabilir. NHibernate eşleştiricisi, özellikle GIS çözümü tarafından üretilen Etki Alanı Sınıfı kütüphanesi ile hızlı veri erişim düzeninin geliştirilmesine olanak sağlar.

Anahtar kelimeleri: MVC, NHibernate, Veri tabanı ilişkileri, Düzen, GIS, izin.

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1. INTRODUCTION

GIS is a geographical information system, often called a computerized data base management system used to store, retrieve, analyze and display spatial data. GIS stands for geographic information systems. All information that contains a local road address, a zip code, a census of tracts or longitude and latitude is considered spatial. Various data types can be incorporated in the GIS and shown as a map layer. Spatial patterns and relationships develop often when layers are developed on each other. In the spatial statistics and/or question reply maps, GIS is the most commonly used product (Cartographers Modeling Laboratory 2004).

GIS integrated software, hardware and data may collect, manage, analyze and display information on the basis of geographical reference data. In the form of maps, globes, reports, and charts which mirror relationships, patterns or trends, visualization, understanding, questioning and interpretation of GIS data through the Internet is made possible in different ways. All this information can be shared easily and quickly. In many corporate Information Systems, such as government, universities, companies, etc. can also use GIS technology. Various users can use GIS to meet their unique needs. In case of GIS analysis and decision-making, for instance, certain customers want to view special objects based on the geographic location while others may use GIS for emergency rescue and natural hazards. GIS may be used by governments and certain organisations.

GIS is now widely used and is changing the world we see and overcoming obstacles. GIS is used in large numbers. Countries set up their own SDI and share geospatial information globally [4]. SDI is being developed by the countries. Nationally and globally, certain information - sharing standards were developed, making GIS data compatible and interoperable. This interoperability enables user experience and information sharing. GIS is beneficial today by improving the maintenance of the specified geo-area, taking decisions on the location of the real-site and selecting a route, removing natural resources and evacuation planning, for example, cost savings and efficiencies. A household building with a longitudinal and a latitute geography is, for instance, one item for repository administration (34 ° 54' latitude north, 118 ° 34' longitude east). We assume

that objects possess geographical and contextual characteristics. The locations where the resources lie can also be defined, and relevant volumes and densities can also be recorded. We can analyze context and make beneficial decisions with context attributes. When we look at GIS, we can identify patterns and trends of objects to make better decisions over a period of time.

Special places where geographical characteristics, such as maps, roads, buildings, rivers and parks, are defined are the spatial objects (SObj-s). These attributes can be used for object analysis. For defining a spatial object, certain proper Grenularity characteristics, for instance geographical reference, object owners, object expansion, object context and levels, must be provided. The GIS SObj-s is spread across a network of various informative resources that provide a comprehensive information service and make it easier to decide, as the GIS requirements are extremely comprehensive, and are particularly comprehensive and need to be outsourced and shared [1]. The information provider should be taken into account and information security should be taken into account with regard to the provision of information from SObj. We must give people who can read, write, modify or remove information a role and permission in this respect. Users with authorisation to read, zoom in or out, write, modify and delete sensitive and confidential data must also be permitted to use them. You can therefore get much more reliable information and choose valuable information more effectively. In several past contexts such as economic contexts, quality contexts or usage contexts, and government contexts, dates are classified as repositories of SObjs management and for providing contexts - based information for analysis. In the meantime, information from geography and demographics should be available and available in any context, as this information is generally used widely.

However, security issues are becoming increasingly critical when GIT is developed, particularly with regards to military, security, email, electricity, the digital cities and privacy, and other applications, including government and city intelligence [13]. Security problems are becoming increasingly important. GIS threats to safety have recently been mainly caused by wavesdropping, unlawful access, sniffing, masking, the brutal attack and domestic attack. Three general measures have been taken to tackle these threats: spatial access control, security of spatial transmission and

repository security for spatial information. Many investigations into the three measures are carried out, but no integrated security technology system ensures GIS security and satisfies the overall and systemic GIS application requirements.

The right of users to access a particular SObj must be monitored for user identification (roles and permissions) so that the confidentiality and sensitivity of GIS SObj-s are protected. Indeed, people can access various data in terms of granularity, with different identifications. Users can access SObj information in a hierarchic fashion on a vertical level, for example in the region, the town and the city. On the horizontal levels, because of the sensitivity and the confidentiality of SObj, users can only access SObj's or some of its attributes. Common users can see, for example, only the geographical reference and extensions at the same level, but building managers can see and modify the tax data of the people mentioned in the building in order to read the owners ' names and government workers ' names. Based on its roles and data protection allowances in selective access modes, users can access SObj-s in various details and enhance security of the GIS.

There has been a lot of research to discuss the safety of GIS. We examine this research for the first time in the thesis. We then define GIS safety model users, roles and relationships. In the model, various users can access SObj – s, usually to analyze data for business decisions, for a variety of purposes. For GIS SObj-s users must be defined, in operating modes, for example read, zoom in, write, modify, and delete. We also expect that license issuers have established and assigned roles and permissions to various users on request. The user may operate in vertical hierarchy and in horizontal granularity on the GIS SObj - s under those roles and permissions.

The International Standard Organization considers unified modeling language insert a software - intensive system modeling industry standard. In order to understand GIS safety problems, UML is used to specify security. Structure and components within SObj-s will be shown using class diagrams. In accordance with GIS, GIS UX and GIS diagrams and sequence graphs, structures and procedures for GIS systems and safety standards are modeled. GIS should provide all the required information resources to users in a secure and efficient manner. GIS requires that various attacks and intruders are not prohibited, but that security of information be maintained and retrieved when

it is attacked or intruded. In addition, if users access information with roles and permission, GIS shall ensure the secrecy of the various components.

This thesis aims to develop a role - based safety model for Nhibernate. After reviewing the status of the investigations and UML role specifications, user access and control requirements are advisable. In relation to context analysis, we also outline how the SObj repository should be managed. We also introduce a function for security access which allows users to access more specific spatial objects, selecting a certain area and filtering the context required. Finally, there is discussion of the application and specification of the permit model in a secure GIS architecture.

In order to store information in the database, most advanced systems use their confidence and standardized query language. Object–Java, C #and C++ programming –orientated languages are the most common languages in system programming. This is because the paradigm-oriented object and relationship databases are founded on a different basis in different specific differences: their implementation and association. In order to address the problem, the mapping tools for objects (OBD) have been designed. theme of these tools is "the object," which means the relationship impedance "mismatch" theory. The most successful representatives of ORM instruments are NHibernate, Oracle TopLink and a newly developed Microsoft Entiy Framework (EF). On the basis of the Agile software and the database development technique, the ORM tools produce automatic database access layers. Developers of applications are invited to consider data layer objects and connections to these tools. The ORM controls the handling with time of objects and relationships. During committing it tracks and places, updates and automatically deletes the required SQL statements.

NHibernate is an all-embracing and stable open source framework. It is also suitable for or for Java. It is possible to find NHibernate in the environment of. NET or Java. There are only a few commercial tools available to map existing object models from existing databases and map files. This is important in trying to make the legacy database systems standard domain knowledge. These three constituents are sufficient to produce a complete NHibernate data access layer.

The main purpose is to create the NHibernate ORM framework for objects – to– database mapping specifications. The correspondence between the GIS solution model and the database can be automatically determined semi - detailed. Corresponding attributes and columns of the database are established. The tool has a visual foreground, which shows the mapping of Levenshtein distance by heuristic data type. These suggestions have to be tapped by the user interaction to define final mapping definitions. The XML - based mapping file is also created using defined mapping definitions.

2. LITERETURE REVIEW

GIS safety is an important and comprehensive issue. The current focus of GIS Security Research is mainly on the administration, sharing and transmission of spatial data, and user access controls.

The paper discusses a role-based access control standard [2]. It provided a Nibernate standard model which would serve to establish new standards for the solution, combining ideas from Nhibernate past models, business products, and research prototypes, of the problems of uncertainty and confusion in the future. Although Nhibernate is often seen as a single access control and licensing model, it contains several models that are suitable for a specific application for security management. Nhibernate is a single model of access control and permission. This model is organized in four levels, called flat RCC, hierarchical RCC, restricted Nhibernate and systemic Nhibernate, which are increasing functional capabilities.

The approval model that suggested by [3] allows users to securely inspect and analyze spatial data according to user roles and classification model of data security. Users receive vertical permission in a single layer to access specifically authorized information in various layers and context permission. Choosing useful data and making decisions based on context analysis is better.

The SDI Services GeoDRM Simplified Mode [4] stated that countries have established their own SDI and have shared geospatial data worldwide. Recently, these developments have caused numerous security, privacy and protection issues. Digital Rights Management Technology (DRM) aims at monitoring the use of digital media by preventing end - users from accessing, copying and conversing to other formats. The management of digital geospatial rights is a paradigm similar to that which seeks a rights management system for specific geospatial issues. This paper provides details for the SDI Services GeoDRM system which, while still flexible enough to integrate existing new standards with the same ease, can be independent of its participating components, and also apply open interoperable rights management standards. [5] Analysis of GISS architectural security solutions. GIS n-type. The article describes the use of the main categories of spatial data management security in the database. A new GISS solution for a database file system (FSDB) with new traditional cryptographic algorithms has been proposed for a safer and more secure spatial file storage system that supports central authentication and control access on heritage DSMS systems.

Cryptography solutions are discussed in detail as a key topic for numerous aspects of network security. The paper also describes several key algorithms of implementation which are symmetric, fast, non-linear, firm and flexible.

GEO-Nhibernate is an extension of the Nhibernate model's space and location data [6]. For object design, positioning, and geographically confined roles, GEO-Nhibernate spatial entities are used. Based on user position, roles are enabled. In addition, the logic position and an independent device (road, city or area) are provided for users apart from a physical position taken from any mobile terminal (or mobile telephone). Their concept of roles was introduced, so that the model was flexible and reusable, defining the name of roles, the type of spatial border and the logical granularity of position. The GEO-Nhivernate also includes hierarchy, modeling permission, users and the activation of the heritage.

Secure access control is available in the multi-user database [7]. A spatial database access control model is introduced, enabling various users to access their access permission's default views. This paper provides three security architectures: one multilevel database, one multilevel database replicate and one multilevel database. Three security architectures also appear in this article.

Other researchers display encryption of database technology. Data for encryption and decryption are broken down into sensitive and non - sensitive data and user data. The database is there. Non - sensitive data can be stored directly, but sensitive and user data should be stored for symmetrical encrypted use and authorization [8].

The AES-based signature system and the ECC present the characteristics, sensibility and confidentiality of spatial data, taking into account increased capability. In addition to implementing unified certificate handling, the document provides for a private key that ensures safety for private keys and utilizes smaller ECC and ECC arithmetic advantages, in order to ensure correct and legal customer and server identity identities. The paper also contains a Nhibernate scheme which is specifically implemented in GIS and its approval is convenient and flexible, fulfilling space cooperative work requirements. Symmetrical AES encryption safeguards data to ensure confidentiality and data integrity during data protection transmission [10].

An integration and security of spatial information was presented. A framework is designed to show the interface within decision making environments between spaces of analysis resources, including permission issues for integrated data. Based upon Web-based technology and services as integration scenarios, architecture and security aspects are considered. The proposal is for the integration in the Internet GIS services of local and web - based information into a spatial decision support model. SDSS architects are developed to show how web - based contexts and functions can effectively implement this technology. This report details and supports decision-making and context analysis on the integration and safety of spatial information [17].

The Smart Infrastructure Framework and evaluation of property location accuracy as a basis for integrated smart - city development with all smart - city infrastructures and systems was discussed. The paper also discusses the main advantages, including measurable and non-quantifiable advantages of the proposed architecture. Increased transparency and participation in decision - making are generally designed as a city that can combine competitiveness with sustainability by integrating diverse dimensions of development and address investment in infrastructures that support both economic growth and communities ' quality of life, and careful natural resource management. Introducing the global smart city framework and architecture is the smart city infrastructure. The paper shows how GIS can be used to decide and to develop intelligent cities [14].

A wider applicability of many IT tools plays an important role in business was discussed. Retailers need to select new shop venues strategically in a highly competitive retail environment. GIS is a powerful IT - tool for the management, display and analysis of business information in space. The aim of this paper will be to explore the option of strategic retail outlets in Indian Hyderabad through the DSS. This process uses web-based geographical information systems (GIS) data, information and software to produce on-line systems for analysis, mapping and visualisation. These processes were integrated and synced with appropriate data layers for better choices (multi - layer system). In order to achieve an ideal retail stored location for possible solutions, the DSS combines several layers of data with spatial methodological analysis [15].

A small business ' potential customers can be identified by using geographic information systems was discussed. Employers should identify the target market of their businesses, know how unmet their business needs are and how potential customers can meet their target market requirements. Customers may find it very difficult to position themselves on the target market because of resource constraints. Nevertheless GIS was made accessible for small business through the convergence of several trends. GIS can help businesses identify the target market location of customers. This article covers GIS for sales data of the startup company to check if the GIS is supplied. It proposes that GIS can accurately identify the customer site and anticipate previous sales in the target market [16].

A discussion is being held on tracks of moving objects in the city, which show numerous semantics on human mobility and urban dynamics. This article introduces first to the traceability of data and then six topics for research in trace analysis and mining [18].

The recent changing conditions for production and consumption in service environments have changed. It also includes the division of production services, growth in the economy and society of the informational wealth, continued growth in digital technologies and services and creativity to consume. These changes affect municipal governments by providing citizens with a variety of infrastructure and welfare services. Concepts like the smart city, intelligent city, and the expert city create new opportunities for cities in an ever more expensive, competitive and environmentally friendly environment to carry out their demanding work. In virtually all, the cities must be represented by smooth information, creativity and innovation facilitated and, through service platforms, intelligent, sustainable solutions promoted. The subject is discussed in this article, starting with service nature and the new services economy, as smart local public service. A comprehensive framework for understanding the fundamental forms and dimensions of intelligent public services is developed here. Conceptual systemisation of key dimensions for intelligent services and conceptual modelling of intelligent service platforms are at the center of the focus [19].

Many people now migrate to towns in villages due to the huge population growth. The majority of human civilizations are projected to be concentrated in urban areas very soon. This increasing

number of people will use more energy and space to live. Finally, as the cities grow into metropolises, they leave behind a greater environmental impact. This has taken place worldwide and has led to serious implications. Therefore, a paradigm for the new type of city, called smart city, has come up to reduce the burden on traditional cities. In order to minimize the environmental impact of human activities, a clever city uses advanced technologies. More and more people are also learning and using computers and handheld equipment with the growing population. In every city, this has led to many computers. In this document you propose the development of intelligent software that makes the city smart and green to achieve a minimum carbon footprint with optimum power and Hardware resource [20].

The Smart City concept is increasingly considered strategic for resolving issues of irreversible urban growth. Establishing in the 1990s, this term is at risk of becoming too generic in conjunction with telecommunications liberalization and the development of internet services, without a common operational definition. The following paper provides an overview of definition and metric problems in two ways. In order to achieve a robust and comparable smart city measuring system, it derives some methodological suggestions from analysis. In view of the dedicated implementation of the surveillance system, last results are extremely important [21].

A major success factor to enable new developments to be addressed and effective decisions to be made. This information should be accurate and readily available. The aim of the study is to develop an automated geo-simulation process based on gathered geographical and statistical data based on a suitable geo-simulation model preparation. All the urban structures interact, and a network of different structures, connections, flows and connections forms the urban environment. The road network and communication network determine both the territorial and business areas ' spatial distribution and development direction. Furthermore, urban development planning also requires up-to-date information on traffic and peatflow and local service access, open land, etc. The information in GIS models is well formed. Capacity information is also available in most model objects. Since the models of GIS are static, the territorial dynamics cannot be identified, but the urban environment is non - linear. Geosimulation models can be designed to help solve non-linearities, since they are more informative than GIS models for dynamic processes. Geosimulation models also enable experiments and optimization tasks to be resolved. The automatic creation of

geosimulation models requires no further profound expertise in the field of simulation techniques. The cost, fast access to data and flexible access characterize it economically [22].

A user - oriented bus selection (BRT) model for the GIS city of Jaipur. Based on the distribution of transport travel in town, the model will choose the BRT corridor for a horizon year. In order to detect BRT at high speed, the model makes use of the city's population, transit and land use characteristics. There are two models in the approach; one is for the BRT demand estimate and the other for certain predefined terms for the BRT corridor. The model creates GIS graphic maps for urban planners to better understand the transit demand pattern and policies. In any similar city in the Indian context, the methodology can be used for mass transit planing effectively [23].

The "smart" urban development has emerged as a strategy to mitigate urban population growth and urban planning problems. However, little academic study discussed the phenomenon sparingly. This article provides an understanding framework for the concept of clever cities to bridge and use increasingly clever urban literature. Based on a varied and comprehensive range of literature from different disciplines. Eight key smart city initiatives have been identified: management, technology, governance, political circumstances, individuals and communities, businesses, the building of infrastructure and natural environments. These factors form the basis for an inclusive framework to explore how local governments plan intelligent urban initiatives. In the context of intelligent urban research, this framework offers guidance, schedules and practical implications for government professionals [24].

3. METHODOLOGY

We have proposed a model of Objects in GIS repositories to define security of GIS. First, we explain the concepts in a simple way and then we reach a model which is then enhanced with issues of authorization.

3.1 GENERAL OVERVIEW

Section 2 was proposed for research on how to manage the GIS repository. With regard to background analyzes and decision-making, In terms of attributes we refer to as context, we can cluster GIS object data. Economic circumstances, environment and quality of life are examples. The attributes of SObj-s can be repeated between different contexts (i.e., the attributes can be different). We analyze and study how SObj -s can assign object access rights to users. Data input, manipulation of data, data evaluation, data review, verification of data, correction and data visualization are included in the management process.

We define SObj as an SObj set containing clusters of metadata attributes (database information that can cluster data effectively by collecting the same attribute data). To access SObj - s, users should define the context of GIS analysis and thus divide it into recoverable objects starting with different users, objects and contexts ' security requirements. As shown in Figure 1, we define a context - based GIS snowflaking model.

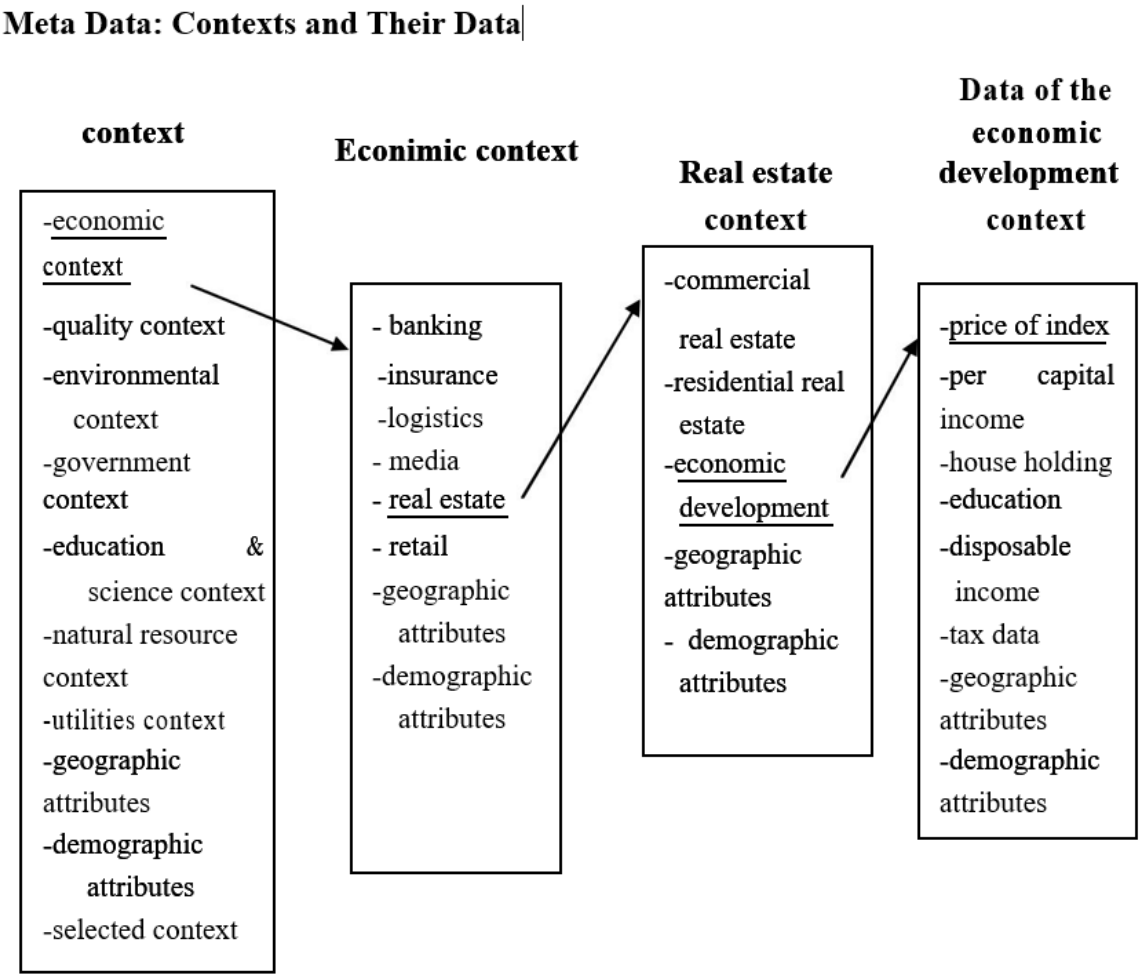

Figure 3.1: Modeling example GIS Snow Flaking database

In Figure 1. GIS meta-data are shown in regard to their contextual relevance for the clustering of different SObj-s. The economic, quality, environment, public management, education and science, natural resources and services sectors. In all contexts, geographical and demographic characteristics are always present. You can select and browse the context. History. - History. History. History. For example, we can go into details (including contexts) by selecting the economic context (underlined in Figure 2). We deal with constantly defaulting banking, insurance, logistics, media and property, retail and geographical and population-based features. Then the economic environment can move the navigation to examine the immovable context. Geographical and demographic characteristics are shown in the particular context because they are extensively used. Finally, the context of economic development comes: it examines its attributes for the

collection of data, indexes, and indicators through information filters (the economic development no longer shows detailed contexts).

3.2 MODEL VIEW CONTROLLER (MVC)

Web applications contain a variety of user information content on a variety of pages. The development teams are responsible for the design, implementation and maintenance of such web apps. This is why multiple types of user interface, for example, are supported. Pages to users of HTML and Java Web developers. This is a problem requiring different points of view from the same data. Additionally, the same data may be updated with different user interfaces. The elements that provide the web application's core functionality should not impact the support of multiple views and interactions.

To correct these things, the MVC pattern is used by distinguishing between core business function and the presentation logic. This division allows you to see the same data multiple times. This allows several customers to be implemented, tested and maintained.

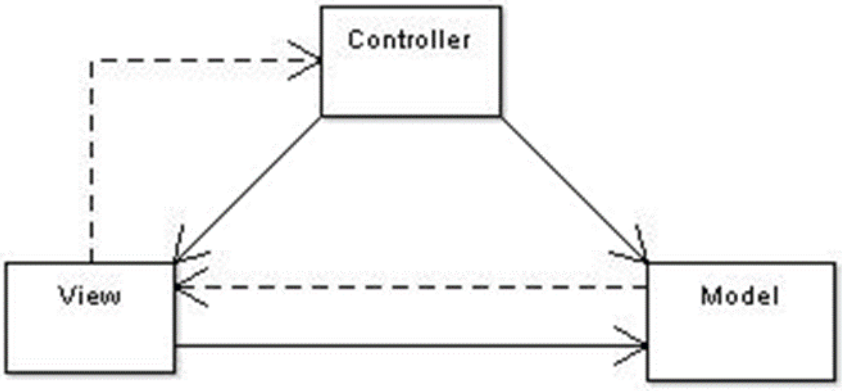

Figure 3.2: Demonstration of the MVC pattern

- **Model**

The model encapsulates an application's functional heart. It displays the data and allows data to be accessed.

- **View**

The display takes charge of rendering the models data, usually elements of the user interface. The presentation of the data is specified precisely. If the data in the model has changed, the view must update the data presentation. Usually the view reads, as the view should not be changed only access to the model.

- **Controller**

It is up to the controller to call the model methods for data modification. There is an equal field between the controller and view. The controller cannot copy data values from the model to the display, but can insert values into the model and show that the model data has been changed. A new view that the user must display is also available for the controller, like a website that shows the results.

The View is the actual MVC pattern based HTML document for web applications, and it's the controller who controls the content and page flow within the HTML code. The model consists in a database or XML file containing current content.

The following scenario shows the actions when the user interacts:

1. UI.
2. The opinion acknowledges that actions have been taken and calls a registered calling method for action
3. The View refers to the appropriate Controller method
4. The controller is modeled.
5. The Model informs all views of the change in data. The Controller can also update the view in Java technology - based applications.

The benefits of MVC are:

- Substitutable user interfaces

The alternative user interfaces for the same model can be replaced by different views and controllers.

- Multiple views of the same model simultaneously
- Views synchronized
- Easier to modify user interface
- Facilities to test

The disadvantages of MVC are on the other hand:

- More complexity
- Close connection between View and Model controller:

3.3 OBJECT-RELATIONAL MAPPING

The application method for converting data between incompatible system types by means of object - oriented programming languages in computer science is Object - relation mapping (ORM, O / RM, O / R mapping tools). In fact, it creates a "virtual object database" from which the programming language can be used. The object-relation mapping packages are both free and commercial, although some programmers choose to build their own ORM-tools.

Data management tasks operate on the objects that in object - oriented programming are almost always non - scalable. For example, an address book entry with zero or more numbers of telephone and zero or more addresses representing a single person. In an object-orientated execution, it could be modeled by "person object" with attributes / fields to hold each data item: name of the individual, telephone number list and address list. The list of phone numbers itself would include "Objects with PhoneNumber," etc. The address book entry is processed by the programming language as a single object (for example, it can be used for a single variable with an object pointer). Different methods, like a method for returning the favourite telephone number, home address, etc can be associated with the object.

However, many popular database products, such as DBMS can only save and manipulate scalar values such as tables-ordered entities and strings. The programmer must either convert object values into groups of simpler storage values in the database or only use scalar values in the software. The first approach is to implement object-relational mapping.

In order to be able to reload them as objects if necessary, the heart of the problem is to translate the logical representation of objects into an atomised form which can be stored in the base data. The objects shall be continuous if this storage and recovery feature is implemented.

3.3.1 Object-oriented databases

In addition to the use of object-oriented DBMS or document-oriented databases, such as native XML databases, data modelling provides greater flexibility. OODBMSs are databases specifically for handling object-based values. The data must be converted from and to the SQL form with OODBMS, since data is stored in their original object presentation and relationships are presented directly rather than requiring tables / operations to be connected. The same applies to document-based databases with object-document maps (ODMs).

Also, users must not shred "objects" through document - oriented databases into table rows. Many systems also support XQuery data collection query language.

The object-oriented database is usually used in complex niche applications. A reason why many programmers have an object-SQL mapping system in place, even if SQL queries can be processed in a restricted manner by most object-based databases. If someone is using the OOD BMS, an ad-hoc application-independent request may not be executed. OODBMS replicates SQL databases to meet the ad hoc query requirements and maintain well-known query patterns.

3.4 NHIBERNATE

NHibernate is a Microsoft. NET platform object-related mapping (ORM) solution. It provides a framework for a traditional relation data base to map an object-oriented domain model. It seeks to

relieve the developer from a large number of related programming tasks related to persistence data. NHibernate shall be freely distributed under GNU Lesser General Public License as open source software. NHibernate is Hibernate's harbor.

Mapping of .NET classes into database tables (and of CLR data types into SQL data types) is NHibernate's main characteristic. NHibernate provides data retrieval and query services as well. With NHibernate, SQL commands are generated and a developer is relieved from manual data set manipulation and object conversion, keeping the application portable for most SQL databases.

For Plain Old CLR Objects (POCOs), NHibernate offers a transparent persistence. A no-argument builder who doesn't have to be public is a strict requirement for a persistent class. (Equal) (and GetHashCode) (methods also require special attention for proper behavior in some applications).

It was later taken up by Mike Doerfler and Peter Smulovics that Nhibert was launched by Tom Barrett. JBoss, Inc. (now part of Red Hat) hired the developer of NHibernate, Sergey Kosheyev, to work in his future versions in full-time at the end of 2005 JBoss stopped funding this project at the end of 2006, which is now fully developed and run by the community.

NHibernate is a port of the.NET platform of Hibernate 2.1. It is now available in version 1.0 as free software under the LGPL after several years of development. Tom Barrett launched the Port of C #, then Mike Doerfler and Peter Smulovics later picked them up. The main developer of NHibernate, Sergey Koshcheyev, has been releasing version 1.0 in recent months. In order to join the Hibernate team and to work on future versions of NHibernate, JBoss Inc. has hired Sergey.

Once the migration is complete, the projects of Hibernate and NHibernate will share infrastructure. We plan to merge user forums and websites, and our list contains additional work on shared documentation. In order to stay tuned, the teams also talk about possible strategies for a port from Hibernate3 to Net and C#.

3.5 ENTITY FRAMEWORK

The Open Source Object - relational Mapping Framework (ORM) is an Entity Framework (EF). It's been a part of. NET framework, but as the entity framework 6 it is separated from the .NET framework.

The Entity Framework is a set of technology in ADO.NET which helps to develop software applications based on data. Architects and developers of data-oriented applications have typically fought for two very different goals. The entities, connections and logical of business problems they solve must be modeled and data motors used to store and retrieve the data must also be used. Even applications that work with a single storage system should balance the storage system's requirements against the requirements to write efficient and manageable application code. The data may extend to several storage systems, each with its own protocols.

The Entity Framework allows developers to process information in the form of specific domain objects and properties, such as customers and customer addresses, without being responsible for the tables and columns underlying the database where this data is stored. The Entity Framework enables developers to work with data on a higher level of abstraction and to create and maintain data-driven applications with less code than in conventional applications.

3.5.1 Mapping

In the Visual Studio entity data model wizard, the one-to - one mapping (1:1) is generated in most cases between the database schedule and the concept scheme. In the relational scheme, the elements consist of tables that connect the primary and foreign keys. In contrast, the type of entity defines the system of conceptual data.

The Entity Types consist of multiple tables of information, each map of the field being aggregated to a certain column of the database. The entities can be connected to one another, regardless of the physical relationships. Likewise, related entities are exposed – through a field whose names indicate their relationship and the cross - relationship contact that returns the related entity (or the collection of entities) instead of finding a column value from the data base.

Tips of entities are compatible with the class of entities of objects that are instances of entities. Entities are individual objects that are part of a problem with the application and indexed to a key. For example, we will have two types of entities when converting the physical scheme described above:

- **CustomerEntity**, which includes the name of the client from the customers table, and the address of the client from the contacts table.
- **OrderEntity**, encapsulating a certain client's orders, retrieving them from the table of orders.

The logical system is shown as the Entity Data Model (EDM), XML and physical scheme map. In an EDM, ADO.NET Entity Framework works together with the companies and resume the use of ADO.NET structures, such as DataSet and RecordSet. The EDM map app. In order to get information on bodies from multiple tables or cross a link, the ADO.NET entity framework makes the necessary connections. When a business is updated, the information table is followed to update the tables that update certain information. When the statements are updated by SQL. The SQL derivative, eSQL, is used by ADO.NET Entity Framework for queries, set-theory, and updating on entities and their relations. When requested in eSQL, the natives of the SQL aroma of the database will be translated.

The Entity11 type and entity is simply the logical EDM and can be displayed in any way. The ADO.NET Entity Framework is an object service describing entities as properties and objects. So, the object entity can be accessed and used in object - oriented language only on the front end of the EDM types instances. Other front-ends that expose entities to and over persistence storage can also be created, i.e., WCF Data Services or XML transfers.

3.5.2 Entities

Entities are EntityTypes instances; they represent each instance of the objects to which the information pertains (for example, customer, orders). In that sense, a type of entity defines a class of the entity and also define what properties it will have. The identity of the entity is defined in

accordance with an instance of the entity. Properties by name and type describe some aspects of the entity. The ADO.NET Entity Framework's properties are fully typed and fully compatible with the DBMS and NET. A SimpleType or ComplexType property can also be multiple valuable. All EntityType are names and each instance of the entity type is unique to its EntityKey property. The following are the different property types:

- **SimpleType**, matches primitive types of data, such as integer, Characters and floating points.
- **ComplexType,** a combination of several characteristics of the SimpleType or ComplexType. However, unlike EntityTypes, ComplexTypes ca n't have an EntityKey. The Entity Framework v1 cannot inherit ComplexTypes**.**

Every entity is included in EntityContainers container for each entity by project. Each project contains one or more reference entities via various namespaces and entities. In collections called EntitySets multiple instances of one entity type can be stored. Multiple EntitySets apply to one type of entity.

3.6 SPATIAL GIS MODEL OBJECTS

In [5] we consider a SObj spacial object to be "recognizable object" in a given position in the world, marked with one length and one width. A spatial object SObj=1 ... N is a map, an image of an area, a plan of parks, a hydrology on the rivers and canals, a city or, for example, building a map. n is the overall number of the GIS object.

The { aji } attributes, I = 1 are stored in the GIS. m is the total attribute number of SObj, and l= 1 .. L is the sum of the details at level l of the GIS. Consequently, L is a GIS property predefined.

The GIS is classified by different map levels. Objects are mapped into several objects (1 to 1 or 1 to many relationships) at the l+1 level in the given layer l of the GIS. At level 1 of the GIS, for example, an object called "Lombardy Region" is mounted on level 2 into 11 objects. The "Province Lombard" (for example the Province of Milan) is then diverted into one capital of the province

(for example, the city of Milan) and the principal towns of the province (for example Magenta, Pioltelo, Sexto, ...).

An object has a number of attributes clustered in every layer. Contexts are clustered, specifically domains of interest. The geo reference are specific objects (latitude, coordonnates, etc.) such as a size, location, owner and other geo. Other SObj attributes define the object characteristics from various points of view, namely Context.

The L+I layer is also used to map the attributes of one layer l for that object. Multiple mappings in GIS levels also have 1 to 1 or 1 attributes. For example, the Lombardy Region's attribute of population number will be a provincial population number as well as a next one of the towns (skema-level1-to-1 mapping). The mapping regions are attribute values 11 (equivalent to the Lombardy county), and the rule is that instance values for the number of residents are equal to the number of residents.

Contexts

Contexts are a mechanism to analyze and manipulate in detail, for example on field management, decisions on GIS objectives. Therefore in the GIS context we should have a repository.

A cluster of { adji}k attributes where k refers to k – th and k=1 is defined as a context. P refers to P as the total set of GIS contexts. For a certain analysis perspective, in particular for a particular discourse area, the context group is relevant. GeoContext and geo reference group attributes are always named for a default context for GIS objects. There are several contexts with an attribute aji. An object such as a map is subject to economic, environmental, green areas, transport, taxation, mobility and health contexts for example.

The user can navigate context. Contexts. More precisely, you can select a context and then expand to see what its specifics are, i.e. which objects in the context and which subcontexts for these contexts are defined. Contexts can be nestled and monitored by means of a recursive function. This is a navigational context hyperlink so as to arrive at the necessary contexts and to inspect its data as in Figure 1.

Applications like Q1 can be solved in contexts by grouping attributes. SObje objects and k contexts can be selected for analysing attributes grouped in contexts (e.g. "Green" for Q1, "Urban Quality Life," and "Urban Quality Life" for Q2). "How broad is this sector's green coverage?"

Contexts can be analyzed at various zoom levels because of the characteristics of contexts. The SObj Spatial Features can be further inspected, by reviewing the regional (widespread) and then provincial maps, and cities in each province, etc. Objects and their attributes can be retrieved in different granularities regarding user function and permission, grouped and saved into different context and GIS layers. In the context of urban quality life, characteristics of various grains can be examined: from macro attributes to specific attributes (for example the number of green spaces in a city) (distribute number of child's sports centres).

To summarize, the definition is as follows:

SObj={{geo-attributes}, {attributes}, {(context,level)}, level}

Where geo - reference, proprietors and {attributes} are part of {geo} attributes, all SObj attributes are set to: context, level of detail for SObj; levels are the number of levels of granularity in a SObj repository. The attributes of SObj.

Therefore, a relationship ({{ adji}k }), as clustered in K – Th, is defined to represent SObj adji attributes.

Examples

1. As shown below, a geo - support map with ordinates, characteristics, contexts, and levels can be defined as SObj.

Region Map={Geo reference coordinates, owner, extension}, {net income, population density, schools, rivers, monuments, average income, transportation means}, {(Economic, 3), (Environment Quality, Education}, 4}.

The regional map contains the context of finance, environment and education. Level = 4 means that the regional map is shown in detail in four GIS levels: province, city, town, and region. Figure 1 describes the economic context with three detailed levels, with three levels to reach contextual data.

The relationship { { adji}k } is like this: the attribute { adji } is the number, and k is a number indication. There are one or many attributes for each k - th context, and this set of attributes may also be associated with different contexts. There are many relationships.

2. A university can be a GIS object in a specific urban area, has 3 analytical contexts and three details. This is officially done.

University={Geo reference coordinates, extension}, {buildings, students, taxation level, facilities, number of faculties}, { (Education,2), (Research,2), (Spin-off, 3)}, 3}

For example when prospective (user) students wish to analyze the research context of a university they should define a link to identify the attribute {adji}. For example, enter the name of the context. Research, the attributes of this context are returned. The program then passes through the two levels vertically and has access to the "General Scientist Research" (first level) and then to the "Science Research in the ministries" (second level), where research performance indicators in the ministries (impact factors, number of awards, etc.). It can analyze and decide based on this information, such as PhD applications, grants and science research departments, etc.

Different users can access different information as regards their roles distributed by authorization such as prospective students, existing students, teachers, managers, and chairperson. Users can analyze certain topics and take more reliable and efficient decisions based on the information collected.

3.7 ARCHITECTURE GIS REPOSITORY

In the management of the depository, the integration and safety of space information SObjs should be considered. Research examines the interface of spatial analysis resources within the policy context, including problems with permission of integrated data [11] within a single framework, that is, the Special Spatial Decision Support (SDSS).

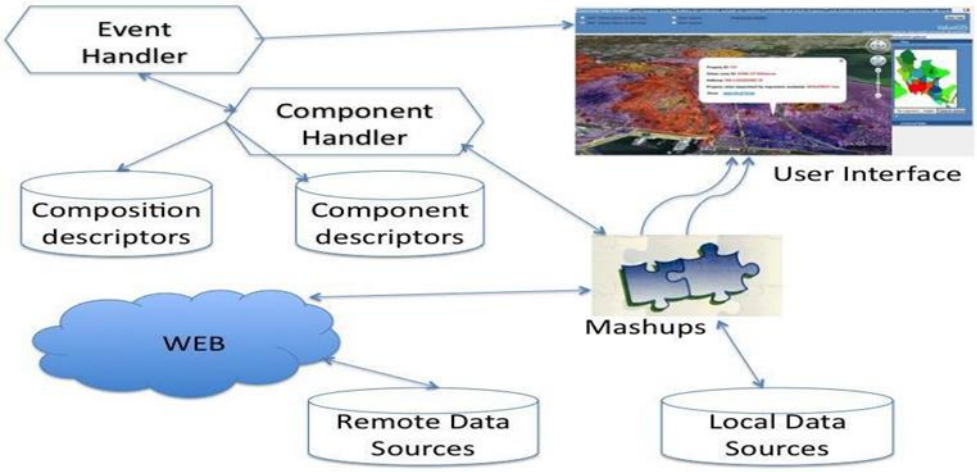

Figure 3.3: SDSS feature architecture

In Figure 2 we use mashups in order to integrate different information sources, to support users in decision-making processes, as viable interconnection solutions. Mashup is a process that integrates data and content from various web resources, allowing the composition of the website to be flexible and easy to use. Figure. 2 shows the functional SDSS architecture suggested. The Mashup framework [11] focuses on this: events generated by user interaction with a single mashup component will be mapped into operations with one or more components provided to such an event.

Components work separately or in a networked setting. This allows for the creation of direct dynamic links among components and other applications, allowing for the differentiation between the architectural features and the user update feature. The User Interface supports the interaction of users in greater detail. In order to perform both simple and advanced spatial analyses, the users can access the calculating environment and browse maps. Access via a web interface is implemented. The visual arrangement was designed to mask the technical detail complexity of the mashup management.

Specific repositories store components and composition descriptors. In particular, component descriptions and wrappers using SDSS services are saved in the Description Component Repository. In the Description Composition Repository, the XML descriptions for the composition and execution of the machining are stored.

The component manager administrates the event's composition and maintains the instance description. The user interface is run and returned after the mashup is completed.

This enables the policy maker to select different decision contexts active and compose them. The spatial picture (e.g. geo - referenced map, topic map or graph) will be rendered immediately so users can easily verify that the context selection meets their requirements. If the results are not satisfactory, the decisional context can be modified by adding more information or requiring a different integration method.

3.8 GIS SECURITY MODEL

We have introduced a safety model based on Nhibernate to deal with GIS security problems. Users must be distributed with roles and permissions to access GIS information, with the corresponding SObj-s. when accessing GIS information. Users are permitted through roles in which users do not have a direct connection to permissions, but through roles.

For example, we suppose we have smartphone-based mobile users. Users move through spatial objects through spatial areas physically. Identified their movements via the GPS to progressively render the GIS a map corresponding to the zone they travel.

This thesis extends the security model to a scale that defines purposes of roles in the analysis of contexts in the Nhiberate models suggested in [2]. For instance, if you are a Mobile User (U), the extent of U - R changes depending on the fields you enter and you can measure the mobility levels with the Green Manager on Polmi - Leonardo campus. For example, when U-R enters building 20, U-R gets 20 and loses that level if building 20 leaves it.

3.8.1 Diagram for GIS Class

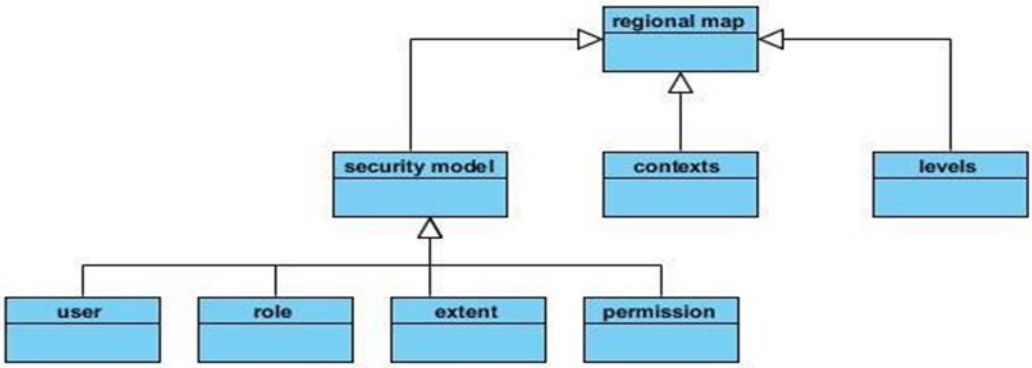

Figure 3.4: Regional map object GIS class diagram

In the case of security, the diagram shows the security model and contexts as well as the standard of user, role, extent and allowance for the security model. The regional map consists of a spatial object containing attributes that are clustered into contexts. The diagram contains the following attributes. Fig. 3. To receive more detailed information, users can access the object in various levels of detail: how much is stored. By filtering and selecting authorised space objects in contexts for use in a more specific context, users can analyze attributes in line with the subject, analyze and decide user access privileges based on roles and permissions. And the extent to which a role can be activated with permission shows the relevant activities.

3.8.2 GIS Security Model

Users shall be allowed to perform roles and access control permits to improve GIS security and protect SObj's privacy and sensitivity. User permissions with regards to their roles and GIS services (e.g. view / read, zoom-in, write, edit, delete) are provided under the roll-based access control. Roles and permission within the RPB are assigned, extracted from the database, and by issuers of roles and permissions to users accessing a GIS SObj-s system.

Table 3.1: GIS security model

Role	Extent	Permission
Public user	Information search	View
Green manager	Context analysis	Zoom in/out
		View
Object owner	Data management	Modify/update
		Write
		Zoom in/out
		View
Governor	Decision making	Modify/update
		Write
		Zoom in/out
		View
System manager	System maintenance	Create/delete
		Modify/update
		Write
		Zoom in/out
		View

The GIS security model for Nhibernate - based in SObj is provided in Table 1. Higher roles subsume the permissions of subroles (roles are increased from first to final rows in table 1). In this way, the roles of the subroles are combined.

Roles are default and distributed by various users when accessed. In one interaction with the system, roles are unique. The SObj-s Information is only available to public users. Two roles are distributed to green managers: search for information and analysis of context. We assume that each role requires a specific password. You can also zoom or zoom in on the information to get more information by entering a password to scan the data you have collected when SObj is used in context analysis. Likewise, if a user is identified as a system manager, a person may enter a system

manager under 3 roles under each authorization. With several passwords, you can connect to the system in one role. A system manager, for instance, can only see information with the search function. However, if the GIS system is to remain, it must take on the maintenance function of the system and use permission such as removal, modification / update, writing, zoom in or off and view / read.

Two possible roles lie in Green Manager: information search and context analysis. The same set of allowances involves a certain role. For example, the zoom-in and view / read permission is given for Context Analysis. The system manager utilizes system maintenance functions that allow him to maintain a broad range of systems: views, zooms, writes, changes and creates / removes SObj - s. No permission is given to create or delete objects to the user of the object owner. Users, such as the object owner and the governor, may obtain the same permission given their roles: they also have the same permission for other reasons in table 1. Table 1. For example, both the owner of the object and the governor may view, zoom in or out.

Figure 4 shows a hierarchical approach to the GIS Security model. The hierarchy can be understood in various roles with different permissions from the figure. The public is the least permitted to access, view and, for green managers, have public permission and permission to zoom in / out, which are not accessible from the public, so that only special information provided can be accessed and viewed. System administrators can view, zoom, write, modify / update and create and detect data in this hierarchy as far as possible. The safety of GIS information is guaranteed with this hierarchy as access to information is strictly controlled through the allocation of corresponding roles and permissions. The following is shown in this hierarchical safety model:

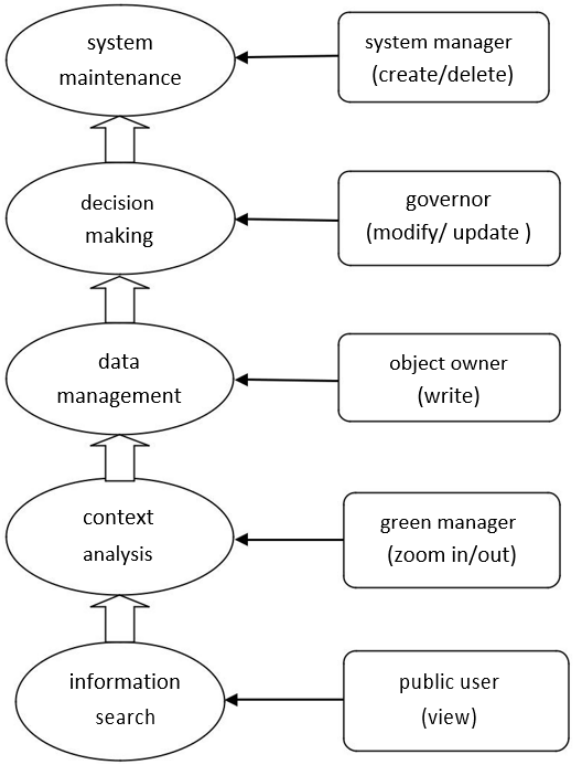

Figure 3.5: GIS Roll Hierarchy Security Model

3.9 GIS SECURITY UML ANALYSIS.

We conduct UML analysis to show the GIS applications, including the case, UX model, analytical graph and sequence schedule. This UML analysis enables us to better understand GIS safety issues, illustrate them and provide a systematic and general solution.

3.9.1 Use Case

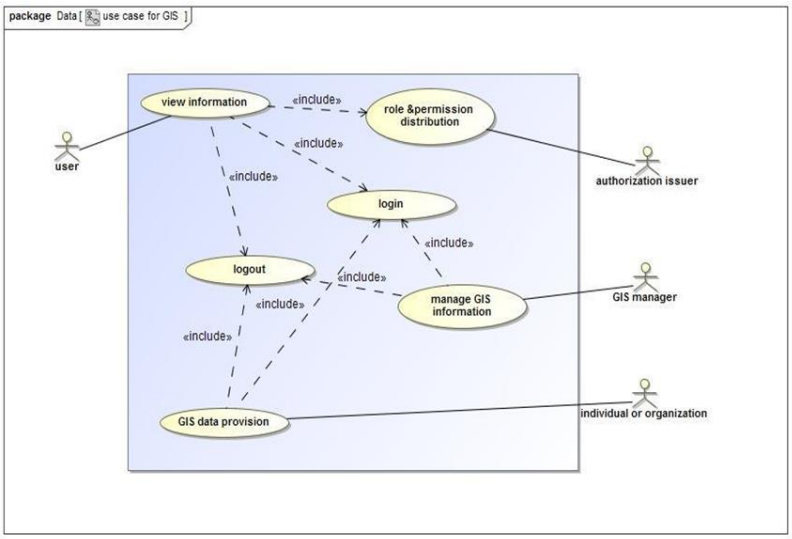

Figure 3.6: GIS Usage Case

The usage case for GIS safety is shown in Figure 5. Four actors are involved:

-**users**, using and using GIS information to resolve operating problems and improve them;

-**authorization issuers**, who grant a particular user role and authorization and can be a system third party;

-**GIS manager**, GIS information and databases maintain and follow up; -persons such as stakeholders and business boards, providing GIS information, which can be a GIS manager.

Users should log in and receive specific roles and permissions to access a specific GIS object to receive the GIS SObj-s required. The roll and authorization distributed by the Authorization issuers can be read, written, modified and deleted by users, individuals or organizations of GIS managers.

3.9.2 UX Model for GIS

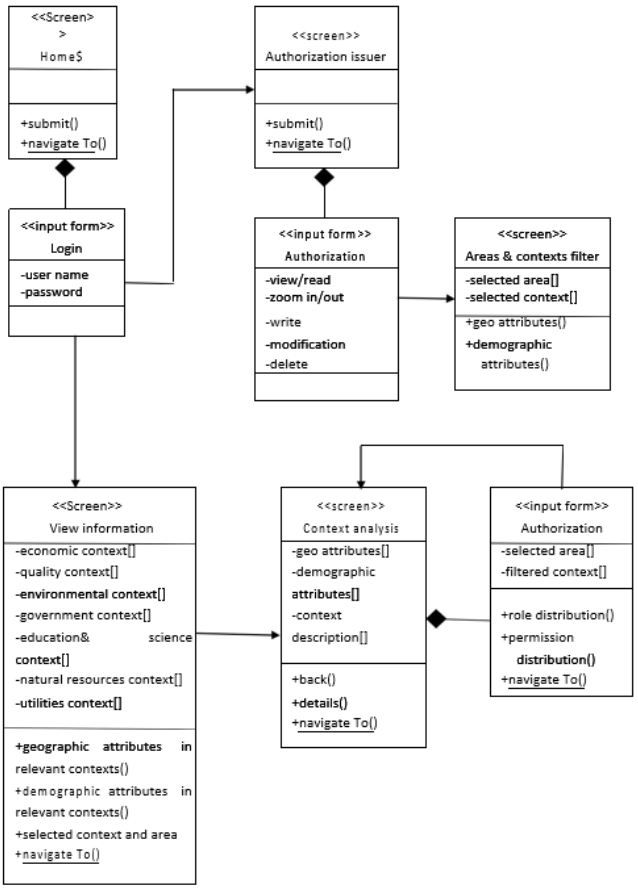

Figure 3.7: GIS UX Model

The UX model for GIS is shown in Figure 8. We want to make SObj accessible to users from the fields of geography, demographics, economy, quality, government, education and research, natural resources and utilities. The user role permission that allows users to have access to cluster database sources that they can configure and select for analysis [2] includes a particular setting.

Economic context data includes, inter alia, capital income, banking, retail, logistics, procurement, and expenditure, etc. Quality contexts encompass pollution, public green areas and urban changes expected. Information such as water, sea, soil, fauna, vegetation and other environmental contexts is included. It includes national and regional agencies, national security, defense, fire, medical emergencies, disasters, police, health and traffic information. The context of educational and scientific information includes research, books, museums,K-12 training and so on. The context of

natural resources allows us to gain access to data on agriculture, forestry, mining, pipeline and oil. The services include information on electricity, electricity, gas, telecommunications, water management and waste water. In their own name and on their own behalf, users have the right to access any of this information.

In selected regions, we are all able to provide geographical and population - based GIS data that are essential in each context for GIS.

3.10 THE ANALYSIS DIAGRAM FOR GIS

Figure 7 shows how users access the required GIS information in their GIS analysis diagram. In general, a issuer of permissions can control and obtain permission, the role and the distribution of the authorisation for the user. Upon acquiring the role and authorization, a user has access to all available information. The filtered function is then used by a user to get additional data for a specific object in a particular area. The GIS Analytical Diagram can also be prepared for the same purpose for issuers of permits, persons or agencies and managers of the GIS.

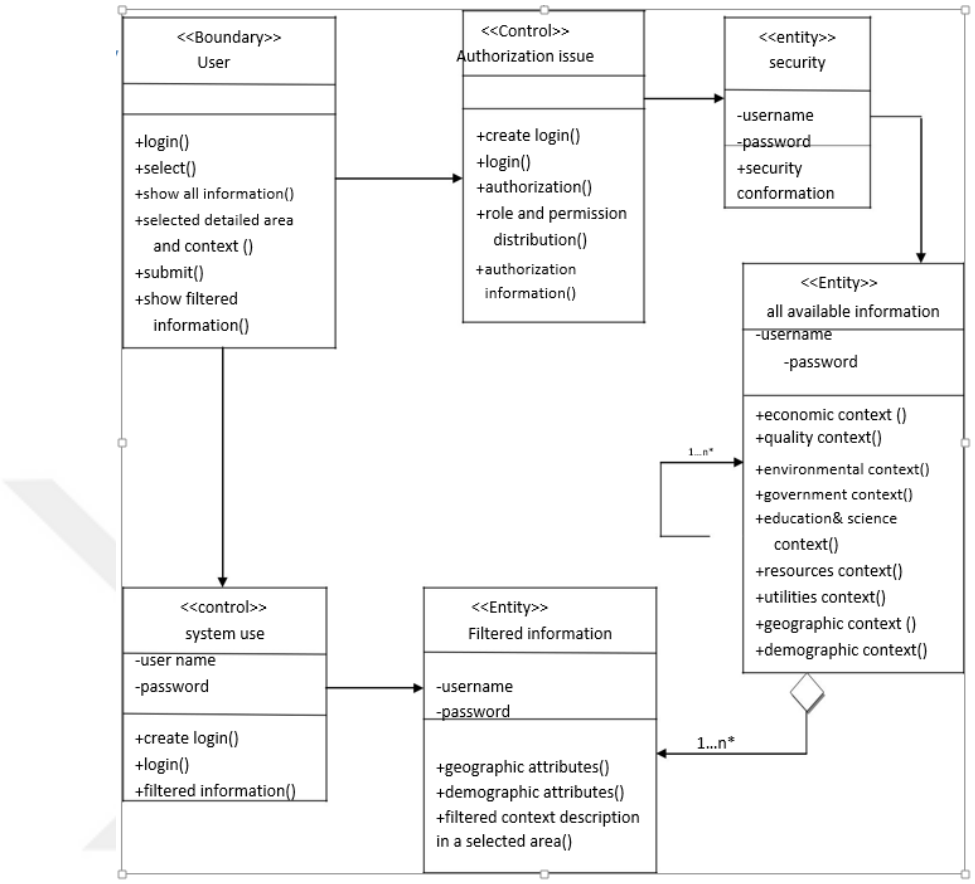

Figure 3.8: Diagram for the GIS analysis of users [Boundary Entity Control Model]

3.11 SEQUENCE DIAGRAM OF GIS

GIS sequence charts will be established during this session to identify specific recovery and storage of GIS for GIS users, GIS providers (persons or agencies), licensing agents and GIS managers, who may be a GIS security concern and a potential GIS security hazard.

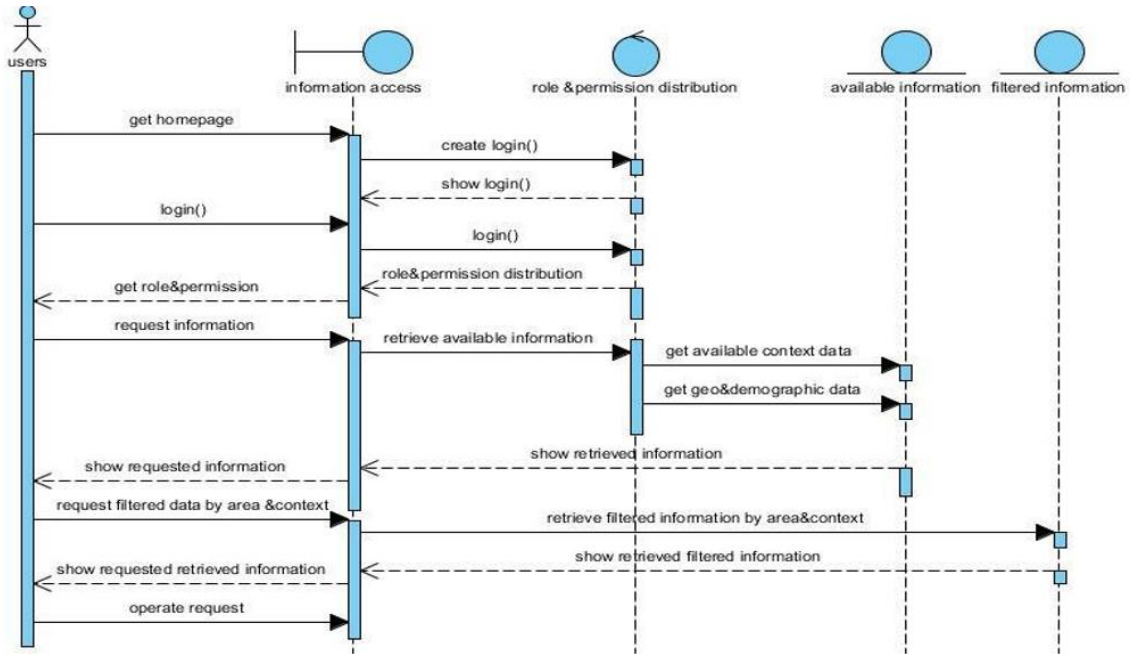

Figure 3.9: The GIS procedures

By means of the procedures described in the graph shown, as in the diagram below, users can access the requested information. The following activities, such as login, functions and permission, should be completed on time, available information should be collected, a more comprehensive context selected and an appropriate context analysis description given. In the event of a conflict between role and permission a priority should be given.

3.12 GIS SECURITY CONFIGURATION

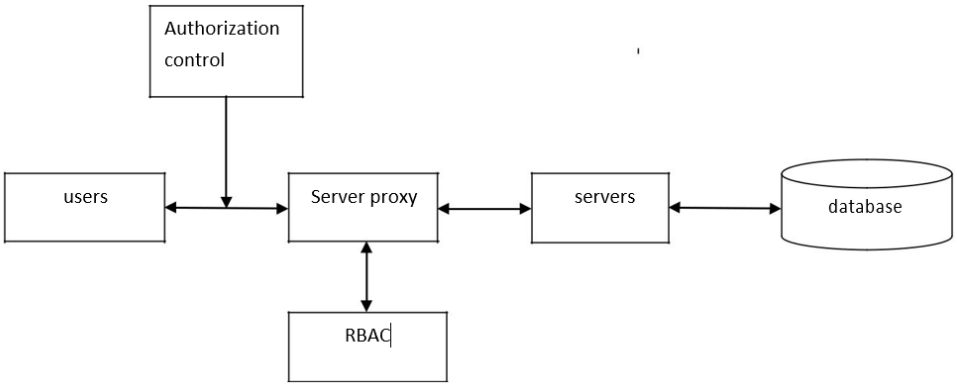

Figure 3.10: Settings for GIS Security

The set - up includes users, server proxies and control permission objects as illustrated in Figure 9. The main responsible for distributing user roles and permissions is controlling authorisations. This gives users a special role when requesting information that allows users to access information for certain objects. Service proximity means user and server communication, user requests and server feedback can only be made by the proxy of the server. Server proxies can also track and encode or decrypt user roles and data transmitted between the users and servers.

The server proxy can usually allocate roles - based Nhibernate access controls and the transmission of data information from the cipher / discipline that ensures and enhances GIS security. Users are generally allowed to distribute permissions.

3.13 MODEL FOR CONTEXT ANALYSIS

This section shows the GIS information collection process and security issues and how these security problems can be resolved. The above authorisation model (Figure 10 is shown in this section.

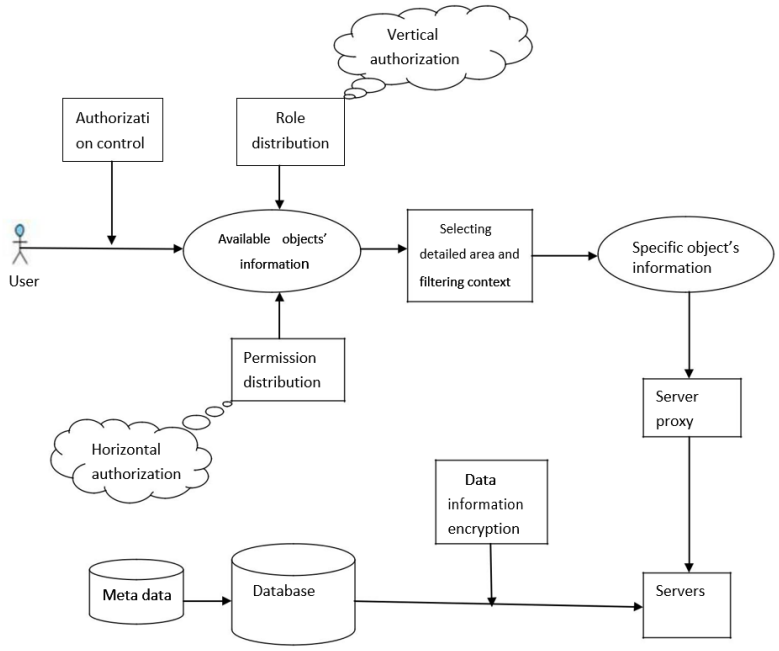

Figure 3.11: GIS context analysis authorization model

We can see from the figure that users want to obtain in the form of context clustering information stored in a database. First of all, the user should be authorized to access all the information available for verifying and validating the authorization entity's role and authorization. However, the user may not be complicated to display the information. A Green Manager, for example, would like to see how much green coverage is to be improved by 30 %. In this case, only all greenery of the region can be understood, including roads with trees, mountains, forests, parks and greenery changes. But once you enter the information interface, all information about your role and your permission is available to you. This is difficult, because some information does not help him in making decisions but must be treated effectively and efficiently, including the economic situation, wells, governments, etc. We are therefore offering a model for users to select or filter background data to hide the unprotected information of their users in a selected field that helps them to better analyze and decide. Users can access a data interface in the specific areas and filter context, zoom in, vertically and horizontally to access more information on an interface based on interfaces and information and, if necessary, continue selecting and filtering. In case of need. User applications can be transferred from a database to servers where the data is encrypted, to secure information via a server proxy as shown in the figure.

Users need a role and permission to access information. Rollablazing gives users the ability to access details of context autorization on the same level with information for vertical approval across diverse hierarchical layers.

3.14 NHIBERNATEMAPPER ARCHITECTURE

The process of NHibernateMapper file generation is based on existing relationship databases and specific domain knowledge in applications. Classes are available for application programming. The tool uses open NHibernate scheme definitions-mapping the mapping file name (nhibernate-mapping.xsd). For the use of the NHibernate Mapper tool that is the existing and the domain object, the Dynamic Linked Library (DLL) classes shall be applied. NHibernateMapper is automatically extracted from the database and the Member Class attributes for the DLL selected.

The user must select an object manually-a class-oriented object and a data table. The schema and attribute of the database is then automatically scanned and suggestions for the user mapping are shown. For each column, the applicant mapping is made based on a matching string algorithm (column–to-map) and on a data-type comparison. The user may accept or reject the proposed mail. Upon completion of mapping suggestions, users may also use an interactive GUI. In addition to the acceptance or refusal of the proposed mapping, mapping can also be manually redefined. Users can be saved in the NHibernate XML mapping file when the mapping definition has finally been met.

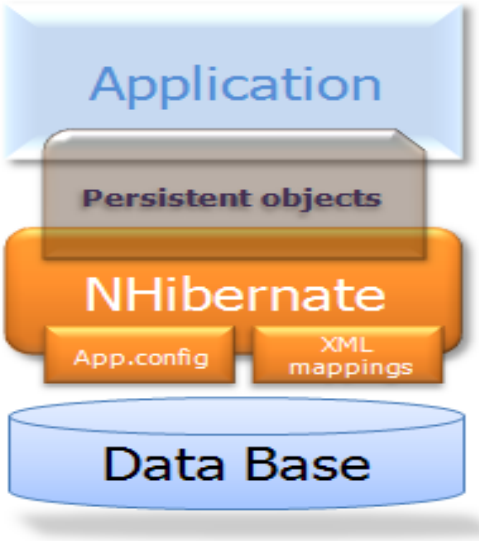

Figure 3.12: Nhibernate Architecture

4. IMPLEMENTATION AND RESULTS

Microsoft.-Microsoft. NET Framework 4.0 is NHibernateMapper's full implementation in C#. This creates a NHibernateMapper.dll class library. Databases and file management classes in all library programming classes can be split into two main groups. The Dbinfo class is a central class of the database retrieval system. It is a model of a schema object database. The schematic information is collected and connected within the DbInfo class, such as tables (DbTableInfo), columns (DbColumnInfo), and restriction information (DbConstraintIfo).

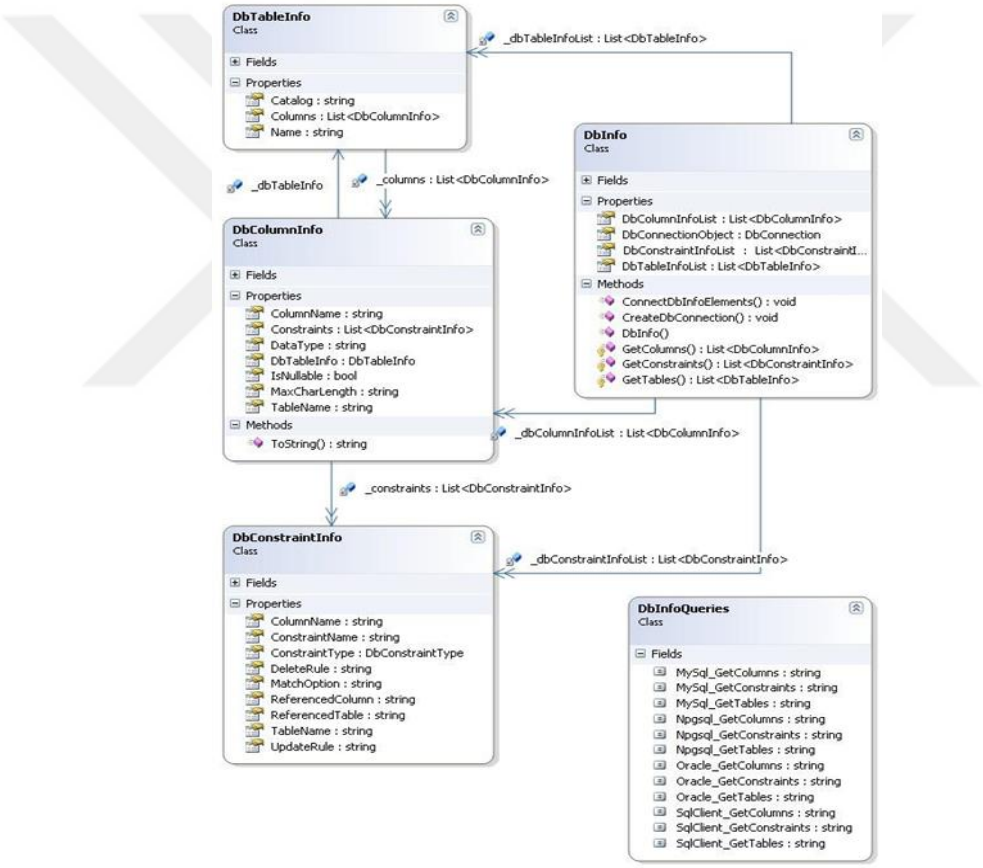

Figure 4.1: Schema Recovery Diagram of classes.

```
private static ISessionFactory CreateNhSessionFactory()//(Assembly _assembly)

{

         var connStr = DBHelper.getDB_CNN(); //
         ConfigurationManager.ConnectionStrings["DB_CNN"].ConnectionString;

       try

       {

                 return Fluently.Configure()

              .Database(MsSqlConfiguration.MsSql2008.ConnectionString(connStr))

                 .Mappings(m=>m.FluentMappings.AddFromAssembly

                 (Assembly.GetAssembly(typeof(ENTUserAccountMap)))

                 .Conventions.AddFromAssemblyOf<PriamryKeyConvention>())

                     .BuildSessionFactory();

       }
```

Figure 4.2: Example of database connection file

Any other DBMS with an. Net data provider is supported in the configurable design. In three steps support for a new DBMS could be introduced:

- Define three additional queries on the database schema to recover information. The questions belong to the class DbInfoQueries. (Tables, columns and restrictions) (Get tables)
- The DBMS Data Provider offered by DBMS Provider (in DLL format). In MySQL we already have MySql and in PostgreSQL we already have MySql.dll. Data.dll usage.
- Change the configuration file to include an added data provider declaration.

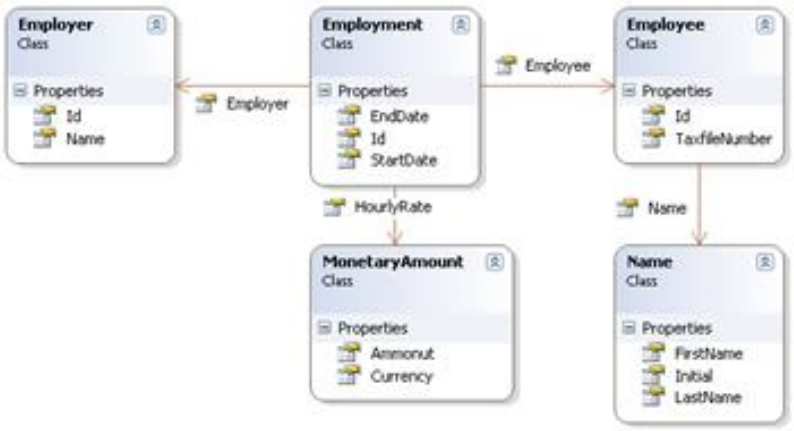

Figure 4.3: Diagram of Nhibernate schema relationships

The XML mapping file object model and system file storage is responsible for the creation and construction of file manipulation classes. Class XmlMapElementInfo manages to map a column for the database with a class character. The main class of this part is XmlMapFileGenerator. The mapped items are connected to each other and saved to an XML file. The architecture of new heuristic algorithms and the "Levenshtein Distance" and "Correspondence Type" are sufficiently flexible.

At the programming level, the mapping generated by the schema definition file shows the Object Model. The developer's scheme definition allows the validation and storage of the XML file. The entire file generation mapping process can be compiled with a code snippet in the above programming classes. The tool aims to apply this in interoperable GIS solutions, as already stated. We tested the GIS database of NHibernateMapper in PostgreSQL.

5. CONCLUSION

NHibernateMapper is a set of scheme mapping tools. This tool was specifically developed for mapping data to dominant model classes via existing databases. Domain classes can be used as a starting point in Ontology. For an authentic object, the mapping specifications for a semicolon were also developed based on the NHibernate ORM. Ontologies provide a consistent mechanism for defining the importance of data and are a suitable way of defining a domain model. The ontology concept can be regarded as a domain object, as represented on the maps of existing relationship databases by ontology as an object. For the application in the area of geographical information systems, NHibernateMapper is primarily developed. It can be combined with a tool that turns ontology into a concept oriented towards an object-a class. Therefore the generation of an access data layer using existing ORM tools should be supported by NHibernateMapper. The use for intraoperative GIS solutions of semi-Automatic mapping and the [4] tool can play a large part in developing data access layers quickly.

A sophisticated new DBMS is provided by the configurable NHibernateMapper design. At present only hibernate mapping is supported by NHibernateMapper. The enhancement plan presupposes the addition to other popular ORM map definitions of the Microsoft Entity Framework. The tool is also meant to be included in the entire WebGIS application source code generator solution.

5.1 SUGGESTION

The Data Access Layer should be generated using existing ORM tools by NHibernateMapper. Through its semiautomatic mapping generation and a tool described in [4], NHibernateMapper can make a significant contribution to the quick development of the Interoperable GIS Data Access Layer.

The advantage of NHibernateMapper is its configurable design, which enables the new DBMS to be intuitively implemented. Currently, the NHibernateMapper supports only Hibernate-

mapping. Enhancement Plan includes an extension to other popular ORM file definitions of the Microsoft Entity Framework. It is also planned to integrate the tool into the whole solution for generator applications of WebGIS source code [14].

REFERENCES

[1] Zhong-ren Peng and Ming-Hsiang Tsou. INTERNET GIS Distributed Geographic Information Services for the Internet and Wireless Networks. Published by John Wiley & Sons, Inc., Hoboken, New Jersey. 2003.

[2] Ravi Sandhu, David Ferraiolo, Richard Kuhn. The NIST Model for Role-Based Access Control: Towards A Unified Standard. 2000.

[3] Mariagrazia Fugini. Spatial Data Security: Analysis Contexts and Authorization Model. Department of Electronic, Information and Bioengineering, Politecnico di Milano.

[4] Murti K C S, Venkat R Tadimeti. A Simplified GeoDRM Model for SDI Services. Bilra Institute of Technology Pilani, India. Proceeding ICCCS'11 Proceedings of the 2011 International Conference on Communication, Computing and Security. 545-548.

[5] Michael Govorov, Youry Khmelevsky, Vasiliy Ustimenko, etal. Security for GIS N-tier Architecture. Developments in Spatial Data Handling, Leicester: Springer Berlin Heidelberg. Peter F. Fisher, 2005. 71-83.

[6] Elisa Bertino, Barbara Catania, Maria Luisa Damiani, et al. GEO-Nhibernate: a spatially aware Nhibernate. In Proc, 10th ACM Symposium on Access Control, 2005,29~37.

[7] Sahadeb De, Caroline M.Eastman, Csilla Farkas. Secure Access Control in a Multi-userGeodatabase. http://gis.esri.com/library/userconf/proc02/pap0355/p 0355.htm .

[8] Samba Sesay, Zongkai Yang, Jingwen Chen and Du Xu. A secure Database Encryption Scheme. Consumer Communications and Networking Conference, 2005. 49~53.

[9] Elisa Bertino, Barbara Catania, Maria Luisa Damiani. GEO-Nhibernate: A Spatially Aware Nhibernate. Proceedings of the tenth ACM symposium on Access Control Models and Technologies. 29-37.

[10] Li Juan. Secure GIS research and application. Zhong Nan University. 2008.

[11] Mariagraza Fugini. Architectural and Security Aspects in Spatial Decision Support Systems. ITAis Workshop, Milan, Dec 19,2013.

[12] Yu,J., Benatallah, B., Casati, F., Daniel, F., 2008. Understanding mashup development, IEEE INTERNET COMPUTING Volume: 12 Issue: 5, Pages:44-52.

[13] Papa, Rocco and Gargiulo, Carmela and Galderisi, Adriana (2013) Towards an urban planners' perspective on Smart City. TeMA Journal of Land Use, Mobility and Environment, 6 (01). pp. 5-17. ISSN 1970-9870.

[14] Mahmoud AL-HADER, Ahmad RODZI. The smart city infrastructure development and monitoring. Theoretical and Empirical Researches in Urban Management. Number2(11)/May 2009.

[15] Sreekanth PD, Kumar KV, Soam SK, Rao NH and Bhaskar Kannoju. GIS-based Decision Support System(DSS) for Recommending Retail Outlet Locations. Information and Knowledge Management Vol.3, No.4, 2013.

[16] George H.(Jody) Tompson, S.Wright Kennedy. Where Exactly is the Target Market? Using Geographic Information Systems for Locating Potential Customers of a Small Business. Entrepreneurial Practice Review, VOL 2, NO 4(2013).

[17] Michele Argiolas, Nicoletta Dessì, Barbara Pes A Web-Based Application Supporting Real Estate Decision Making, Internal Report University of Cagliari, May 2013.

[18] Gang Pan, Guande Qi, Wangsheng Zhang, Shijian Li, and Zhaohui Wu, Zhejiang University Laurence Tianruo Yang, Huazhong University of Science and Technology and St. Francis Xavier University. Trace Analysis and Mining for Smart Cities: Issues, Methods, and Applications. IEEE Communications Magazine , June 2013. Pages:120-126.

[19] Ari-Veikko Anttiroiko, Pekka Valkama, Stephen J. Bailey. Smart cities in the new service economy: building platforms for smart services. Springer-Verlag London 2013.

[20] Mourjo Sen, Anuvabh Dutt, Jennifer Shah, Shalabh Agarwal, Asoke Nath. Department of Computer Science St. Xavier‟s College (Autonomous), Kolkata, WB, India. Smart Software and Smart Cities: A study on Green Software and Green Technology to develop a smart urbanized world. International Journal of Advanced Computer Research (ISSN (print): 2249-7277 ISSN (online): 2277-7970) Volume-2 Number-4 Issue-6 December-2012.

[21] R. De Santis, A. Fasano, N. Mignolli, A. Villa. Smart cities: theoretical framework and measurement experiences. MPRA Paper No. 50207, posted 26. September 2013.

[22] Kaspars Cabs, Arnis Lektauers, Yuri Merkuryev. A methodology for automated geosimulation model generation. International Conference on Applied Information and Communication Technologies (AICT2013), 25.-26. April, 2013, Jelgava, Latvia.

[23] Vimal Gahlot, B.L. Swami, M. Parida, Pawan Kalla. User oriented planning of bus rapid transit corridor in GIS environment. International Journal of Sustainable Built Environment (2012) 1, 102–109.

[24] Hafedh Chourabi ,Taewoo Nam,Shawn Walker. Understanding Smart Cities: An Integrative Framework. 2012 45th Hawaii International Conference on System Sciences.

[25] Adya, J. Blakeley, S. Melnik and S. Muralidhar, “Anatomy of the ADO.NET Entity Framework”. In Chan, C. Y. Ooi B. C. & Zhou, A. (eds), Proceedings of the ACM SIGMOD International Conference on Management of Data, June 11-14, Beijing, China, 2007, pp. 877-888.

[26] P. Castro, S. Melnik and A. Adya, “ADO.NET entity framework: raising the level of abstraction in data programming,” In Chan, C. Y. Ooi B. C. & Zhou, A. (eds), Proceedings of the ACM SIGMOD International Conference on Management of Data, Beijing, China, 2007, pp. 1070-1072.

[27] S. Ambler, Agile Database Techniques, Wiley, 2003.

[28] A. Stanimirović, M. Bogdanović and Stoimenov, “Data Access Layer Generation for Interoperable GIS Environments,” 12th AGILE International Conference on Geographic Information Science, 02-05 June, Hannover, Germany, ISSN 2073-8013, 2009

[29] E. Rahm, P. A. Bernstein, A survey of approaches to automatic schema mapping, The VLDB Journal, Springer Verlag, 10: 334-350, 2001.

[30] H. Su, H. Kuno and E. A. Rudensteinern, “Automating the Transformation of XML Documents,” Proc Workshop on Web Information and Data Management, 2001.

[31] L. L. Yan, R. J. Miller, L. M. Haas, and R. Fagin, “Data-driven understanding and refinement of schema mappings.” In SIGMOD Conference, 2001.

[32] Altova Mapforce, http://www.altova.com/products_mapforce.html

[33] M. A. Goulde, Microsoft's BizTalk Framework adds messaging to XML, E-Business Strategies & Solutions, 1999, pp.10-14.

[34] S. Bossung, H. Stoeckle, J. Grundy, R. Amor and J. Hosking, “Automated Data Mapping Specification via Schema Heuristics and User Interaction,” 19th International Conference on Automatic Software Engineering (ASE’04), 2004, pp. 208—217.

[35] C. Bauer, G. King, Java Persistence with Hibernate, Manning Publications, 2006.

[36] OracleTopLink, http://www.oracle.com/technology/products/ias/toplink

[37] F. T. Fonseca, M. J. Egenhofer, “Ontology-Driven Geographic Information System,” 7th ACM Symposium on Advances in Geographic Information System, Kansas City, 1999.

[38] M. Bogdanović, A. Stanimirović and L. Stoimenov, “Ginis MvcGen – a Prototype of WebGIS Application Source Code Generator,” ICEST 2010, Ohrid, Makedonija, 2010, pp. 307 – 310.