Web Based GIS for Safranbolu Historical City

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SUMMARY

Due to improvements on the technology, web-based Geographical Information Systems become an indispensable part of the projects. Providing and sharing the accessible data of this kind of system, make them popular among the researchers and end users. Thus, web-based Geographical Information Systems are chosen especially for the presentation sections of the projects. Web-based GIS is a tool that uses Internet as a major component to access, distribute analyze and visualize data with different modules. Users do not need specific software in their computer to use these systems. Tourism, publicity of country and economic gains are the main issues related to historical sites of the countries. Because of having lots of historical heritage sites, Turkey takes part an important place among the other countries. Protection and revitalization are the most important issues of the historical heritage sites. UNESCO takes historical heritage sites in to world historical heritage list to protect them. In Turkey, nine historical areas are under protection of UNESCO and one of them is Safranbolu historical city. In this study, establishment of a web based GIS for the Safranbolu Historical city is discussed. During the study, all kind of spatial and non-spatial data were collected related to the registered historical buildings. Using collected data, a geographic database was designed to be served as the main database for the web based applications. Different GIS analysis became possible using different thematic layers which are stored in the system.

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1. INTRODUCTION

Geographic Information Systems (GIS) are now widely accepted as powerful and integrated tools for storing, visualizing, and analyzing spatial data. GIS are usually centralized and need knowledgeable users for effective operation. With Internet technology, GIS was able to make its concepts more open and mobile to everyone thereby facilitating notions such as democratization of spatial data, open accessibility, and effective dissemination (Dragicenvic, 2004). These advanced systems have helped better and faster information flow and transportation. Due to world-wide migration, people are now more exposed to diverse cultures, customs and traditions. Rather than using the power of computer technologies to just disseminate information, computers and the Internet should be used for engaging people in reflective, critical thinking about what they are being taught and the way they perceive life, society, and culture (Barak and Rafaeli, 2004; Dori, 2007; Jonassen et al. 1998, Barak et al. 2009).

Nowadays, it is possible to conceive a new type of GIS project based on a client-server approach using a relational spatial database where all data (e.g. geometric, alpha-numerical) can be collected together and directly managed by the client application on the WEB (Rinaudo et al. 2007). Web GIS (also known as web-based GIS and Internet GIS) denotes a type of Geographic Information System (GIS), whose client is implemented in a Web browser. Early implementations were mainly dissemination of static maps, then interactive maps with pan-identify-zoom features, support for client/server designs, and advanced cartographic and geo-visualization tools (Kraak and Brown 2001; Dragicenvic, 2004). The considerable development of Web-based Geographic Information Systems (Web GIS), which allow for creation, publishing and analysis of geospatial data through the internet without a traditional desktop GIS application, seems to provide the means towards the aforementioned targets. The potential of Web-based mapping and virtual reality technologies for environmental modeling has been considered about a decade ago (Doyle et al., 1998; Kulawiak, 2010).

Web GIS have been widely used for online route selection, city planning, environmental exploration (Kraak, 2004), watersheds management (Kelly, 2001), land-use planning, road/rail construction (Slater 2002), business analysis (Shen, 2001), airport construction (Galinao and Brennan, 2002), and data integration and dissemination (Takatsuka and Gahegan, 2002), just to name a few applications. Web GIS focuses on how to allocate spatial data, both raster and vector (Goodchild, 1992; Yang et al. 2005), in a client–server-based web platform, as well as on how to allocate functions to different system components in processing these data to satisfy users' needs (Yang et al. 2005). Our review includes three parts: raster data transmission, vector data transmission, and other performance-related computing techniques used in the client–server model.

All international organizations now use the term “Cultural Heritage Documentation” which indicates an interdisciplinary work where all the specialists involved in detailed investigations on an object of interest collect, interpret and share the data and the results of their interpretations on a common platform in order to allow a general understanding of the object itself and an integration of the collected information (Rinaudo et al. 2007, Seker et al. 2010). New opportunities and challenges for the development of Web based GIS applications in the field of cultural heritage have been the direct effect of advances in the field of surveying and Internet-related technology. Web based GIS have been used for data distribution in the cultural heritage world along these systems are integration with geographic data and assistance systems. As a matter of fact, an archaeological Web GIS may become a valuable tool in educating people about the past, by convincing them about the need to preserve our historical heritage and demonstrating that archaeological sites are a limited resource. Thus, special focus has been put on the design of a visual environment that provides Web users with a friendly and usable interaction method (Sebolli et al. 2003).

The purpose of this study is established an internet based information system and cooperation system for the documentation of the old part of the city of Safranbolu. For this purpose, all data from different sources with different resolutions are brought together in GIS. All the constructions in Safranbolu will be recorded permanently and architectural features of them will be created database. In this way, this study will be reference for future studies. In addition, by the help of web based GIS which is the fast way to reach the information, the system will be help to increasing the number of tourists reaching the data much more and easy way and increase in the cultural heritage tourism.

2. STUDY AREA

In this study, Safranbolu was chosen as the study area. It is located in the inner part of the Western Black Sea Region. Safranbolu is a typical Ottoman city that has survived to the present day. It also displays an interesting interaction between the topography and the historic settlement. Safranbolu is one of the significant examples of a well preserved human habitation in its original surroundings in the world. Calling Safranbolu as “The Capital of preserved cultures” is quite suitable since the preservation has been accomplished at a city scale. Safranbolu is the result of wealth and prosperity gained at the most powerful period of Ottoman years and the accumulation of a long lasting history and culture. Today, Safranbolu is a special city which carries all characteristics of traditional Turkish daily living and presents its historical and cultural properties in its original surroundings to the people of the world (Figure 1).

Figure 1. General view of Safranbolu historical city (Günay, 1998)

There are numerous historical places in the city 1300 of which are under protection. This number constitutes an important portion of 50 thousand historical places which are under protection in the country. Those places which are under protection at two different locations turned Safranbolu to a vast museum. Its cultural heritage and successful protection has made Safranbolu gain worldwide reputation which has provided the city for joining the UNESCO World Cultural Heritage List in 1994 (URL-1, 2005).

Safranbolu consists of four distinct districts - the market place area of the inner city, known as Cukur (The Hole), the area of Kirankoy, Baglar (The Vineyards), and an area of more recent settlement outside the historic area. The city has about 2000 traces that are being protected in the natural tissue as an expression of the historical and cultural wealth. Rock Graves, mounds, Caravanserai and Turkish Baths, The Old Mosques, Shopping Districts, Water Vaults, Fountains, Tombs and Historical Houses are some of the traces that have survived.

Safranbolu has won its first fame with its buildings that have a traditional and special architecture. These houses are wonderful architecture samples that show Turkish society life of 18th and 19th centuries. These splendid houses which carry the effects of crowded family structure, economic wealth and local climate properties are defined as "five sided architecture" because of their roofs (Aksoy ve Kuş 2001).

Safranbolu houses are the buildings with 2-3 floors, 6-8 rooms, balconies, and lots of windows in every room. In these buildings; esthetical use of stone, unbelievable quality of woodwork, ornaments of wall and ceilings, pools inside the houses, stairs and door knockers (URL 2). In Figure 2 different cultural examples are given.

Figure 2. Different cultural house examples of Safranbolu

3. DESIGN AND DEVELOPMENT OF WEB GIS

The study presented in this paper, as indicated above, purposes to provide a solution in the form of the development of a dynamic data model which would resource the development of the ability of web based GIS (Figure 3) technology to provide the user with faster response time and updated temporal and attribute information, as a normal part of a location-based service. The area of attention of the web GIS user variances, the relevant spatial, temporal and attribute information within each of the areas of interest is updated constantly according to the location and time slot of the web GIS user. The submitted Web GIS offers added value in the form of providing the end user with sectional and synthetic, both spatial and temporal, environmental information through a remotely customizable user-friendly graphical interface (Kulawiak, 2010).

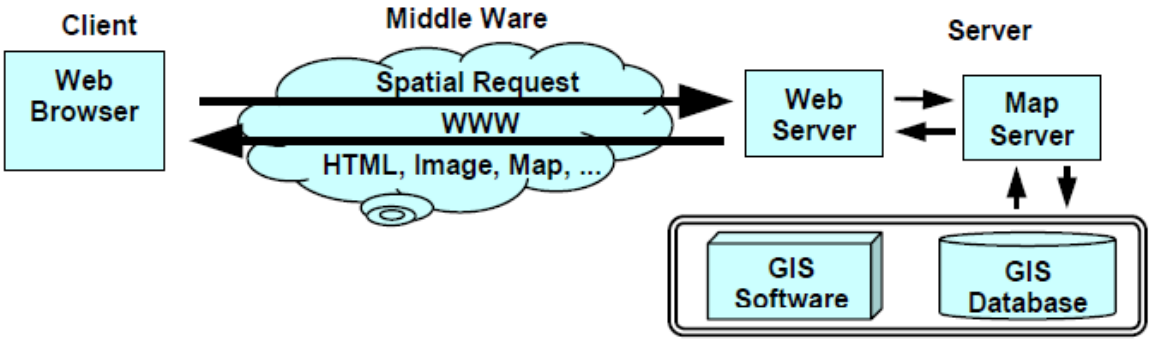


Figure 3. Typical Web-GIS model workflow

The types of data that the system allows to manage are (Meyer et al. 2006):

- temporal data (description of historical periods)
- spatial data (description of places of the archaeological site)
- different sorts of plans that have been digitized (maps, sections, plans, excavation profiles)
- digital photos or ancient photos digitized
- scanned drawings
- scanned texts
- vectorial plans
- 3D models

In general, a GIS manages the following: spatial information, temporal information, attributes information and topological relations. Spatial information describes the location and shape of geographic objects in which the user is interested. Attribute information describes the property, quality and characteristics of geographic objects. Temporal information describes the changes over time in geographic objects, while topologic relations describe the topological relationship between geographic objects (Shi et al. 2009). These techniques will be especially critical in the deployment of large-scale data dissemination projects.

Developing a Web GIS is more than simply buying the appropriate hardware and software. Several strategies have been proposed to provide successful implementation (Alesheikh and Helali 2001).

Because of forming the Geographic Information System can transferred and serviced, first a server computer that installed Windows Server 2003 operating system was needed. Available databases are transformed with the interface of ArcGIS Server on the internet. With created current services, the new web application is created. During this process, attributes of the layers, which are precedence and how they are appeared, are determined (Figure 4).

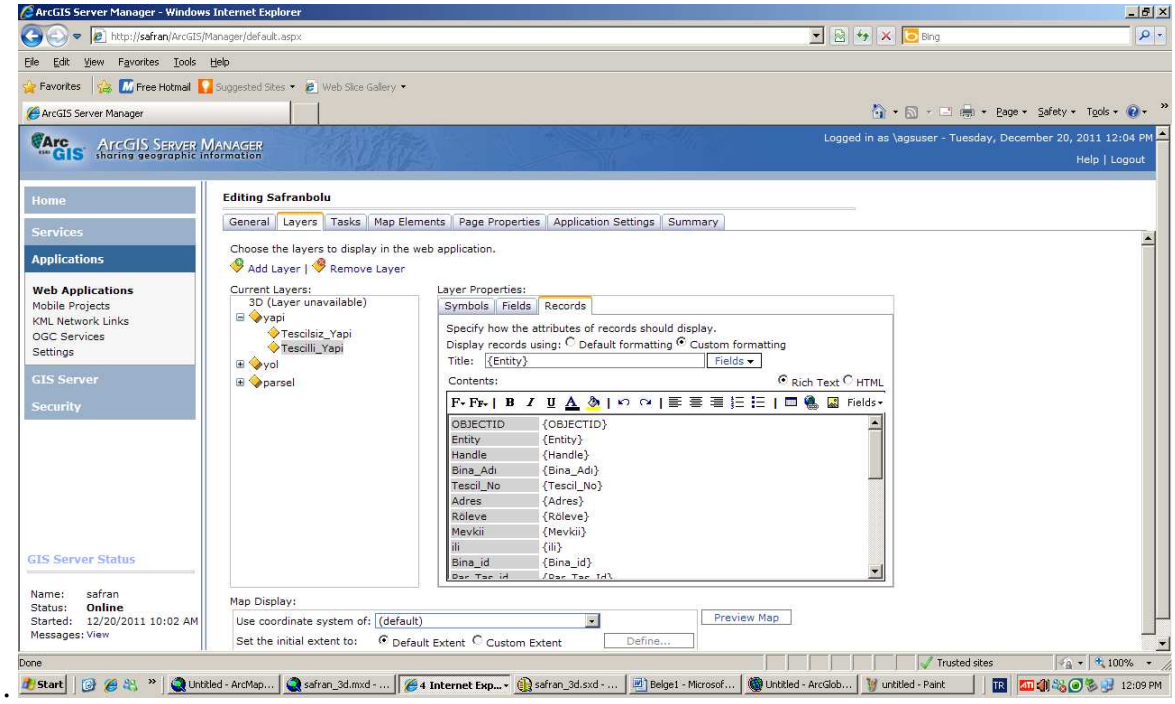


Figure 4. Creating layers of the Safranbolu historical city

The Web GIS we propose provides users with different modalities of query formulation, according to geographic components to be investigated. The next stage, three query functions was separately created as for the name of building, the number of Registration and the name of street to. In this query types, the user sees what they want and when the selection are made

in these lists, the election result is selected on the chart. Users can use the map Interactively by performing GIS functions such as zoom, pan, identify, and queries (Duran, 2003).

Using the Web GIS requires an HTML browser on the client side. At the present, it can be visited at http://www.dmi.unisa.it/research.html. Information System consists of three separate windows and a toolbar. As it can be seen of the first window being in the map, the second of the window that control layers and finally, the window that display the results of searching. As for the toolbar, there are the basic tools and functions which we are formed the web application when they are created.

The user with the generated information system can easily reach data that about wants parcel and building with information button. User can reach historical knowledge and image the object chosen with links (Figure 5).

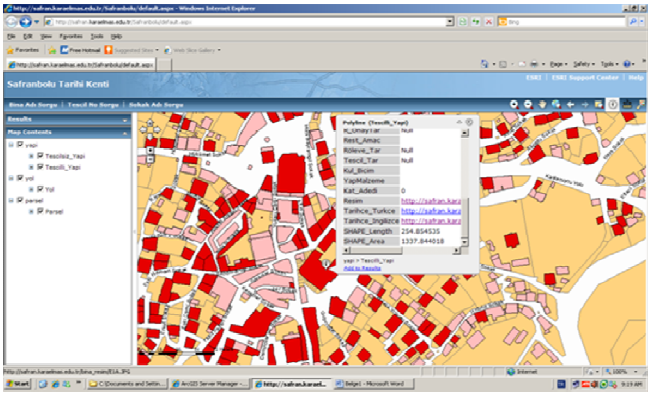
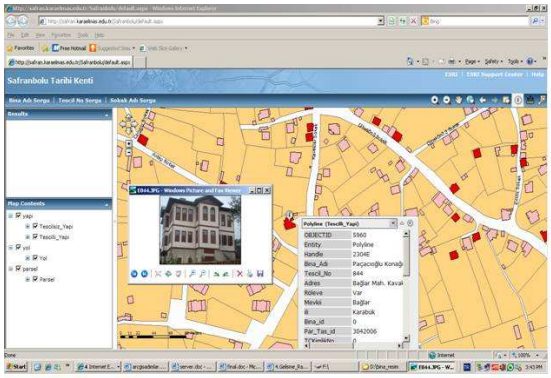


Figure 5. View of attribute data of Safranbolu database

Information system which opens access over the Internet allows two different query types. These are the list query and the searching query. The results that are found as a result of the query are listed in the “Results" window. The list of in this window, with selecting the building, the command of representation to the convergence or attribute information may run (Figure 6).



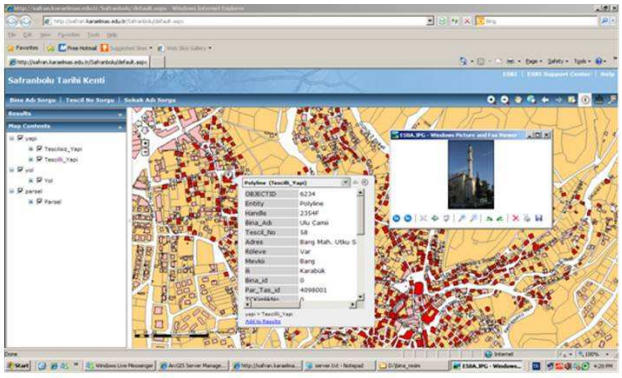


Figure 6. Query Results and Attributes on Web-GIS

5. CONCLUSIONS

Cultural heritage protection is a key matter today worldwide. There are innumerable cultural heritage sites all over the world. Preservation and documentation of these is an important matter. Turkey has a lot of historical cities and areas under different threat and they should be restored as soon as possible. During these relief or restoration studies the mapping step is certainly needed and the time is another important phase.

Safranbolu has been included in the "List of World Inheritance" by UNESCO in 1994 and as a world city because of its success in protecting its natural heritage is just an example in Turkey. Recording analysis, protection and revitalization of cultural heritage sites are being undertaken by different approaches.

The result is a GIS tool that, despite of its internal complexity, allows non-expert users to simply and quickly perform several tasks, like general or detailed context overview, data elaboration, and thematic maps plotting. In the project, all data (photos, videos, architectural drawings etc.) related to selected historical building are presented on the internet. The Web Information System allows recording, making use of and representing data of any Cultural Heritage site. By this way many web users have opportunity all over the world to visit one of the cultural heritages of Turkey and they have the opportunity to make different queries about the Safranbolu. Similar studies preserving of the cultural heritage sites should be encouraged and supported by the decision makers. It was seen that, based on the extracted results, development of an information and management system for recording analysis, protection of cultural heritage sites of Safranbolu can successfully integrated to the web GIS environment.

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