

CULTURAL HERITAGE PRESERVATION USING INTERNET-ENABLED GIS

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ABSTRACT:

Cultural heritage preservation makes necessary to produce an initial technical documentation to be able to establish the plans which allow to develop suitable approaches for protecting. Recent developments in the scientific methods of documentation influenced the conservation approaches to historic areas. In the past, conservation efforts focused on absolute preservation which meant preventing changes. The newer technologies like Geographic Information System (GIS) greatly facilitate the inventory, evaluation, and preservation of historic sites and allow heritage structures to be reused by planning alterations. This project presents a research for historical documentation and also a presentation using GIS and Internet Technology which allows public access to information. In this study, Fatih district of Istanbul was selected as a pilot region because it is one of the oldest settlements of the city that bridges the two continents of Europe and Asia. This study represents the interactivity of the Internet users and the spatial data as well. It is expected this web-based GIS to help the public to form a view on the development process of their urban environment. System monitoring will allow public for change detection and revealing of positive and negative impacts in time. In order to determine present status of the study area, data were acquired from different sources. Then those data were compiled by using GIS softwares for the purpose of various analysis. Public access to the information is provided on a configured web site by using Internet Map Server program. This study serves a software-independent solution to use GIS data and functions. The model facilitates easy maintenance and update data.

1. INTRODUCTION

Today, many of historic urban areas in the world are endangered by long term influences like traffic, air pollution or destructive events causing heavy damage like earthquakes, fire, war etc. For preserving cultural riches, we have to determine and register them. It is necessary to produce an initial technical documentation to be able to establish the plans that allow for developing suitable approaches for protecting. Access to all information related to historical areas is the key for the protection and presentation. For this enormous amount of information, the existence of a heritage information system is essential. So the possibility of implementing of an information system in maintenance of cultural heritage opens the opportunity to control the preservation and interventions.

The newer technologies like Geographic Information System (GIS) greatly facilitate the inventory, evaluation, and preservation of historic sites. A GIS is an organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information. Through a variety of data manipulations and queries within a GIS, we can answer all questions that are necessary for protecting management.

The spatial information is being shared over the Internet. Through distributed geographic information, users have easy access to large databases. Internet technology and GIS provides a group of advantages to simplify the management and to access to the information. Use of internet technologies to provide access to spatial information and GIS on the internet provides the comprehensive documentation and management of cultural heritage.

In this study, Fatih (Zeyrek) district of Istanbul was selected as a pilot region because it is one of the oldest settlements of the city that bridges the two continents of Europe and Asia. Zeyrek is situated at the slopes of the fourth hill in the Historic Peninsula in Istanbul. It is a typical quarter of old Istanbul. The district assumed the name of Zeyrek during Ottoman times. As in most other areas of old Istanbul, fires have caused much devastation in Zeyrek. These fires had a negative effect on the social and physical structure of the area.

2. DATA AND TOOLS

Data were provided from Municipality of Metropolis Istanbul in the scale of 1:1000 digital maps. Data were Micro Station file format (dgn). The study area was evaluated in Arc View software that is GIS software developed by Environmental Systems Research Institute (**Figure 1**). ArcView was used for browsing the data and examining the datasets. ArcView shapefile data format stores the geometric and attribute information for the spatial features in a data set. A shapefile consists of a main file, an index file, and a dBASE table. The geometry for a feature is stored as a shape including a set of vector coordinates. Shapefiles can support point, line, and area features.



Figure 1: Study Area

Attributes are held in a dBASE format file. Each attribute record has a one-to-one relationship with the associated shape record. Attribute information of the features such as name of the quarter, name of the street, number of the door, functionality of the building, basement, medium floor, roof, total floor, condition of the building, registration, name of the building, construction date, financer, style of the building etc. were stored in the database table. In the index file, each record contains the offset of the corresponding main file record from the beginning of the main file.

An example for a shape file naming convention

- Main file: binalar.shp
- Index file: binalar.shx
- Database table: binalar.dbf

The graphical and geometrical data generated from digital maps and other graphical external files (like digitized plans, amateur photographs etc.) and the alphanumeric data related to the graphical data were linked and managed together by the GIS software Arc View 3.2 for creating a geographic information system. In this study, Arc/Info GIS software has been used for the establishment of topology of the coverage, which is the basic unit of storage. Then the coverage has been imported to Arc View software for several query and analysis advantages. Digital data in dgn format have 25 different layers. These digital data were transferred into AutoCAD file format and the number of these layers reduced in AutoCAD. **Figure 2** shows the main layers.

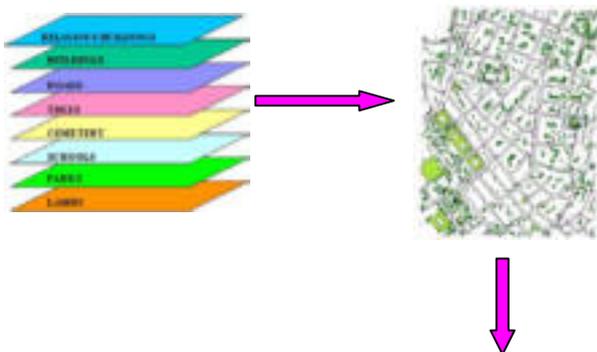


Figure 2: Data Structure

2.1 Heritage Information System on the Internet

Geographic Information can be distributed in any form over the Internet such as static map images, simple map services, or advanced GIS. In this study, mapping application type is dynamic web browser which means that the Internet sends map parameters, and the map image is formed according to the setting parameters. In **Figure 3**, the architecture of the dynamic map browser is shown.

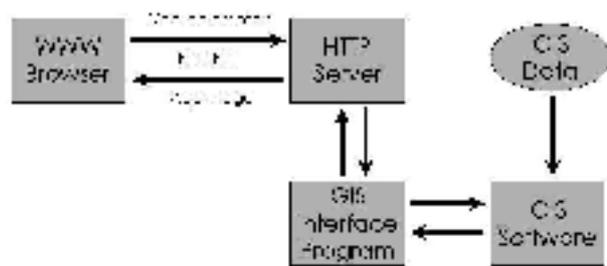


Figure 3: Architecture of Dynamic Map Browser

The tools used in the study for creating such an architecture are Map Objects ActiveX software component and Map Objects Internet Map Server (MOIMS) software. Map Objects builds GIS application and MOIMS is a gateway program between Web Server and the mapping application. In the study, these tools were embedded into a Visual Basic file. All map layers and functions on the web page were added by writing codes in the Visual Basic. Microsoft Personal Web Server program was used for information sharing over the Internet.

Map Objects ActiveX software component has the following functions:

- Display a map with multiple map layers, such as roads, streams and boundaries.
- Pan and zoom throughout a map.
- Draw graphic features such as points, lines, ellipses, rectangles and polygons.
- Draw descriptive text.
- Identify features on a map by pointing at them.
- Select features along lines and inside boxes, areas, polygons, and circles.
- Select features within a specified distance of other features and more...

Data layers, data types, feature types, and file formats for serving over the Internet are shown in **Table 1**. **Figure 4** displays the web page.

Layers	Data Types	Feature Types	File Format
Orthophoto	Raster	Image	Tiff
Trees	Vector	Point	Shp, Shx, Dbf
Roads	Vector	Polyline	Shp, Shx, Dbf
Parks	Vector	Polygon	Shp, Shx, Dbf
Schools	Vector	Polygon	Shp, Shx, Dbf
Buildings	Vector	Polygon	Shp, Shx, Dbf
Religious Buildings	Vector	Polygon	Shp, Shx, Dbf

Table 1: Geodatasets

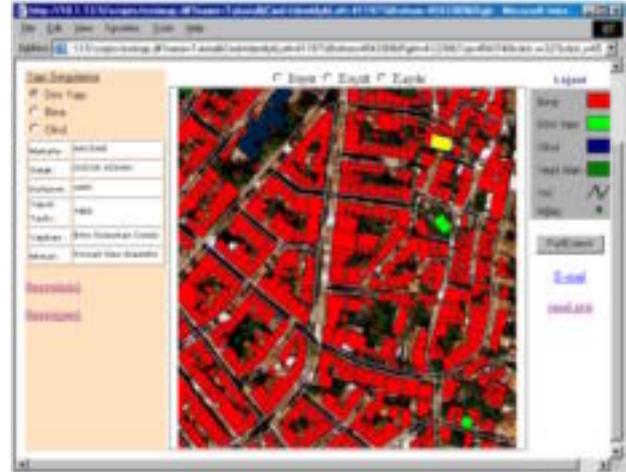


Figure 5: Query Results

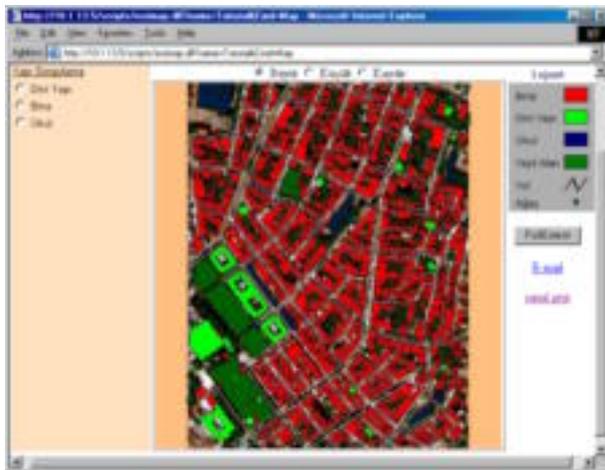


Figure 4: Web Page

The web page contains an interactive map container, which displays the map layers, a toolbar column, which is used for querying buildings, and a legend column, which is an explanatory table of the map features. Users can use the map interactively by performing GIS functions such as zoom, pan, identify, and queries. There are radio buttons for querying the buildings on the map. Clicking a feature on the map one can perform a spatial query. In order to query on a layer, its radio button is activated. Then a feature related to active layer is clicked on the map. The query results will be displayed in a table on the left column (Figure 5).

3. CONCLUSIONS

In this study, approximately 2000 records have been entered into the database. The final product is a software-independent web-based GIS for the study area that provides the comprehensive documentation of cultural heritage. This study represents the interactivity of the Internet users and the spatial data as well. The web-based information system will help the public to form a view on the development process of their urban environment. Continuity of the system and monitoring will allow for change detection and revealing of positive and negative impacts in time.

The very high value of online GIS is apparent. It combines the advantages of both GIS and the Internet. Information will be available for several different types of user. The solution performance can be changed according to the needs of the user by simply reconfiguring the server. The approach to access information will take some time for communication between the client side and the server side. There will be subsequent improvements in the techniques to make it more efficient.

Cultural heritage documentation and Internet GIS study comprise a wide range of objects, disciplines and technologies. So co-operation between different scientific and professional disciplines is necessary.

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