

ARCHITECTURAL HERITAGE & NEW TECHNOLOGIES

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The architectural heritage is a live and integral part of the social life of a place and not a dead past that serves an object of study for scientists. According to the perception that there is neither present nor future without past, the further study of all those historic elements that have been tested through the years is an essential requirement for their preservation, rehabilitation and re-incorporation in the urban planning tissue.

The admittance that each area should be confronted based on its special characteristics in combination with the study of the prerequisites of architectural heritage's cultural values leads inevitably to the necessity of creating a system capable of encompassing, incorporating, presenting and analysing all the equivalent information.

The object of this announcement is the presentation of a Geographic Information System (G.I.S.), because of its capability of creating an integrated procedure where data collection, analysis and decision follow a sequential flow.

Such a system contributes to the proper, faster and easier management of the information (data), whilst it has a "dynamic" character since its database can be modified and updated. Furthermore, the use of multimedia leads to an in-depth and complete approach of a Spatial Decision Support System (S.D.S.S.), which can be utilized as in culture and education as in economy sector.

The system contains geographic and attribute data, structured in such a way that will ease the transition from the general to specific information i.e. from small to large scale. Hence, the user will be capable of acquiring information as in the level of a preservable building as in the level of the totality of a historic town.

This system can be implemented in the historic center of Athens. Its role as a S.D.S.S. will serve the necessity of study for the development, restoration and re-use of the historic framework and the generation of applications such as multi-thematic routes (classic, roman, Byzantine, Turkish or modern period routes), serving educational, cultural and economic objectives.

I. ARCHITECTURAL HERITAGE:

The term "architectural heritage" according to the "Pact for the preservation of the architectural heritage of Europe" comprises of the following properties: The monuments, concerning every structure especially significant due to its historic, archaeological, scientific, social or technical interest. The architectural sets, which are regarded as homogeneous totalities of urban or rural structures that can be demarcated in ground. Significant historic places, concerning the compositions of human and nature works, forming areas so homogeneous and characteristic that can be easily surveyed. Thus, architectural heritage contains not only the structures of excellent quality and their direct environment but also cities or villages of particular historic or cultural interest. The potential of architectural heritage and the reasons for its conservation have nowadays become more obvious. A new type of urban planning focuses on recreating the "enclosed" areas, the human scale of a city with the social and cultural variety that existed in the urban tissue of the old cities. Additionally, the rehabilitation and reuse of the historic buildings with uses that can correspond to the modern lifestyle can intrinsically contribute to the resources conservation and the waste avoidance, issues of critical interest in the modern society. Therefore the implementation of a system that would be capable of combining, managing, visualising and analysing all those elements of architectural heritage that exist not only in the level of historic buildings but also in the wider area of a city, is quite significant and critical.

2. IMPLEMENTATION OF A G.I.S. :

A G.I.S. is a computer-based information system that enables capture, modelling, manipulation, retrieval, analysis and presentation of geographically referenced data. Such a computerized mapping system consists of a database containing location and attribute information, combined with computer software for organizing the data and the hardware needed to run the system. It is intrinsically, like any information system, a multi-faceted entity consisting of hardware, software and data and going through several processes, from conception through design and implementation, to use. Therefore, after clarifying what the system is required to do and how it should be designed, the implementation stage is faced during the system development.

Most commercial GIS packages provide a range of functionalities, categorized into the next five areas:

- a- Data acquisition
- b- Preliminary data processing
- c- Data storage and retrieval
- d- Spatial search and analysis
- e- Graphical display and interaction

At the heart of any GIS is its database that forms the most critical issue for the implementation of a G.I.S. The quality and quantity of data is inevitably responsible for the results retrieved from spatial queries and analyses. Having invested much whether in time or money, it becomes imperative that the resulting database should be managed in a way that both exploits and preserves its most valuable asset, the data. There is a variety of characteristics that should be met by the database in order to be useful such as data integrity (i.e. correctness and consistency of available information), avoidance of redundancy, need for security and provision of concurrency.

3. DESIGN OF THE SYSTEM:

The aim of this paper is the presentation and design of a Geographic Information System capable of incorporating, presenting and analysing all the relevant to the architectural heritage information. The potentiality of its database to become an inventory of not only the historic buildings of a study area but also of architectural and urban planning sets, is of top priority.

Additionally, the database of the system should be structured in such a way as to allow future updates and upgrades of data and its purpose should focus on providing not only a means of efficient data management but also a better maintenance of the most important information concerning the field of architectural heritage. The creation of a GIS will help in achieving the linkage of the database information to a digital map in order to manipulate the historic data on a visual geographic base.

Furthermore, the necessary criteria that should be taken into consideration for the creation of such a GIS entail the following:

- a- Capability of storing and manage a large and diverse amount of data
- b- Query and retrieval of all the available information
- c- Upgrade of the system in terms of more data input and easy update (dynamic and "open" character of the system).
- d- Easy use and access of the system since it is addressed mostly to people with little computer knowledge (User friendly Graphical User Interface).
- e- Capability of analysing and visualizing all available data and defining potential trends.
- f- Multimedia integration in order to achieve a more in-depth and complete approach of a Spatial Decision Support System (S.D.S.S.).
- g- Easy transition from general to specific information; i.e. from small to large scale or else from the level of the greater area of a historic town to the level of a specific monument.

4. USES OF THE SYSTEM IN THE STUDY AND MANAGEMENT OF ARCHITECTURAL HERITAGE:

There are a great variety of uses of a G.I.S. that can be applied in the field of architectural heritage. Issues such as information accessibility and dissemination, efficient and accurate map storage and updating, site monitoring, site maintenance and planning are especially significant in achieving the desired results of preservation and development of architectural heritage.

Of the many sorts of information disseminated, maps are among the most useful since they form the most indispensable illustrations in any case study such as comparative studies and research, heritage planning and management and analysis of threats. Maps have the additional benefit of being a graphical rather than a textual information source, and therefore understandable by people of diverse educational level or even from different countries.

Furthermore, the provision of spatial information access across departments of governmental bodies or municipalities is of great significance. This information previously existed only on separate maps in different offices. However, with the use of a GIS, spatial data can be combined and transmitted as needed. Since a GIS is a digital form of information, it can also be displayed

or downloaded via the Internet. The World Wide Web is an ideal medium for the dissemination of spatial information, as it permits graphical display and rapid updating and transmission. It is not only preservationists and researchers who could make use of such information. Students from the university level to elementary school age can now access and use the information disseminated in the Web. Efficiency of space is another quite critical benefit derived from the use of a G.I.S. A computer workstation with a plotter could fulfil the same storage and reproduction needs in at least half the space that is needed for the respective hard-copy maps, and provide greater flexibility in using and updating the data. Moreover, space efficiency can be achieved by the capability of each map to play the role of many different maps depending on the diversity of needs. Elements within the layers can be reclassified to create specialized thematic maps, e.g. to show only those monuments with handicapped access. Even more important than storage considerations are issues of accuracy. Regular updating of spatial data reduces the possibility of error from the use of the data, and also provides an ongoing record, which can reveal trends as well as spatial relationships. Spatial data is much more easily updated once it has been digitised, since the entire map does not need to be replaced but only the portion of data that is being updated.

Moreover, the capability of site monitoring is one of the most important aspects of achieving the conservation of a site. Monitoring is necessary to ensure that conservation goals are being met and to allow recognition of potential threats and emergencies. As already mentioned, a larger-scale approach is needed in the study of most historic sites. Apart from preservation and restoration of built structures, there should be a trend towards the protection of larger sites and of monuments surrounds. This trend also calls for new tools and methods for site documentation and management, provided by a G.I.S.

Systematic monitoring including observation of the site, the identification of threats, the identification of decisions and actions to be taken, can be significantly assisted with the use of a G.I.S. Additionally, satellite images, pollution measurements, and other current data can be most easily compared with spatial features such as historic monuments and towns and integrated with other multimedia in a G.I.S.

On the other hand, site maintenance ensures that a site's cultural or natural value will be protected for future generations. By organizing all information, a GIS can help a site manager make informed decisions regarding maintenance priorities. A GIS can cross-link spatial data to attribute data such as the date of installation, date of last servicing, and any other information which may relate to maintenance.

Finally, preservation planning is perhaps the most effective use of a GIS, since careful planning can prevent some threats to architectural heritage sites before they become problems. One of the most important uses of a GIS for the heritage would be in the planning of tourism. Tourism planning can play an important role in the protection of sites. For example, some sites are over-visited while others have not yet been discovered by tourists. One way to protect over-visited sites is to divert tourism to other sites. Which sites to develop for tourism should be decided not only on the basis of the sites' cultural or natural interest but also on their ability to support tourism. For both natural and cultural sites, a tourism carrying capacity can be calculated using a GIS.

Analysis of spatial and attribute data is a quite simple task in the environment of a G.I.S. Some types of analysis, such as classifying monuments by age and type, can be done statistically with the results displayed as text and numbers. A GIS allows the user to see spatial relationships such as clusters of sites or patterns of distribution allowing the creation of possible tourist routes. It is the automatic and rapid display of selected spatial data that allows a researcher to explore many alternatives and to perform a complex analysis in a reasonable time period.

5. THE CASE OF ATHENS:

In studying the architectural heritage of Athens we are looking at the development of an ancient city-state that played a very important role in the formation of European civilization. Athenian accomplishments in art, architecture, politics, philosophy, literature and drama are well known. A GIS system that integrates, demonstrates and analyses all available information of the architectural heritage of Athens, helps us to understand the context of these achievements and institutions more completely. Moreover, the implementation of a G.I.S. in the city of Athens would be of great interest and benefit towards two directions.

The first direction concerns the study of the historic city whether it refers to urban planning sets or individual monuments. Athens is a complex society that passed through numerous stages of social and cultural development in its long history which are depicted in its urban planning tissue. Thus, there are prehistoric footprints and also ancient, classic, hellenistic, roman, Byzantine, tourkish even more recent areas demarcated in its current urban tissue.

Therefore, the creation of a database that entails and combines all these different eras and its implementation in the modern world, helps as the researchers of private sector as the public sector in the complete and accurate comprehension, surveying, and exhibit of the urban planning sets. Conservation rehabilitation and preservation of these sets are also quite important factors for the development and promotion of their architectural heritage. Furthermore, individual monuments inside the current tissue of the city such as Acropolis and Byzantine churches, can be integrated in the prementioned GIS. Their exact location and demarcation, their incorporation in the urban planning tissue, the potential of observing and studying them and finally their correlation with culture and humanity can be easily offered by the new technology.

The second direction of the use of new technologies and most probably the one that interests the citizens is the point of connection and composition of the tradition with modern human. Therefore, a GIS can be utilized for educational and training needs, serving different categories of people (i.e. students, employees, tutors e.t.c.) and aiming to the popularization and interrelation of the architectural heritage with modern human and his life in Athens. The same result, as in the level of monuments as in the urban planning totalities, can be achieved if such a system is accessible through the Internet. The World Wide Web is an ideal medium for the dissemination and use of spatial information to public.

On the other hand, public services and all the responsible sectors for the life of the citizens of a town, such as Athens, can gain great potentialities using a GIS and especially its enormous database. For example the Water Company knows any time where to pass its network or what problems they may encounter. Additionally, Metro of Athens, which is currently under

construction, could have accelerated its completion if all the necessary information concerning archaeological sites were depicted in the system. .

Finally, the use of the GIS in tourism especially in Athens, hostess of the Olympic Games of 2004, is quite critical. Under these conditions, the design of multi-thematic routes, the demarcation of historic urban planning sets, the exhibition of monuments and the creation of centres of information (i.e. touch screen machines) are only some of the possible uses of the new technology.

6. CONCLUSIONS:

Geographic Information Systems are complete systems for the collection, storage, management, analysis and visualization of a huge amount of information concerning matters of geographical nature. The creation of such a system that would be capable of serving both the role of a register of the historic buildings and the means of incorporating and presenting all the available information in the level of architectural or urban planning sets, is inevitably of great beneficial to the preservation, rehabilitation and development of the architectural heritage. The design of the system is quite difficult and; thus a careful planning is necessary for its successful implementation. The stage of the collection of all the available information and their quality control, are significantly time-consuming tasks needing all the possible assistance from local authorities, governmental bodies and researchers. The combination of all the geometric and attribute data including the registration and rectification of the former and the entry of the latter in the system demands a lot of work in order for all the data to be in the same coordinate system. By all means, the implementation of a G.I.S. is a very difficult project that however would solve a vast variety of problems and contribute to a planned development and conservation in almost every aspect of the modern life that is in close relation to architectural heritage. Therefore, the future will be built with strong underpinnings, creating the most suitable circumstances for the evolvement of respect and preservation by the next generations.

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