

Cultural Heritage and Web-Mapping

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SUMMARY

The use of computerized information is a growing part of our society; people use geographic, social, economic, political and environmental information to answer practical questions. Information mining and sharing is therefore of crucial importance: drawings, photographs, documents and surveys information enhance the understanding of resources; map positioning offers a new way to examine resources not only individually but also in relationship to each other. GIS technology is very useful because it offers a powerful set of tools for collecting, storing, analyzing and visualizing spatial data. Finally, publishing GIS on the Internet makes it possible to share information with a large amount of people, thus enhancing the exploitation of resources. The system developed in our Institute is intended to explore such potentialities in the field of cultural heritage; the prototype is based on SQL-server for data and DbMAP ASJ for cartographic publication and data query over the Internet; the extensive use of codes makes the system very flexible.

KEYWORDS: *cultural heritage, webGIS, GIS*

INTRODUCTION

Over the past decades, the concept of cultural heritage has expanded to include different materials (such as vernacular architecture, ensembles of buildings, natural and cultural landscapes) and other objects that are significant to specific groups of society. Moreover, in the twentieth century, the conservation community and the heritage field have undergone an extraordinary expansion and new groups have become involved in the creation and care of heritage. These groups of citizens arrive with their own criteria and opinions on how to establish significance, what merits conservation, and how it should happen. Then, heritage, and the right to make decisions about it, is sometimes the subject of debate between different groups.

In the field of physical planning this problem has been recently recognized and a new planning approach has been introduced: the so-called 'reconnaissance planning' (Kluskens, 1999); the emphasis mainly lays upon the 'planning process' where various actors within the socio-physical organization are given opportunities to contribute to the final decision.

Organizations are now able to supply the public with decision-making environments based around Geographical Information Systems across the Internet, enhancing the two-way flow of information between the public and those governing them, developing communities interested in particular problems and aiding the formation of a democratic consensus in problem areas (Evans et al., 1999). Also in the field of cultural heritage, the role of citizens is very important to reach effective resources preservation, especially for minor heritage. Anyway, it is necessary to document the location, nature and quality of all cultural resources, through a GIS-based cultural resource inventory. The function of the inventory is to provide information that can be used to assist in the site management decision-making process, as well as to enable researchers to access the results of all documents already provided for each site. Our system will contribute to this end publishing data on the Web using different interfaces.

IDENTIFYING AND LOCATING RESOURCES

For heritage preservation and management, accurate location is a key to learn about traditions, settlement patterns and past life ways; identifying and following trends on the landscape requires that we can locate resources on the ground (Deidre McCarthy and Stein, 2001). Resources identified

during the survey provide the information base from which planners and professionals make decisions, develop theories and studies on material culture through structures. Surveys are conducted through the analysis of existing inventories: architectural and archeological constraints, Land and Town Thematic Plan (wetlands, caves, biotopes, natural equipped parks, fauna constraints, controlled and marked properties ex-law 1089/37, controlled properties ex-law 1497/39), master plans of municipalities. Beside structural characters, resources disseminated on the region have been considered, as they hold remarkable importance in the landscape:

- features of historical-testimonial interest ('tratturi', ancient farms, cowsheds);
- elements of the original vegetation.

Surveys may be conducted at different scales and collect different information about each resource; most surveys take the form of either a reconnaissance or an intensive data collection.

Reconnaissance surveys take a more cursory look at building collecting only the minimum of data, while an intensive level survey would involve investigating a structure's interior as well as the background and history of a structure or group of structures, according to Italian standard. We chose to add the use of GPS to standard documentation practices for geo-referencing site plans depicting the location of interrelated cultural resources. During the survey location data (such as the building footprint) and ancillary data (such as the access point from the street) were collected. The precision of the used system is not a problem, due to the representation scale (usually 1:10.000; sometime up to 1:2.000 for urban center). The differential correction of data collected is indispensable only if the representation scale is at the building level.

SYSTEM ARCHITECTURE

The system architecture has been settled holding similar researches and initiatives in due consideration. The analysis is available on the website www.iris.ba.cnr.it/ofanto2004.

Inventories are the core of the system; in each inventory all entries have associated attributes – most of them are used for searches. For example, data set (resource or service), category and sub-category are assigned to each entry of site inventory.

There are also a number of database, developed for the project (on-site surveys) or developed by external agencies for their own purposes. The extensive use of code and relationship archives makes the system very flexible:

- Site-Survey – data about the site
- Site-Municipality – site extended in different municipalities
- Site-Site – sites in relationship
- Site-Map – site without georeferentiation
- Site-Image – Image in relationship with different sites
- Site-Route – Stages of specific routes

The system is based on SQL-server for database and DbMAP ASJ for cartographic publication and data query over the Internet. DbMAP ASJ is an advanced tool for web application developers oriented to build HTML pages, JSP pages and other types of dynamic Web pages (ASP, PHP, etc.) with GIS data view features (vector coverages and imagery) and vectorial drawing editing; the displayed content can be fully customized using an XML project (static file or dynamically produced on the server). The system has been developed using DbMAP ASJ Viewer, a multi-platform client application available for analyzing, displaying, web deploying and editing geometries stored in a relational database. It is an interactive application, specifically created for Database Administrators and for anyone involved in the planning, production and web publishing of geographic information systems. Among the main functions available in the user interface:

- Creating, configuring, managing and publishing XML projects;
- Importing and exporting of shapefiles;
- Connecting and navigating among the spatial database schemes and views;
- Managing the displaying of spatial data, raster and vector (zoom in/out, pan, etc.);
- Creating, configuring, and managing layers and raster/vector overlays;
- Creating, configuring, and managing multiple themes;

- Configuring and managing data queries pages;
- Dynamic list management of layers and themes.

SYSTEM CONSULTATION

The home page introduces the project and allows user to select the Information System or the G.I.S.; the interfaces available for the system consultation are:

- text-based navigation for both 'citizen' (general knowledge about resources, thematic routes and local services) and 'expert' user (in support of decisional processes in land planning as well as in tourism and cultural resource management).
- map-based navigation both to execute the virtual exploration of the region (ancient maps and not georeferenced maps are visualized with a java viewer) and to visualize on maps the search results of text-based navigation (fast connection needed; plug-in not required).



Figure 1: Text-based navigation

Text-based navigation

The user is allowed to search information in the following sections: sites, routes, maps, aerial images, images and documents. The result of a search is always a list of items pertaining to the query. The user selects an item, looks at the data sheet¹, navigates using the proposed links, eventually activating the webgis.

The citizen is allowed to search items using free-text boxes (Sites, Images and Documents) and selecting items in lists (Routes; Municipality for maps and aerial images); brief suggestions for data to be inserted are reported close to the fields in all the masks, so the user always obtains a result.

The expert is allowed to perform also advanced searches using in conjunction all the items selected

¹ Data sheets are dynamically produced from database.

and/or inserted; a description of the search fields follows.

- Sites (876 items, 52 sub-categories): site code (experienced users), denomination, municipality, county, region description, data set (resource or service), site category², sub-category, integrity (good, normal, not bad, ...), property (public, mixed, private, ...), position (accurate or not), actual use (free text), initial use (free text), accessibility, geographical position (latitude and longitude with a distance range). The results are displayed by denomination for default; other criteria are selectable (by municipalities and denomination; by importance and denomination, ..). The result is a list of sites; the user selects an item to view the data sheet (figure 2), with a report about all the related data.



Figure 2: Data sheet of a selected resource

- Routes (50 items, 5 categories): route code (experienced users), denomination, category. Actually, the results is a list of routes; the user selects an item to view the list of sites in the selected route (a map with routes colored according to the category is foreseen).
- Maps (366 items, 8 categories): map code (experienced users), category (aerophotogrammetrics maps, cadastral maps, cultural heritage maps, historical maps, technical maps, topographics map zones), georeferentiation, color, scale, denomination, producer, year, raster/vectorial, municipality, county, region, geographical position (latitude and longitude with a distance range). Actually the result is a list of maps: the user

² Actually the provided categories are Architecture (Military, Industrial, Religious, Rural, Civil), Archaeology and Ecology – for resources – and Hotel, Food, Bar, Entertainment – for services. The open architecture of the system, however, makes it possible to add more categories.

selects one or different items to access the webgis. Maps without geographical references are displayed using a java viewer.

- Aerial images (58 items, 4 categories): aerial image code (experienced users), georeferentiation, color, scale, producer, year, category (plan-photo, ortho-photo, aerial-views), municipality, county, region, geographical position (latitude and longitude with a distance range). The result is a list of aerial images: the user selects one or different items to access the webgis. Aerial images without geographical references are displayed using a java viewer.
- Images (1451 items, 10 categories): image code (experienced users), country, category (original photo, reproduction, drawing, ...), color, description, title, author. The result is a list of images: the user selects an item to view the data sheet (A photo-album is foreseen).
- Documents (748 items, 11 categories): document code (experienced users), title, author, category (atlas, monograph, review, web link, ...), year, publisher, library. The result is a list of documents: the user selects an item to view the data sheet (if the text - both in pdf or jpg format - is available, a links to open the document is provided).

There are also the following functions:

- Homepage link
- Bibliography (a search page for bibliographic sources);
- Glossary (a search page for common terms);
- Meetings (a list of scheduled events);
- News (a list of recent and planned innovations);
- Project (description of the state-of-work);
- Registration (Registered users will be allowed to download selected items);
- Message (to send reports about new sites);

Functional keys are also provided (confirm, cancel and guide - about fields, data and range).

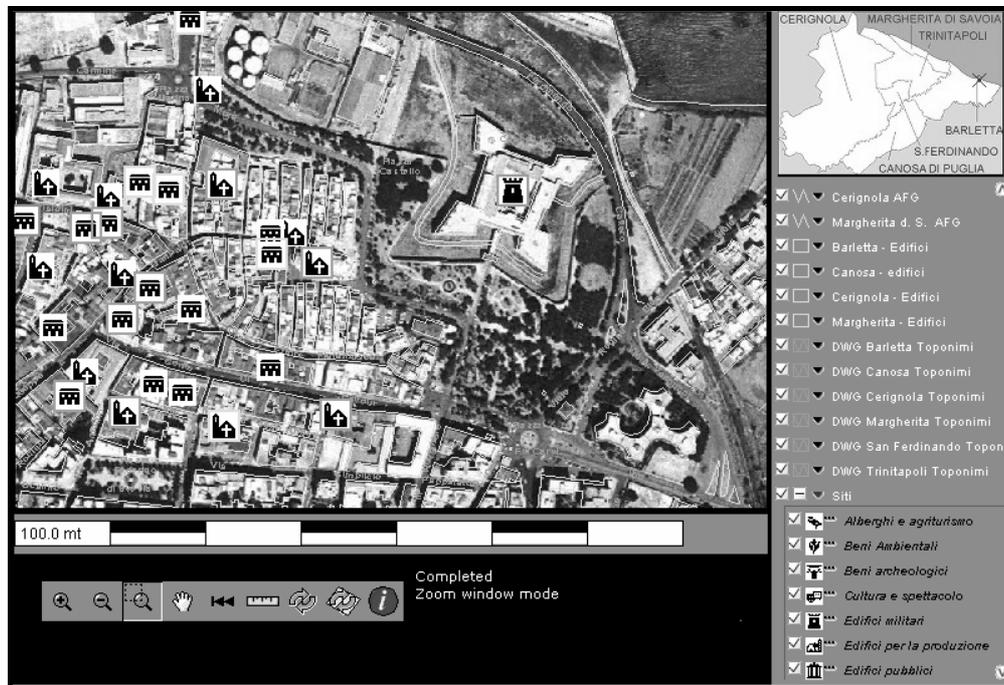


Figure 3: Map-based navigation

Map-based navigation

In the webGIS linked to the homepage the maps are automatically displayed as follows:

- 1:200.00 / 1:100.000 Political map (raster tif); layers: site (simple symbols);
- 1:100.000 / 1:25.000 Roads map (raster tif); layers: site (simple symbols);
- 1:25.000 / 1:10.000 Roads network (vectorial shape file); layers: site (simple symbols);
- 1:10.000 / 1:5.000 Building shapes (vectorial shape file); layers: street and place names; site (icon symbol, colored according to selected attribute);
- 1:5.000 / 1:1.000 Aerophotogrammetric map (compressed raster ecw).

In the webGIS used to display the results of selections in text-based navigation, the maps are displayed as follows:

- The “Citizen” user is allowed to navigate aerophotogrammetric maps at different scales according to the selected Municipality – only the raster compressed format (ecw) is loaded (increased speed);
- The “Expert” user is allowed to navigate all the vector/raster maps selected in the search result list (Maps and Aerial Images).

In any case, maps and layers are displayed according to the current scale. Beside the typical navigation controls, an info key allows the visualization of data about the selected object.

According to the current scale, the site’s location is reported in maps using signs or icons by categories. The perimeter of icons is coloured in accordance with the state of the selected attribute, if compliant (building status³, property, integrity,...).

CONCLUSIONS

The possibility of a better use of the region in the long term, also to the advantage of local communities with specific reference to economic development, closely depends upon the ability to both deepen cognitive processes and disseminate information. By the time the project will be finished, new tools of knowledge and new methods of analysis will be available to the community committed with preservation issues. The future work will explore the possibility and opportunity to assign a special URL to each site, based on its geographical location, thus enhancing data accessibility.

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³ Building status: green=good; light blue=regular; yellow=not regular; orange=bad; red=ruins; brown=destroyed