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Open Source Interactive Map of Albania Cultural Heritage

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Abstract

ICTs represent strategic resources for Cultural Heritage (CH) projects. Anyway, several conditions put the success of promotion projects at risk, especially if carried out at the local level. Firstly, local scale amplifies the weight of budget constraints on the priorities of public administrations, compelled to allocate funds to the physical conservation of heritage rather than to software and training. Secondly, proprietary SW, often sophisticated and complex in procedures, fails to integrate precious unformalized knowledge from local stakeholders and communities, particularly in the field of cultural tourism. Finally, a changing demand for cultural tourism, with potential visitors frequently searching for information directly on the Web before moving, requires a higher interactivity in tools and systems. The paper illustrates the work carried out at the Construction Technologies Institute for delivering procedures and SW specifically designed to simplify the publication of geo-referenced information and reduce the need for specialized skills and equipments. The described results were achieved along different research programs focusing on the Albanian CH with a learning-by-doing approach.

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1. ICTs for Cultural Heritage: the Experience of the Institute

The worthy, virtuous contribution that ICTs can bring to the field of cultural heritage and to heritage-

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related programs is more than acknowledged. Nevertheless, since any process addressing cultural resources is complex and involves well-differentiated activities and objectives, ICTs for Cultural Heritage can not be considered as a single domain, but should be dealt with, more properly, by purpose-driven areas, refining research efforts accordingly.

Undoubtedly, when compared to the phases of collection and cataloguing of knowledge on heritage, presentation and dissemination tasks represent more dynamic steps, potentially able to trigger territorial development by boosting visit-related activities, tourism in the first place.

Among its main activities, our Institute has been carrying out transnational cooperation experiences in the Mediterranean basin under several EU programs; some of these focused on the Albanian heritage promotion.

Though among the smallest countries of Europe, Albania owns a rich and variegated cultural history, with a still vivid tradition. In the whole territory, about 2400 architectural monuments are to be found, such as castles of the ancient and Medieval periods, fortifications, rural constructions, cult monuments as well as iconographic works, post-Byzantine frescos, etc., not to mention archaeological centers and ‘museum cities’ (Butrint, Apollonia, Durachium, Bylis, Berat, Gjirokastr, Krujë, etc.).

All this heritage has long suffered from neglect due to political and economical reasons, but recent efforts in collecting knowledge on sites and their actual state of conservation are being made among regional agencies in a positive attempt of cultural identity awakening, with thousands of photos, drawings and maps accompanying their reports to the central government.

A first map reporting the status of buildings in 50 sites (fig.1) was developed within the ‘A3C - Albania: Conoscere, Comunicare, Condividere’ (*Albania: Know, Communicate, Share*) cooperation project (INTERREG III-A FESR/CARDS Italy - Albania 2004/2006 Proximity Program). The activity was particularly time-consuming due to the acquisition and geo-referencing of maps as well as to the development of the interactive map, so an authoring system to facilitate the interface development was planned.

The screenshot shows a web browser window displaying a WebGIS application. The browser title is "Albania: conoscere, comunicare, condividere - Mozilla Firefox". The address bar shows "http://localhost/pmapper/map.phtml?config=imk". The application interface includes a search bar with "imk" entered, a search button, and a "Ricerca" button. Below the search bar is a form with fields for "DENOMINAZIONE", "DISTRETTO", "TIPOLOGIA", "USO", "PROPRIETA", "PROCLAMAZIONE", and "INTERVENTI". The search results are displayed in a table with columns "N.", "DENOMINAZIONI", and "FOTO".

N.	DENOMINAZIONI	FOTO
4	ABITAZIONE ANGONATI	CASA_ANGONATI.jpg
18	CASTELLO DI GIROKASTER	CASTELLO_GIROKASTRA.jpg
26	CHIESA LABOVA DELLA CROCE	CHIESA LABOVA.jpg
45	TEATRO DI SOFRATICA	TEATRO_SOFRATICA.jpg
50	ANTICO STADIO DI AMANTIA	ANTICO_STADIO_AMANTIA.jpg

Fig. 1. WebGIS (Pmapper version) - Search results for sites needing restoration

In such a context, where diffused ‘minor’ assets far exceed the number of single masterpieces, whole regions can be identified as ‘local museums’ in themselves, the success of which generally depends on their ability to be integral part of a community, rather than mere ‘tourist attractions’. It is crucial, then, to deliver simple and easy-to-use management and promotion tools mainly to local municipalities, enabling them to make their heritage an active resource for social and economical development.

Open Source technologies, such as those implemented at ITC-CNR, offer a two-fold efficacy. On one hand, they match typically operational problems that require easy-to-implement solutions, as is the case with huge quantities of sites to be located, mapped and presented. On the other hand, OS software hits the main target of the latest European Framework Programs and markedly of the ‘Heritage for All’ initiative, whose basic principle, the creation of communities able to autonomously create and document “the digital record of their own societies” and grant their future accessibility [1], quite naturally leads to orientate research towards technologies with specific ‘enabling’ value, up to supporting ‘user created content’. Open source technologies, then, are not just ‘convenient’ for low cost and ease of use; indeed, their effectiveness is farther-reaching. European projects for cultural heritage of the last years – such as CHIMER, CIPHER, COINE – have been focusing on solutions that support ordinary people and communities in building the “living picture of regional heritage across Europe” [2], while at the same time promoting cooperation and exchange. OS technologies, then, will become increasingly central in projects for the heritage, also to the benefit of specific objectives such as technology transfer and capacity building as well as social inclusion and enlarged fruition in relation to weaker user groups.

With specific reference to the issues of visualization and presentation of cultural resources and sites and in line with the areas of interest pointed out in the European Research Network on Excellence in Processing Open Cultural Heritage (EPOCH) Research Agenda [3], the work of our institute focused on the elaboration of an authoring tool in order to support non IT-specialist users in the presentation of assets for promotion purposes. Further work addressed the realization of appealing, interactive virtual tours of resources, in order to capture the interest of as many as possible potential visitors. A specific attention was paid to interactivity of tools, in order to capitalize usability and user experience, which represents a specific concern area for future research; indeed, a greater involvement of end users is seen as decisive for a significant penetration of ICTs in the CH sector [3]. The developments described in the following, started within the above mentioned ‘A3C - Albania: Conoscere, Comunicare, Condividere’ cooperation program, are proceeding and under refinement, with new functionalities, within the ‘SOS – Shqiperia Open Source’ program, in conjunction with IMK (Instituti i Monumenteve te Kultures), the Institute for Monuments of Tirana in Albania. The project aims at promoting the growth of operational skills among IMK staff involved in the Albanian cultural heritage promotion, thus contributing to the development of initiatives in the tourism sector, with potentially remarkable results since tourism and culture activities as well as IMK are managed by the same Ministry. Project activities are generally carried out in a ‘learning-by-doing’ modality, in order to maximize both know-how transfer and the development of related skills. The project conclusion is due in February 2014.

2. The Authoring System for Interactive Map Generation

There are many commercial suites that offer authoring platforms for creating and customizing Web-based tools in the field of geomatics. They are often a collection of several instruments, typically desktop applications, which allows to create geo-referenced content, change the layout of presentation in a Web page and to facilitate its publication. After an extensive review of solutions offered in WebGIS authoring platforms [2], both Open Source and proprietary, we can state the innovative character of an integrated WebGIS authoring application, completely Web-based and therefore accessible and usable simply with a Web browser, that allows the creation of a totally customizable and editable WebGIS application.

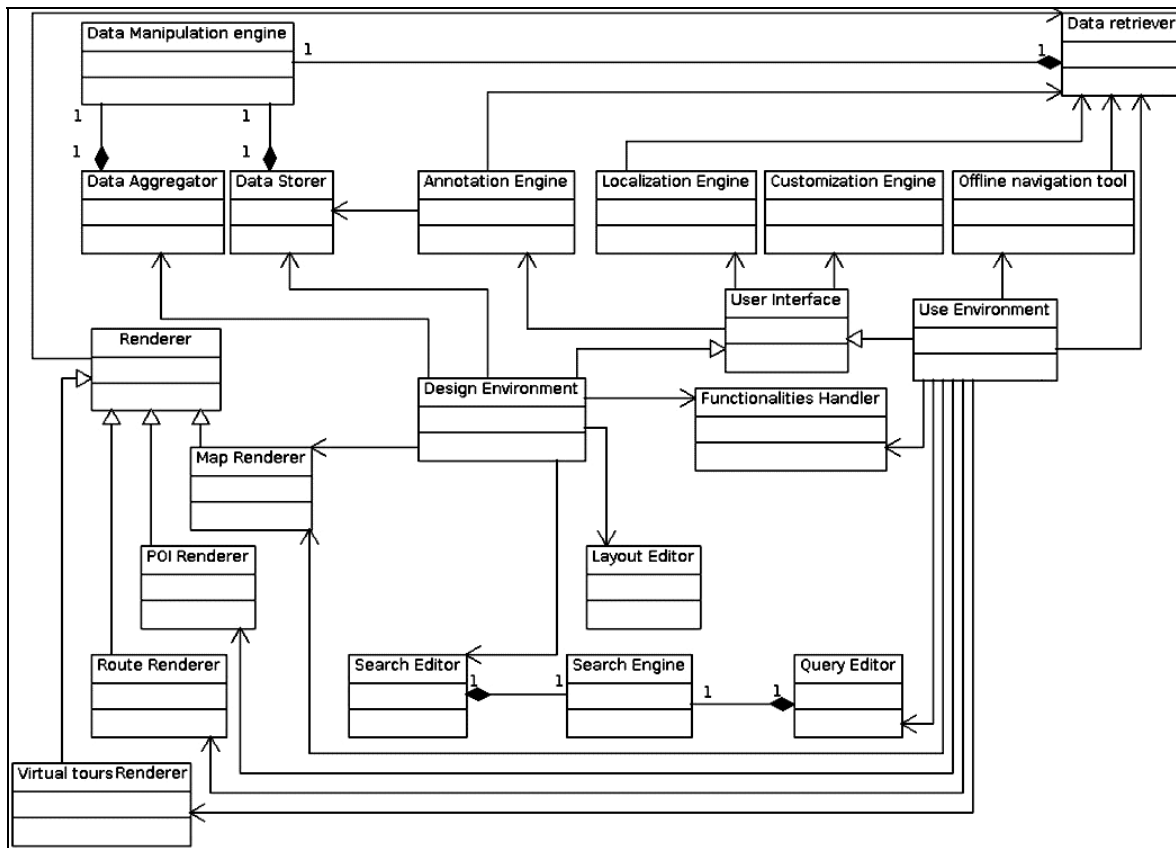


Fig. 2. The system’s UML Class diagram

The developed prototype makes use of AJAX (Asynchronous JavaScript and XML), with the open source JavaScript library OpenLayers API (<http://openlayers.org>) for rendering geo-spatial data within a Web browser. To meet the demand for simple system's installation, all data are stored in an XML file rather than in a database (which would require the installation of a DBMS if not already present on the server hosting the system), except for the geo-referenced data, stored in GeoJSON (Geographic JavaScript Object Notation) format. GeoJSON is a specialization of the JSON data interchange format that can manage geo-referenced data using a subset of instructions provided by the JavaScript language. For the implementation of the editing environment, characterized by a high degree of interaction a JQuery UI library was adopted: it is based upon JQuery, a more general Javascript library providing a high level of abstraction for programming interaction and animation, advanced graphic effects and customizable event handling. The same was also used for the implementation of the WebGIS interface instance and for the resulting WebGIS environment, with easy-to-use tools for map navigation and information search. The class diagram in Fig. 2 gives an overview of the overall system architecture by showing the relations between the different software components and how they rely on each other. The main class is the User Interface class, a generalization of the two subclasses Design Environment (representing the authoring system) and Use Environment (representing the WebGIS).

All the graphical widgets in the interfaces users can interact with, such as icons, buttons, text fields and

text labels, are localized according to the preference each user indicates, and customized on the basis of the role of each user, i.e. a Web publisher, a content manager and so on. The user interface localization process is performed by the Localization engine, which lets users decide the interface language. In contrast, the customization engine acts automatically on the user interface: it presents widgets and data coherently to the user's role and the to the environment invoking it.

The Annotation Engine allows to create and recall annotations produced by the system's actors. Web publishers can annotate the data organized by content managers if they find errors or if they need some kind of information that has not been produced. By doing so, content managers can retrieve these annotations and correct the problems. At WebGIS level, final users can add geo-referenced annotations to the map they are browsing, or read annotations left by other users; this allows them to share their impressions and experiences about places they have visited. Moreover, they can annotate the WebGIS instance itself, to communicate their needs, in terms of information or functionalities, to content managers and Web publishers.

The Data Manipulation Engine class implements, through the Data Aggregator, Data Storer and Data Retriever, all the functionalities to read, edit and write data according to each stakeholder's role in the system.

The Data Aggregator is used to manipulate datasets and create new ones; this is particularly useful for homogenizing data gathered from different sources and for the creation of new ones, that will be saved in a suitable format by exploiting the Data Storer. The Offline navigation tool relies on this functionality to produce maps and file with the points of interests (POIs) to be downloaded by the users.

The Data Retriever, then, manages the access to already stored data. The Renderer class is specialized into four different subclasses, each of them taking care of rendering, mostly in the WebGIS, different geo-referenced graphical elements: the map, the POIs, the routes and the virtual tours. The Renderer relies on the Data Retriever to get geo-referenced data and annotations to be displayed in the WebGIS, and on the Data Storer to save annotations and temporary users' routes.

The Functionalities Handler allows Web publishers to activate and configure the functionalities that will be offered to final users in the WebGIS (map zoom and pan, selection of points of interest, allow or deny annotations' creation, route computation). At the same time, the Functionalities Handler is called in the WebGIS to actually implement the selected functionalities.

The Layout Editor acts as a graphical editor for the disposition of the functionalities and the information visualized by final users interacting with the WebGIS: Web publishers can build the WebGIS layout by dragging and dropping widgets associated to map's browsing tools and visual elements such as page header, page layout and how final users' requested information should be displayed.

Finally, the Search Engine, constituted by the Search Editor and the Query Editor, allows content managers to configure the search tool for final users. By exploiting the Search Editor, content managers can configure which geo-referenced data can be searched by final users and the way they are allowed to build their queries.

3. Interactive Map of Albanian Heritage

Subsequent steps have to be followed in order to generate the map: the planning of the places to be surveyed; the GPS survey of suggested access points, opening modalities (closed, open on request, open), accessibility status (accessible for all, accessible with constraints, not accessible); the generation of a file containing both the image information (exif data: latitude, longitude, image name, date) and the additional information inserted by the user (site name, image content, site type, data sheet URL).

First, the Authoring System reads the file and reports the fields; the user chooses the one suited for latitude and longitude, for classification and research purposes. Moreover, each field can be assigned a specific text.

Then the classification task is performed and special icons should be assigned to each type (an overturned water drop symbol – with different colors – is the default).



Fig. 3. WebGIS interface under development using the authoring system (Openlayer version)

In the 'map' tab the system displays the Google map, allowing to locate the workspace, recording its centre and scale factor to be used when the user starts the WebGIS; in the 'callout' tab the user is allowed to specify the contents of the callout displayed when clicking on a point of interest, within a predefined layout.

Finally, an interactive map interface is generated automatically (fig. 3), organized into four sections.

The 'heading' section presents the logo, title and subtitle assigned through the authoring system.

The 'search' section – often absent in other systems – presents a text box for text insertion and a checkbox for checking/unchecking of each typology. This function implements auto-completion to assist users in the search phase: when typing characters in the dedicated box, the system proposes and updates the list of those places whose search-enabled fields contain the typed text and whose typologies are checked in the communication tab, thus restricting the search field (default: all typologies checked).

The 'communication' section has two tabs: the 'thematic map' tab shows the available typologies, preceded by the same marker used in the map and a by checkbox for inclusion/exclusion of typologies in the map and in search sessions; the 'search results' tab shows the list of the points of interest complying with the search criteria, including thumbnails.

The 'map' section has an overview and three display modes (hybrid, streets, satellite); it allows users to interact with the Google map by:

- reading the information associated to the place – by clicking on the icon, the system displays the previously designed callout containing links to both the photographic image and to a description;
- navigating with 'pan' and 'zoom' tools; the latter automatically manages the overlapping of points of interest that occurs at reduced detail levels, by replacing the bunch of icons through a single predefined yellow icon reporting the total number of the points of interests grouped in it.

The interactive map currently developed for testing purpose refers to places in Albania where our Institute developed virtual tours within different international research projects.

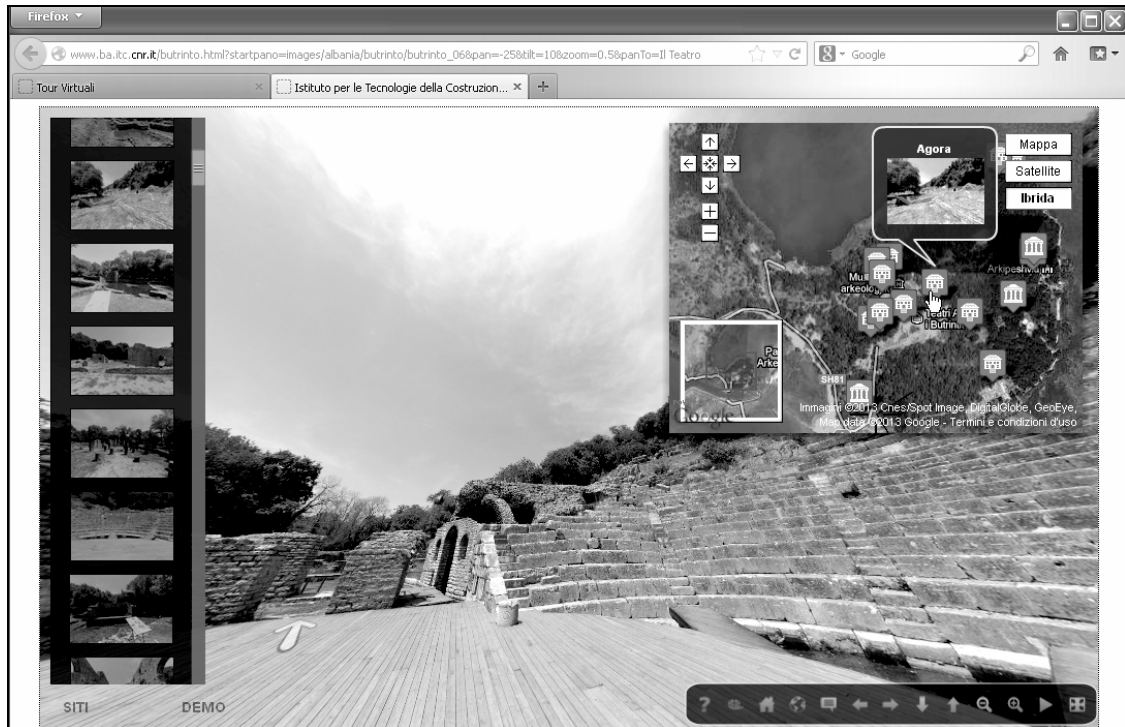


Fig. 4. Virtual tour of Butrint

Virtual tours make the user feel immersed in any space, anywhere in the world, although it has never been there. It sets the user in the centre of a place in order to discover its details at the click of a mouse. Google Street View shows places from a pedestrian perspective; by using arrow keys or mouse, users can control their direction and tour speed; by moving an icon (representing the traveler) to a certain point, they can move to different places very quickly. Virtual tours are becoming an important means for remote fruition of sites; in the tourism industry they help travelers make better decisions (saving time and money) before purchase by providing them with vivid images of destinations – therefore it is an effective way to promote new or existing destinations [3]. In the culture sector they allow to visualize and investigate those places that, due to safety issues or impossible collective fruition, are kept closed or made unavailable to the public access. Moreover, virtual tours support – effectively and cheaply - small communities in the promotion of ‘minor’ cultural heritage doomed to perish without care and funds, raising communities’ awareness and attention towards artistic, cultural and environmental heritage – the examples shown here refer to the Butrint archaeological site in Albania (fig.4).

The interface has buttons for navigation (‘enlarge/reduce’; arrows to pan the image by recurrently clicking; stop the image rotation), help about the use of the interface, restart, turn on/off hot spots on the image; switch on/off full screen; turn on/off map, start a guided tour, see place gallery and focus gallery.

The map is generally a graphical reproduction of a territory or building, with icons for each place involved in the virtual tour: by clicking the icon, the user jumps in the connected place. A “radar icon” – moving according to the actual image rotation – is positioned in the observed place. We used a Google map as in the WebGIS with an overview and hybrid, streets or satellite modalities.

The guided tour starts navigation through places and focuses, according to a planned itinerary, allowing the user to have a comprehensive overview. It is not a video but a programmed synchronized loading of events, so the user can stop the guided tour anywhere, to start its own exploration of the place.

The place gallery is a preview of places shown in the virtual tour; the focus gallery is a preview of relevant details; by clicking on a preview, the virtual tour receives parameters allowing to start directly from that area – an innovative function available also with external link.

Three kinds of sensitive points - called “hot links” - can be found on the image: “navigational” (jumping in a connected place – as in the map, so giving the impression of moving within the space as it happens in real vision); “informative” (opening an info-box with text and a text-to-speech functionality); “focalize” (magnifying the view on a focus; an high resolution image is required, to be managed with a cache technology to reduce loading time); an hot link has a label, usable for search.

4. Conclusions

With specific reference to the issues of visualization and presentation of cultural resources and sites, the work of our institute focused on the implementation of an authoring tool in order to support non IT-specialist users in the presentation of assets for promotion purposes. The prototype adopts a KISS (Keep It Simple, Stupid) approach and using javascript “Openlayer” libraries, it generates a WebGIS application for the publication in the Internet of geo-referenced information acquired through a GPS camera. The implemented interface is illustrated using information on virtual tours in Albania developed within different international research projects: two challenging technologies that our Institute is enhancing with new functionalities.

On-field activities oriented to the acquisition of information about monuments and sites as well as the final testing of the prototype will be carried out by the staff of our partner – IMK - in a ‘learning-by-doing’ modality, in order to maximize both know-how transfer and the development of related skills.

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