Mobile Devices: Manage, Organize and Share Information from Anywhere. The Example of the Great Thermal Baths of Villa Adriana

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Abstract

The paper presents an approach to efficiently increase the information of cultural heritage using mobile systems as PDA or tablet PC. This work explains a method to take advantage of using this mobile system and a database software during the survey or study of cultural heritage. The study was conducted on the Great Thermal Baths of Villa Adriana.

In the last few years a major shift in numbers and capabilities of mobile devices has taken place. Each year the gap between desktop and mobile devices continues to narrow. Mobile processor speed and network connectivity continue to improve, making web browsing on these devices a viable alternative to laptops. Fortunately, mobile web browsers now use standard HTML and PHP. PHP is the most popular language for building data-driven web pages with over 25 million websites.

The system described aims at providing a web-based platform for collaboration and data sharing between specialists, planning agencies, citizens and private entities. We describe the salient features to create a database developed by integrating Database and PHP language into a web based client/server environment.

Keywords

Cultural Heritage, internet/web, Archiving, Surveying

1. The structure

This article describes the key step needed to define a system for archiving and managing data collected during the study of an archaeological site. The methodology applied is part of a broader project that will be presented at the end of the writer's doctoral thesis.

3D web survey, the name of the project, represents a possible management system that can collect information such as notes, metric data, images and all the necessary information to the description of an archaeological excavation or a monument. In addition, the system is designed to support research and the sharing of information even between different research areas, in order to deepen and increase knowledge.

In recent years technological development has provided researchers with new tools to work and to analyse in greater detail the items under consideration. This growth has facilitated the work by providing increasingly precise and detailed analysis, but has also created some problems with exchanging information related to the various languages used. In fact, often you cannot read or write this information in a unique standard, involving considerable difficulties in the transmission and storage of the collected data.

In this perspective it is necessary to study a system capable of acquiring and cataloguing information, making it usable in a language as common as possible with other applications. It is also very interesting what is offered by GPS media associated with mobile systems, having a significantly improved performance, allowing everyday use by facilitating and accelerating the acquisition and processing of data.

2. Structure system

Often the structure of a project, including the cataloguing of information and their positioning in space, is likely to be organized within a proprietary software that, by its very nature, limits the possibility of exchanging solutions. Furthermore it determines a development closely linked to the guidelines of software houses to which they belong. To avoid this problem it is essential to adopt from the outset a solution that provides a programming language and integration of information, as common as possible, using the solutions adopted and developed by the

scientific community. The language of the database proposal was SQL[1], because it is able to interface with other open source programs such as DBMS[2] or languages used by most people like the PHP[3] able to create simple but very useful dynamic internet pages for inclusion and display of information (*Fig. 1*).

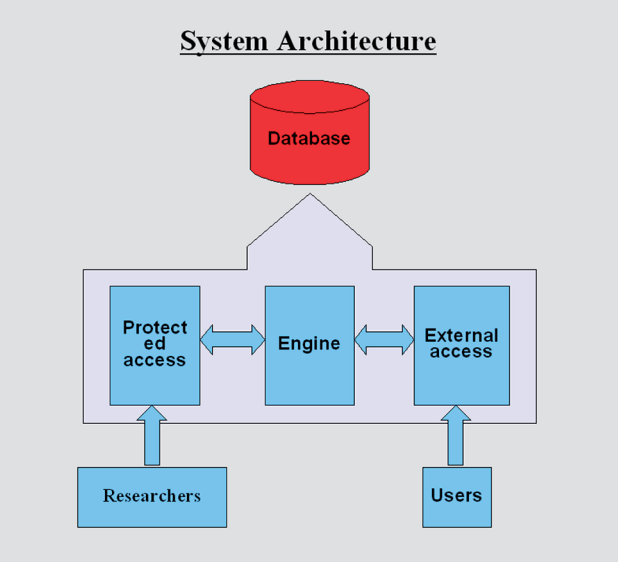

Fig. 1. System Architecture.

While planning the structure it is necessary to establish in the first analysis what the fundamental requirements are that you can meet in different research areas such as: daily update of the stages of excavation/relief, flexible structures, a simple management interface, place the information in space and time.

It is therefore necessary to build a system with a structure that can be upgraded over time depending on the needs and programming languages *and what the scientific community accepts as a methodology for data management.*

Finally archaeological situations and different analyses produce a multitude of formats which are difficult to connect with each other. Moreover, whenever this information is related to each other by different researchers, a large amount of information will be produced which are hardly comparable with other researches, changing their initial structure. It becomes therefore essential to maintain the original data in their original format in order to have more control and verification possibilities, as well as to encourage further analysis and interpretation.

3. The case study of Great Baths of Hadrian's Villa

Emperor Hadrian's Villa is quite famous for different topics: its huge extension, the innovative shape of many of its pavilions (made using umbrella vaults), the complexity of the planimetrical composition and the great number of statues exhibited inside this vast Hellenistic project. Settled near Rome, it was not just a place for the emperor's "*otium*", but a never-ending project where Hadrian could experiment with

Fig. 2. Grandi Terme in Villa Adriana.

[1] SQL (Structured Query Language) is a database computer language designed for the retrieval and management of data in relational database management systems (RDBMS), database schema creation and modification, and database object access control management.

[2] A DBMS is a complex set of software programs that controls the organization, storage, management, and retrieval of data in a database. DBMS are categorized according to their data structures or types, sometimes DBMS is also known as Data base Manager. It is a set of prewritten programs that are used to store, update and retrieve a Database.

[3] PHP (a recursive acronym for PHP: Hypertext Preprocessor) is a computer scripting language, originally designed for producing dynamic web pages. It is for server-side scripting, but can be used from a command line interface or in standalone graphical applications.

his architectural skills by means of developing many typologies. Considering the vastness of this complex, it is very easy to understand how many people have been working at the villa for almost twenty years (117–138 AD). The baths were an important part of the villa's project. There were four thermal baths, a smaller one for the emperor inside the so called Teatro Maritimo, another very close to the ancient Republican villa (*heliocamino*), and the two main structures: the Piccole Terme and the Grandi Terme (*Fig. 2*).

4. Management and display system

The system architecture has the classical structure of a dynamic system, where public accesses to web pages for users' navigation and protected access to allow administrators and operators to manage the data contained in the system are integrated. Besides administrative operations, the site must be updated by researchers of different disciplines, to allow the input and editing of the information and data contained in the system. This access is also protected by passwords and each researcher will have their own password, to monitor activities and to associate data with researchers or associations that added them to the system, protecting their property.

All data are entered following a system to system tree that allows to have a tabular diversified depending on the nature of the information (SUW (*Fig. 3*), photographs, VRML[4], etc. ...), but at the same time allowing the possibility of a report and producing a result that we can then analyse.

The documentation acquired during the phases of relief and during archaeological excavations can be divided basically into two categories: text and images. This information is usually collected with paperless pre-filling fields. This system may be a limitation and it can produce some serious errors. Indeed, these paperless fields can often get deteriorated or lost, causing problems for all those who want to analyse the same object later and reuse relief's databases executed. Moreover, simple typing errors often occur and may undermine the process of reading and interpretation of the site analysis. In this sense it is clear that a digital media can be seen as a solution to such problems. The system described here was therefore created by planning a series of masks,

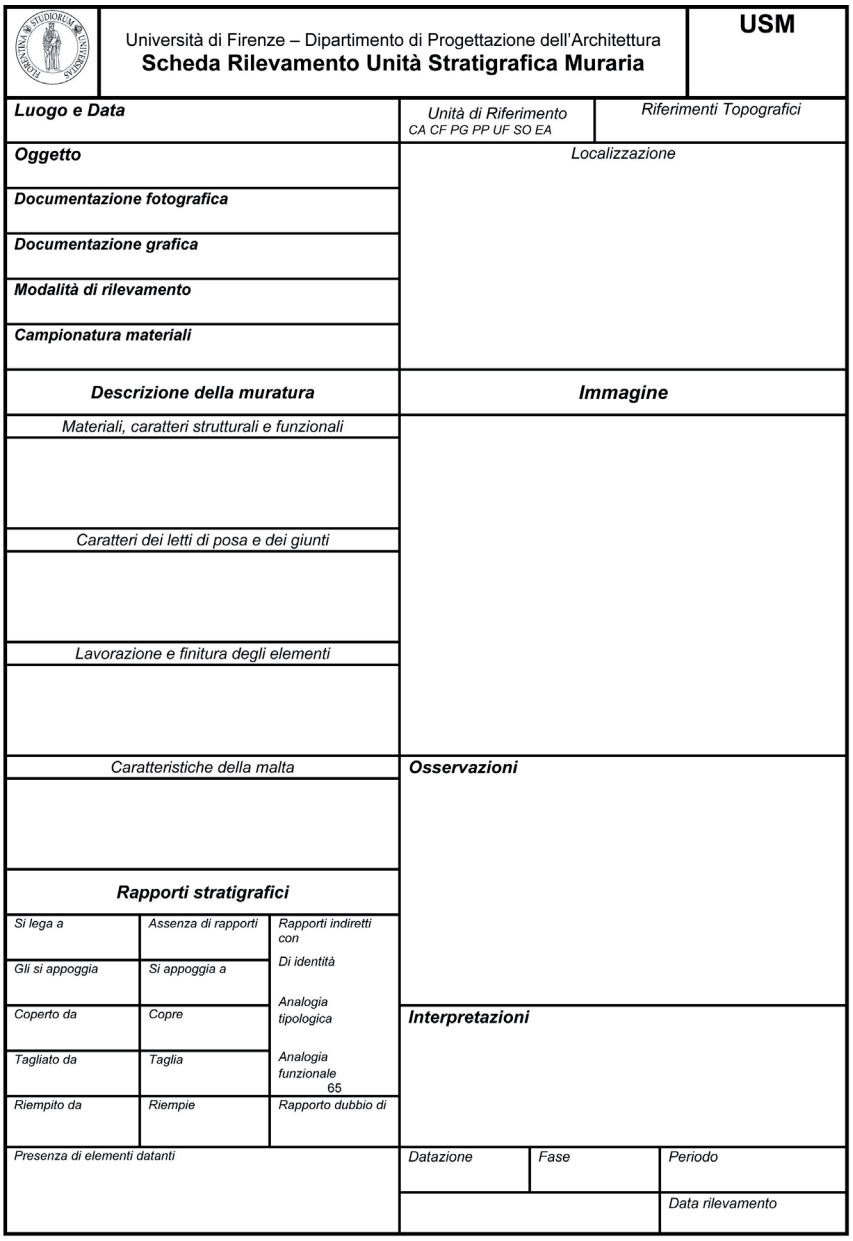
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Immagine
Materiali, caratteri strutturali e funzionali
Caratteri dei letti di posa e dei giunti
Lavorazione e finitura degli elementi
Caratteristiche della malta
Osservazioni
Rapporti stratigrafici
Si lega a
Assenza di rapporti
Rapporti indiretti con
Di identità
Gli si appoggia
Si appoggia a
Analogia tipologica
Coperto da
Copre
Interpretazioni
Tagliato da
Taglia
Analogia funzionale
65
Riempito da
Riempie
Rapporto dubbio di
Presenza di elementi datanti
Datazione
Fase
Periodo
Data rilevamento

Fig. 3. Scheme of stratigraphic unit wall.

[4] VRML (Virtual Reality Modeling Language, originally (before 1995) known as Virtual Reality Markup Language) is a standard file format for representing three-dimensional (3D) interactive vector graphics, designed particularly with the World Wide Web in mind.

placed in a position to acquire the information and save them into a database. In addition, in order not to upset the habits of operators, such as the use of a particular device for stratigraphical unit wall (SUW), Data Entry interfaces maintaining the same layout of the paper were built in as well. The translation of paper files in the database tables was an opportunity to optimize certain aspects of entering the data. In fact, some fields were summarized in multiple choice items in order to help the operators during data acquisition. The data collected were placed in an SQL database. In addition, to get a better display system in archaeological examination, it was decided to use VRML to display those parts detected with the topographical or laser scanner, could better describe their morphological and compositional characteristics.

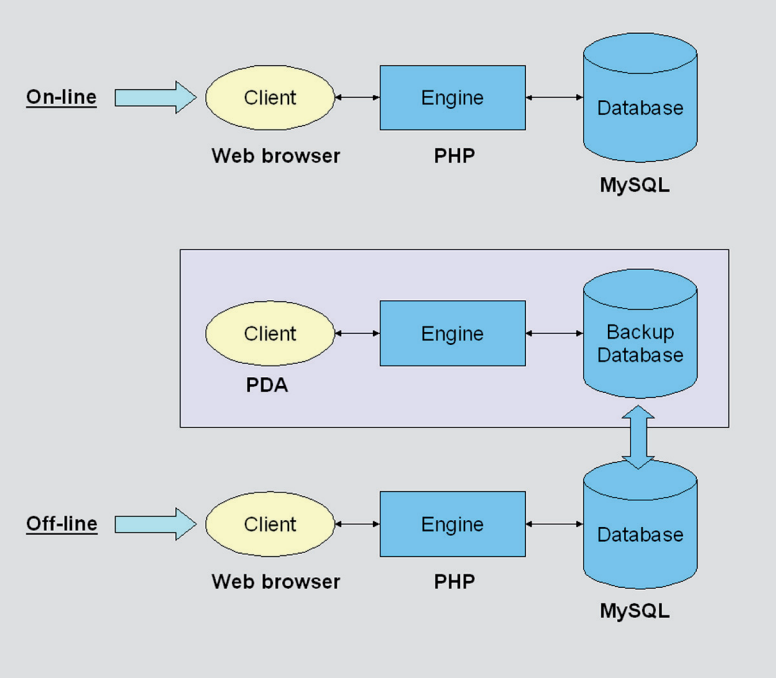

Fig. 4. Scheme of the use of PDA.

In order to guarantee a more flexible usage, a supporting management system based on a web architecture was created. The choice also took into consideration the particular flexibility of use and the particular burden of both software and hardware systems available.

The system was also strengthened by inserting a particular methodology that allows the use of PDAs and can record spatial information and position. Indeed, through the use of mobile systems and of software that can record GPS position[5] (*Fig. 4*), you can associate certain pieces of information that later will help researchers analyse the archaeological site. The methodology provides two options: the use of PDA online, and the use of PDA offline and subsequent upgrade of information. In the first case, the use of a mobile system needs a connection to the World Wide Web and so you can view the input masks. In the second case, when it is not possible to be linked to internet, the tables necessary for the cataloguing of information will have to be downloaded before, and after filling the fields they will be sent on the internet to update the database. GIS synchronizeable with cartographic servers working in laboratory systems finally allow to solve, or at least reduce, the heavy fracture existing between the laboratory and fieldwork, providing in the end the same quantity as the activity in campaign; amount and quality previously placed finally will provide the same information accessible on a desktop PC or a cartographic server.

5. Conclusions

The application allows archaeologists to store, manage and analyse the information collected during the campaigns of relief. In addition, the system provides an opportunity to share all information with other research institutes in order to deepen research. Actually, the technical system is set up and future works will be directed to improve the interfaces and to interact with 3D models entering information and displaying only those areas responding to a specific query. Finally, it is desirable to provide an improvement in both hardware and software for mobile systems. Indeed, the illegibility of PDAs in strong light makes it difficult to read the information and the lack of suiting programs designed specifically for this purpose makes the operations and management of data synchronisation still too cumbersome.

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[5] For this research I have used a free open source program: GPS2Clipboard gets the GPS position data and copies them to the clipboard from where they can be pasted to any application with a paste command. Moreover, GPS2Clipboard shows visually the quality of the GPS signal to help obtain a good position data. http://forum.xda-developers.com/showthread.php?t=378255

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