Developing a Flexible Web-based System for Documenting Archaeological Excavations

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***Abstract*—Here we present our work in progress on a web-based system that could be used as a tool for the documentation of the findings in an archaeological site. Our aim was to create a tool that is flexible enough to allow researchers to adapt it to the special situations that may appear during an excavation process, and at the same time, stick to a fixed skeleton, so that the resulting documents keep a uniform structure. The design of application is adaptive, in order to move it to a mobile application in the future.**

***Index terms*—Archaeological record, web-based applications, mobile devices.**

I. Introduction

People think of archaeologists as some kind of romantic adventurer in search of hidden treasures. However, reality is more prosaic, as the archaeological work consists of recovering, analysing, interpreting and publishing the material remains left by different human societies throughout History. These remains are found during archaeological excavations that must be done following appropriate procedures to not only recover the remains, but also record the huge amount of information related to the excavation process.

Recording all the information from an archaeological excavation in a systematic way is essential, as an archaeological site is "a book that can be read only once" due to the fact that excavating is a destructive task that can not be undone. Therefore it is necessary to use a methodology intended to allow the reconstruction and reproduction of the site prior to the excavation.

The standard tools used to store the information during the excavation process are the following:

- An *excavation diary*, used to write down all the interesting details related to the digging progression, like used techniques, edaphological features, relevant changes, objects, structures and their relationships, topographic information, etcetera. This diary is often replaced with fixed-format paper forms.
- *Drawings and photographs* of levels, structures and objects.

However, this classic methodology has significant shortcomings due to the use of paper as main data storage medium:

- It is not possible to set up data validation rules to verify and filter each value in a paper form according to a fixed procedure.
- Performing operations like searching for a specific form can be really difficult, as the amount of forms can be very large.
- It is necessary to preserve the paper forms, protecting them from humidity, dust, etcetera.
- It is not possible to store multimedia information like audio or video.
- The amount of recording tools (paper forms, excavation diary, photo camera, computer) makes fieldwork tedious and annoying.

In order to overcome these problems, different computer-based systems have been developed to record the information from an archaeological excavation. Some of them are standalone desktop applications [1], [2], while others are designed as client-server applications [3], [4], [5], [6], or even mobile applications [7], [4], [6]. Other alternatives include applications that make use of digital pens to fill out a form and then send the written data to a server using a mobile device [8].

However, it is very difficult to create a software solution that fulfils all the requirements from all the archaeological researchers all over the world. Some of the applications above mentioned use a fixed data scheme that does not allow the users to create records for findings that were not considered by the software designers; other systems provide the users with a data model that may be too flexible, resulting into a quite non-uniform, difficult to understand documentation.

Here we present a work in progress of a web-based system to store the data collected in an archaeological excavation. The system is partially flexible, because the users can define the record types and the labels, and they can choose how many items (dates, coordinates, relationships, attachments...) can be added to a single record.

II. System overview

Our system was designed as a web-based client-server application, intended to be used with either desktop PCs or mobile devices. The client side was developed as a JavaScript single-page application [9], using Bootstrap [10] in order to produce an adaptive web design. The server side of the application consists of a MariaDB database [11], and a set of PHP scripts built on top of the CodeIgniter framework [12]. The communication between the client and the server is coded using the JSON format. Figure 1 shows some screenshots of the application.

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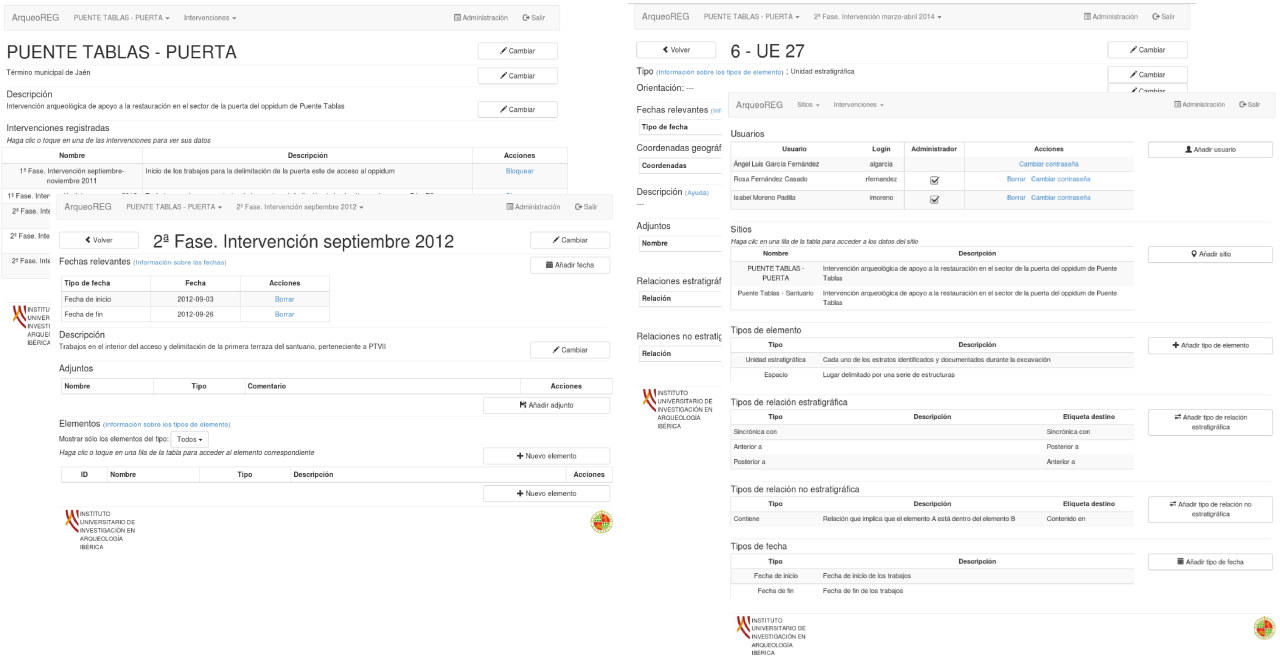

Fig. 1. Some screenshots of our application

The data model of our application is as follows: the main entity is the *Element*, which represents anything we can be interested into saving information about; every Element is related to a *Campaign* on an *Archaeological site*, and to a series of data that define it (a *Description*, a set of *Dates*, *Coordinates* and file *Attachments*), as well as to a set of *Relationships*. It is a user responsibility to define the element types (for example: pottery, stratigraphical unit, material set, etc.) and the labels for these data (for example: date of finding, *over* relationship, etc.). This way, the user is not restricted to a fixed set of fields in a form.

III. Results and Future Work

The system is currently in test phase in the Instituto Universitario de Investigación en Arqueología Ibérica (University Research Institute of Iberic Archaeology) of the University of Jaén. We are expecting the feedback from the users in order to solve any possible bug and improve the application.

Apart from that, we plan to enhance the system with the following features:

- Use Apache Cordova [13] to produce a mobile application, so that the users can use the application without the need of opening a web browser. Moreover, this will prevent our application from suffering problems due to the different implementations of the JavaScript engines from each web browser.
- Add map support, so that the users can include a map showing the actual location of the item that is documented, if necessary.
- Automatic generation of Harris matrix diagrams [14], so that the stratigraphical relationships among the different findings can be easily understood.

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