"Social Heritage" Augmented Reality Application to Heritage Education

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Abstract. Heritage education can be conceived as a pedagogical and didactical process focusing on knowledge, perceptions and values of Heritage being part of a society and interpreted and known by people. This process can be offered to a society by any educational institution in formal contexts, but also by specialized organizations or persons in informal contexts. For instance, it is common to see citizens learning about heritage in their own cities, but also learning about heritage as tourists in other cities. Nowadays, the processes of heritage education in informal contexts have been supported by those technologies such as tourist guides, audio guides, and tactile televisions, among others. However, technologies such as augmented reality, contribute to the knowledge of heritage in a contextualized, situated, and enriched learning process.

The purpose of this paper is to present Social Heritage, and a solution aiming to develop heritage education processes based on augmented reality. Social Heritage runs in mobile devices; it is based on the collaborative construction of heritage content and can be used in both, formal and informal learning contexts.

Keywords: Heritage education · Informal learning · Augmented reality

1   Introduction

Heritage education as a process is based on learning theories and specific didactic methodologies, with the purpose of achieving genuine appropriation and participation among citizens. This as a consequence, conserves heritage using it properly [1–3].

Heritage education has been carried out traditionally in formal learning contexts where the main actors are students and teachers who using a standardized curriculum, interact to achieve a basic understanding of heritage. Frequently, this learning process is not situated in heritage itself due to different reasons: actors could not be located in the cities that were considered in the learning process or perhaps it was easier due to economic and logistic limitations.

Technology has been used in order to facilitate heritage education, tourist guides, audio guides, and interactive screens; mobile applications and web sites, are examples of technologies which facilitate approaching among citizens or visitors to their heritage.

However, emerging technologies offer outstanding opportunities to contextualize and enrich the heritage learning process [4]. Augmented reality particularly allows users to interact in heritage scenarios through the enlargement of different kind of information that helps citizens or visitors having a better understanding of their heritage [5].

This paper proposes a mobile augmented reality application, allowing heritage appropriation based on collaborative content construction that can be used in both formal and informal learning contexts.

2   Technologies to Heritage Education

As mentioned before, technologies such as tourist guides, audio guides, and interactive displays have been used in order to facilitate heritage education. These technologies have been really useful but not allowing user interaction to enrich or improve the content they offer, is one of their limitations; furthermore, they reduce decision making among users on where to go or what to do.

Applications for heritage education based on augmented reality can be identified from the ones shown below.

2.1   Ayuntamiento Arjona

Ayuntamiento Arjona application aims to encourage tourism in Arjona. Using today's technologies, Mythical Technology company has developed this application with augmented reality where tourist sites and areas can be seen by visitors and citizens in this Spanish town located in the province of Jaén. Application functions include marking recognition labels locating places related to heritage content and information on Arjona tourist site routes [6].

2.2   Guimarães

Guimarães is an application that offers information on heritage and the Guimarães city history, ancient capital of Portugal. With Guimarães, city's official application, medieval historic center exploration in a didactic and interactive way can be done; it was declared World Heritage by UNESCO in 2001. This heritage route application includes functions such as theme tours, treasure hunt for children, knowledge test, augmented reality vision, accommodation in the city search engine and content sharing [7].

2.3   Valladolid Tu Corazón

It is a technological solution that extends the current cultural and tourist services for citizens and visitors who come to Valladolid. Application functions include sightseeing tours information, parking, augmented reality vision and hotel booking information [8].

2.4 Artà Travel

Artà Travel application provides augmented reality information on heritage, tradition, modernity, nature and tourism technology. Application functions include language choice, heritage routes selection, audio guide, geo positioning and QR reader [9].

2.5 Camino Mozárabe de Santiago

Camino Mozárabe de Santiago application uses ARPA® Mobile Technology with augmented reality to quickly and easily locate tourist information centers, heritage resources, accommodation, museums, and restaurants. Application functions include heritage category selection, heritage route search engine, content sharing, record of places already visited, visualization of the nearest places with augmented reality and how to get there. It is known as one of the most complete applications, providing information on heritage interests, however as preset cities implemented information is static it lacks scalability [10].

Our contribution to the above mentioned applications is the possibility to create collaborative heritage content as well as integral consideration of heritage educational process.

3 Social Heritage Application

Social Heritage is an application based in augmented reality seeking heritage education process development, based on collaborative construction content and user role definition to support heritage educational process.

Fontal proposes different strategies and models to Heritage Education [2], including: (1) Teacher-centered models (2) Student-centered models (3) Content-centered models and (4) Context-centered models and other variations (Fig. 1).
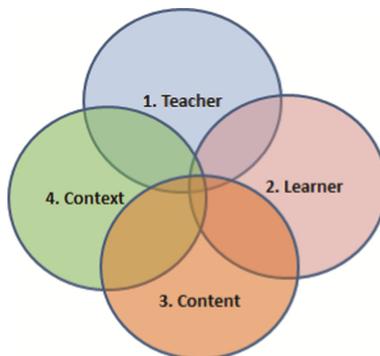

Fig. 1. Heritage teaching model - fontal

This work is based on hybrid models where learner, content and context in a process of formal and informal education are articulated. The learning process takes place in

real scenarios where individual needs are customized. In addition, the content is developed collaboratively among the learning process actors (Fig. 2).

Fig. 2. Social heritage logo

Social Heritage, an augmented reality mobile application, has been developed for Android OS devices, allowing users real time experience.

Social Heritage is based on geo positioning for heritage interest places display, through a geographic information system method and screen overlapped radars with augmented reality. This application provides users the ability to interact with heritage, also benefit from provided information to achieve a greater rapprochement and heritage appropriation.

3.1 Process Roles

For heritage education process, the application displays two roles: Users (citizens and visitors) learning about their heritage and Heritage Managers, heritage specialists, supporting the process of education through the validation of content and identifying places of heritage interest.
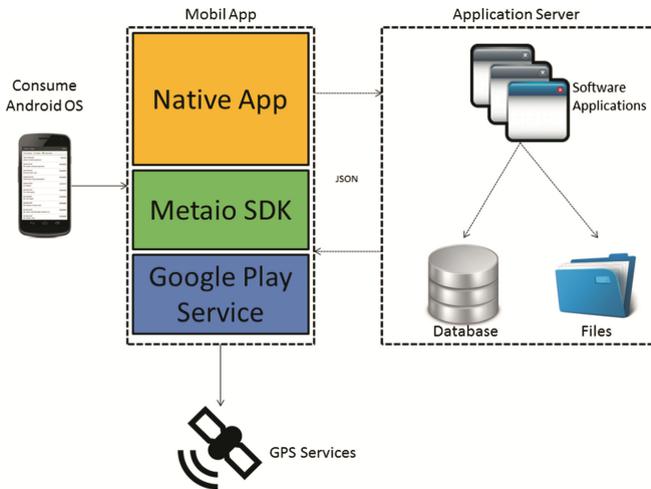

Fig. 3. Application architecture

3.2 Architecture

In order to provide users enough information and have a reliable, truthful and efficient heritage education process, this application contains two components, a Native Application and a Web component, consuming services from it for proper functioning in order for users to acquire heritage principles. The application architecture can be seen in Fig. 3.

3.2.1 Functions

Social Heritage application offers users the possibility to initially register and login once user has already registered. The registration module is composed of data allowing user preference setting, in order to generate recommendations on interesting heritage content (Fig. 4).

Fig. 4. Register and login screen view.

In order to offer heritage education process services, information provided is divided into three modules: (1) visualization of places of interest, through geographic information system (GIS), (2) custom search through lists and (3) visitor information centers
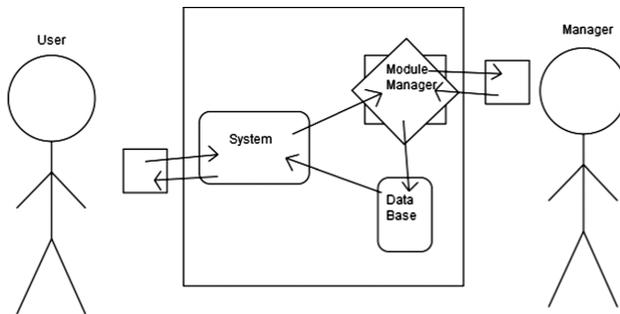

Fig. 5. Content validation process.

with augmented reality visualization. Offering versatile observation capabilities and extending appropriation experience among users.

Appropriation process should be completed along ability among users working with the construction and dissemination of content, such as images, videos, texts, etc., in order to provide users with accurate and quality information; content is validated by the heritage Manager after loading it. Validation is made in order is verify the relevance and quality of the content. See Fig. 5.

Heritage education modules offer users the possibility to interact with information they are visualising, displaying marking maps, highlighting designated heritage land-marks through a heritage route. Viewing by lists, gives the user all the interesting heritage places, organizing them by initiation points, moreover, it counts with a specific search engine to enhance user-system interaction.

Augmented reality overlaps screen radar views representing heritage interest places displayed through geo positioning, marking heritage interest places. This type of display offers users detailed information on interest places, providing routes to get there and also further information if required. See Fig. 6 for GIS Module and lists.
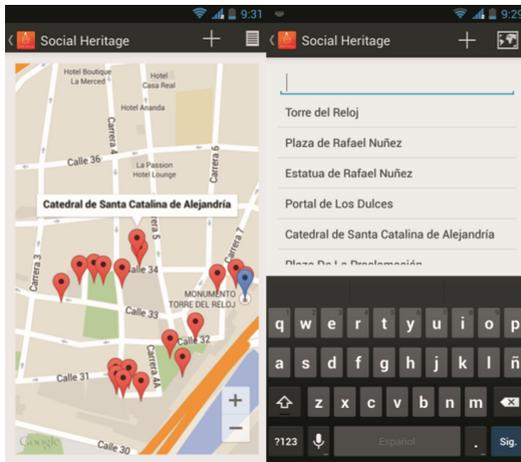

Fig. 6. Geographic information system modules and list.

Additional functions to achieve collaborative experiences to users include modules allowing system heritage attractions loading, these created marking points are offered but before being published, they go through a Heritage Management validation process.

Heritage interest points are oriented to user appropriation, displaying specific windows and providing detailed information on each place, such as name of the interest place, description, videos, images, etc.

Validating information on provided interest places to users, this application has validated functions visible only on Heritage Manager's role. These provides the admin-istrator a list with assigned heritage interest places, aiming to pre-establish some quality and credibility parameters as well as validating the quality and application of videos, images, sounds, etc. added as heritage interest content.

3.2.2 Developer Tools

As application is initially oriented for users with mobile devices with Android operating system, IDE development is required to support Android SDK, Eclipse software with a specialized version for mobile applications for Android programming was chosen for it [11]; to guarantee information display to users via GPS and Augmented Reality, Google Play Services were used by the Google Maps Android API V2 component, this library can generate map markings, indicating places of interest and displaying signaling routes and Metaio SDK [13] provides libraries to create on screen overlapping radars through augmented reality.

4 Validation

Cartagena was declared a World Heritage and Cultural site by UNESCO being the city with the highest tourism and heritage riches level in Colombia.

For validation development purposes, proceedings to define heritage landmarks in the historic center of the city of Cartagena was set, for each of these places, basic content was built: description, images, and video.

Once having the basic contents, proceedings to perform a validation test with local users and visitors to the city of Cartagena was set, testing the application, users were able to interact with it.

The application was well received by users in general, expressing a good perception through a survey. All participants agreed on the application being able to become a great support for heritage education process development.

5 Conclusions and Future Work

It is important to develop technologies that allow people to achieve heritage appropriation; for this type of development, augmented reality becomes a great opportunity to allow people interacting with heritage and tourist scenarios in real time.

Technology as Social Heritage can be used both formal and informal contexts; it can be used by teachers supporting their classroom work and it can also support visitors or citizen by simply sightseeing and learning about their heritage.

Future work is aimed for the application to recommend heritage content and places of interest to users, based on a user model in order to deliver content according to user needs and interests and also carrying out a larger validation process in the cities of Cartagena (Colombia) and in Girona (Spain).

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