

Disclosing Documentary Archives: AR Interfaces to recall Missing Urban Scenery

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Abstract—This paper describes the current results of a research project whose goal is to create a mobile Application aimed at the use of the Cultural Heritage stored at the Documentary Archives of Ascoli Piceno, Italy. The application core is based on the visualization of multimedia content in Augmented Reality mode. The application shows the realistic and digitally rendered scenarios of virtual restoring vision of the places “as they were and where they were” in order to communicate the historical value of the heritage preserved in the Documentary Archives; it prioritizes the visualization of the 3D reconstructions of architectural heritage based on Archival Resources. Moreover, the 3D models become interfaces to access different associated 2D content connected generating a cascading system, structured on hierarchical information. This App, defining a technological framework mainly based on Open Source systems, aims to offer an expandable and repeatable “open data” experience of Cultural Heritage, to make available and accessible “hidden” information.

Keywords— Augmented Reality, mobile Application, historic Documental Archive, image-based modeling.

I. INTRODUCTION AND STATE OF THE ART

Finding new ways to enjoy our Cultural Heritage through the transfer of qualitative knowledge of the architectural, urban, and historical value of past and new environments, is a new challenge. This research aims to define new kind of explorations based on “perceptual” criteria allowing the user to interact with the space related with Cultural Heritage. The added value of this approach is to make possible to experience a “virtual view” of cultural content directly in the real world and therefore carry a greater involvement [1].

At the state of the art a growing number of applications are able to implement “Augmented Reality” (AR) contents. They are different according with: the user experience (static or portable); the device (desktop or mobile); the framework (location based, marker based, image based); the ways of interaction (passive, active, exploratory, logging, querying tool); the sensory feedback (visual, auditory, audio, mixed); the context of use (indoor and outdoor), the use of proprietary or open platforms [2].

In the field of museum desktop marker based AR applications allow to increase collections and exhibitions with virtual content [3]. The AR applications in urban context and in

architectonical or archaeological sites are based on the use of mobile devices with specific sensors and systems for geo-referencing and geo-tagging.

A few examples: VISITO-Tuscany, promoted by the Tuscany Region (Italy), is based on the use of photos taken by visitors and it become an interactive guide to visit some art cities of Tuscany [5]; The PhillyHistory.org Mobile, made by the Department of DOR in Philadelphia in 2010, uses the Layar platform to make accessible the historical images of the city of the entire collection [6]; UAR, launched by the NAI in Netherlands in 2011 makes use of the Layar infrastructure connected to their digitized archive. It shows 3D visualizations of buildings as they were in the past as well as projects to be realized in the future [7]. Google Glass Project represents the future scenario in this kind of application. In fact this is a proposal for a wearable “heads-up display” that overlays digital information displayed on glasses over the reality viewed by the user.

In this context, the ultimate goal of the work presented here is to structure a Communication Project which defines new strategies to make the city an active subject of the process for creating an enhanced access to our Cultural Heritage by using a specific AR application suitable for mobile devices. Specifically, a proposal for a project finalized in the valorization of those diversified Cultural Heritage Assets (iconographic, photographic, graphical, cartographic, and other types), of which the documentation is currently stored in the City’s Archives, was presented to the administration of the City of Ascoli Piceno. The objective is to render part of those assets accessible thanks to an application for mobile devices, Smartphone and Tablets, that generates a composited view of real and virtual representation, overlaying various levels of digitally mastered data on top of the experiential fruition of the historical asset.

II. SELECTION CRITERIA, SCENE SET UP AND 2D/3D RESOURCES LINKING METHOD

We first selected all the Archival Documents. In order to achieve the selection we have carried out a systematic research at the main Archives and Libraries of the city: the Iconographic Historical Municipal Archives (ASICAP), the “Giulio Gabrielli” Public Library, and the Public Works Archive. The

research was conducted by categorizing architecture and urban areas, according to the following typological criteria: churches, city gates ports, bridges, squares and streets.

Due to the incredible amount of documents we established some selection criteria. The main challenge was to choose the Resources that better allowed to highlight both the changes which occurred during our past in the city (Ascoli as it was), and even those only prefigured (Ascoli as could be). For this reason we selected:

- Documental Resources regarding architectural artifacts and urban spaces, such as evidence of a historical condition (demolition, additions, renovations, etc.).
- Documental Resources that, compared with the present bear, witness of projects or transformations never executed.

Secondly, and on the basis of a proposal made by the municipality, it was agreed to link the location of the Points of Interest (POI) of the city to the tour of the light train service called "Ascoli Explorer". In relation to this agreement we have carried out inspections and surveys in the historical center aimed firstly at recognition and lastly at definition of urban areas (buildings, spaces and urban views) to augment the Documental Data. We identified a total of 35 Points of Interest chosen with the intent of offering to the visitor-user further information about the city, not limited exclusively to the route previously established but encouraging them to continue the exploration outside of the route.

The next phase of the research consisted in the identification of the most appropriate procedures for the use of Archival Data through a mobile Application. In particular we have considered 2D and 3D visualization system and therefore we have defined:

- The amount of Documental Data to convert in a three-dimensional digital model.
- The visualization of all the Resources in both a catalogue Data ID card (Fig. 1), that provides a largely descriptive documentation, and a simple Archival Data visualization (digital image).



Fig. 1. Data ID card example of storage resources completed through the web portal and displayable through the mobile App.

The Data ID card, aimed at cataloging singular and systemic Archival Resources, has been compiled based on the Italian Standard of NIERA (*Norme Italiane per l'Elaborazione dei Record di autorità Archivistici*), in particular with reference to the *Progetto Sistema Archivistico Nazionale* (SAN) managed by the *Istituto Centrale per gli Archivi* (ICAR).

The 3D enhanced visualization of Documental Archival Data was realized for those cases in which the cultural object did not reflect any longer, in whole or in part, to the current reality. For this purpose, following a series of surveys to compare what is displayed in the Documental Data and what is the current status, we have verified the possibility to use some of this Archival Resources to accomplish the 3D reconstruction for the AR system on about 20 of the 35 located POI.

Technically, for the realization of 3D content, it has been necessary to distinguish between two different processes in relation to the type of modification occurred in the urban area.

In the first case (still existing differently located objects) 3D reconstructions were made with image-based techniques, (Autodesk ImageModeler 2009 from 8-10 images) building a 3D model of the current state from which has been derived the historical contextualization witnessed by the Documental Data (Fig. 2).

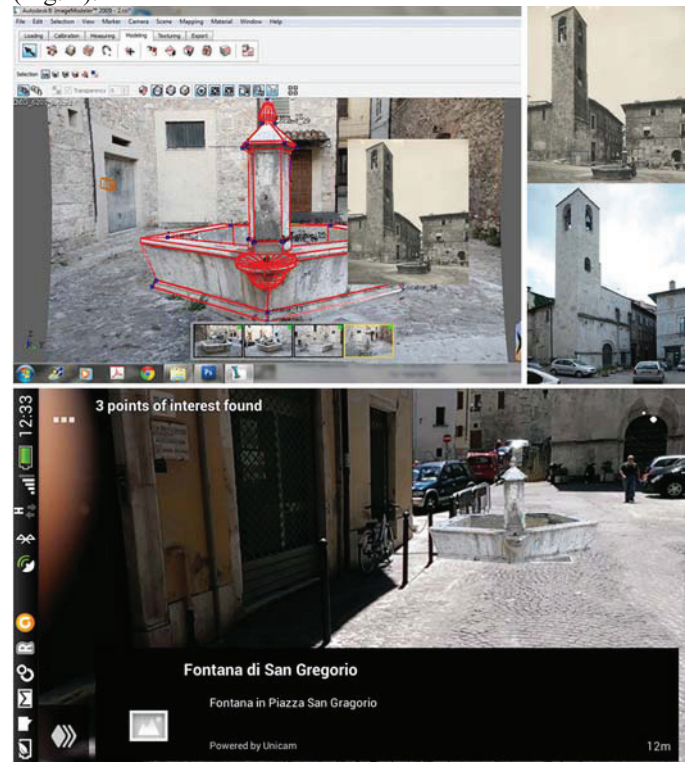


Fig. 2. Relocated fountain (S. Gregorio square): 3D image-based modelling, historical Alinari data (1915) and current state, mobile App visualization.

In the second case (no longer existing artifacts) the 3D reconstructions were made by digitizing the photographic resource, and then using a drawing procedure to obtain the 3D model from an individual image (Autodesk ImageModeler 2009), based on the recognition of double orthogonality, according to the directions x, y, z, detectable between pairs of elements of the depicted object.

In practice, the user, along his city tour, looks at the real urban view from the camera phone as he wants take a picture, doing this on the App interface he finds, located at the top right of the screen, a compass indicating all the POI marked and available in AR, in the radius of 300 meters from its location. As the user moves closer to one of the POI, depending on the type of content associated with it, he automatically watches on the screen of his device, overlapping, an hypothetical three-dimensional reconstruction of the today changed artifact, or a colored icon indicating the presence of image linked from the Archival Resources (Fig. 5- 6).

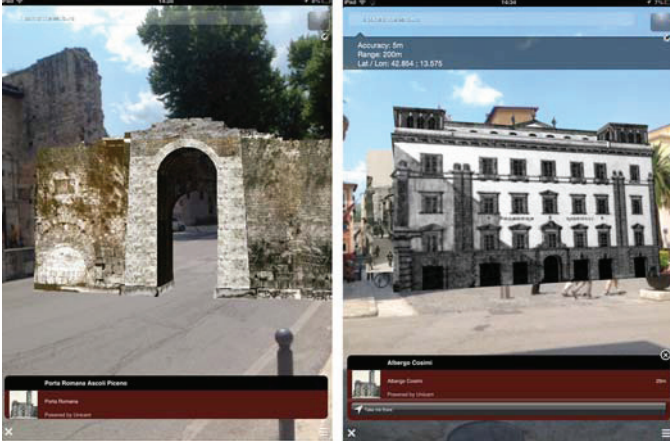


Fig. 5. Two screenshots of the 3D reconstructions of storage resources displayed in the mobile App: Porta Romana (1824 – demolition in 1929), Gabrielli's hotel in piazza Roma (project never realized by O.Cosmi in '900).



Fig. 6. Screenshots of the 3D reconstructions of storage resources displayed in the mobile App: Cathedral of Sant'Emidio in the early Christian age, in Arringo square.

The application interface, after having selected with a tap the 3D content or the icons, shows, on the bottom, a bar that, in addition to providing a series of data, such as name and its actual distance from the user, suggests the presence of additional available Resources associated with the selection (Data ID cards and more pictures).

V. CONCLUSIONS

The goal of this application is to increase the awareness of the cultural object, through a direct comparison with the current state of the places (urban contextualization), and to

establish a connection between the city and the institutions responsible for the conservation of the Cultural Heritage. To do this it is necessary to build a knowledge workflow on the heritage owned by the Archives, overcoming the physical separation between Documental Data and the urban space.

The technical App requirements are functionality, robustness and performance. In this regard the design, although it has needed some specific programming languages and codes skills, has allowed us to identify quickly and easily workflow, tools and procedures.

The potential identified for this Project is to predict further developments, in agreement with the municipality of Ascoli Piceno, both to improve the application's stability, increasing the amount of the data content associated to the web Portal and to identify this experience as a first step of a process to be continued for the city Cultural Heritage enhancement.

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