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EXPLORING THE INEXISTENT

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Abstract

Exploring the inexistent, discovering the intangible, walking into the past. An archeological site is 80% inexistent. The most consistent part of this fascinating landscape is made by something which disappeared because belonging to the past. The goal of this research is to make a practical contribution to the development of strategies oriented to the creation of a participated cultural heritage reality and an engaging Virtual Archeology. In fact the idea of the present work is to increase the interest of the work of art passing from a one-way to a two-way relationship. The user queries and interacts with the work which responds to his inputs. The visitor is not a static observer but he is allowed to be involved in the cultural heritage becoming part of it. The visitor changes his role transforming it from "viewer" to "user".

Keywords

Intangible, Exploration, Virtual Archeology, 3D Immersion, Real Time Model.

1. *Introduction*

The work[1] principally focuses on the vast topic of survey for archeology. It was decided to deal with the theme trough an inclusive methodology, so the work started from an urban scale to arrive at the single building. It was chosen to study the Vulci archeological park in central Italy (Fig.1 and Fig.2). The work concerns the reconstruction of the whole area creating a terrain model to arrive to the architectural scale reconstructing the Great Temple. From the beginning it was decided to use different scales of representation keeping a link between the various aspects. Great attention is dedicated to both: the input phase, concerning the survey, historical documentation and 3D reconstruction and the output phase, concerning the representation and digital communication. The work moves within Virtual Archaeology and aimed at rebuilding the entire park which becomes a large virtual container usable and implementable in the future. The present research is not a theoretical disquisition, but is applied in reality.

1.2 *Theoretical Aspects*

Immense and vast is the presence of extraordinary cultural heritage on the Italian territory. The present research focuses on a particular cultural heritage: the archaeological site. Analyzing in detail this reality it's possible to extract some elements characterizing its identity: - urban texture - architectural traces and - relationship with the landscape (Fig.3). The main aspect of the most archaeological sites is made up of what does not exist anymore. The technology in this research is at the service of these "absences" in order to recreate, among the still existing ruins and the visitor, the missing layer realizing the hypothetical reconstruction.
The Technology's role is to transform the visitor into an active participant giving him the opportunity to interact, freely questioning and moving in the new reconstructed virtual landscape. The Intangible is considered a very interesting aspect because is part of that place and because it represents the most relevant part of interest and the 80% of the charm

[1] This work follows the ongoing PhD Thesis guidelines conducted by Giulia Pettoello. SDRA, Department of History, Design and Restoration of Architecture - Rome Italy. In collaboration with Duke University. USA.

characterizing the archeological site. "The work of art through history never lost its vitality because it is not the artistic side which could be damaged with the passage of time, but only the material with which it is made. So the restoration has to take action only on the material of the work, aiming at the restoration of the potential unity of the artwork, without making a false artistic or historical forgery, and without erasing all traces of the passage of the work art over time"[2]. In terms of enhancement of culture and psychological point of view the Intangible represents the dominant feature and is certainly a very interesting and worthy aspect to be taken into consideration.

Certain questions are asked: Can we visualize the invisible? What kind of representation and communication is more suitable? How will the

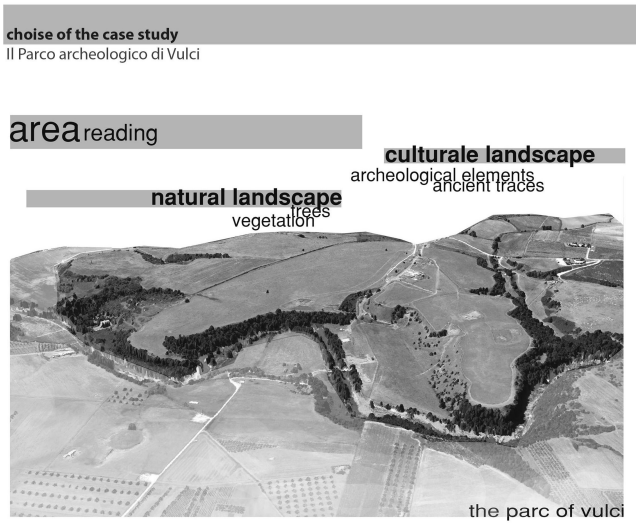

Fig. 1: Case Study, Archaeological Park of Vulci

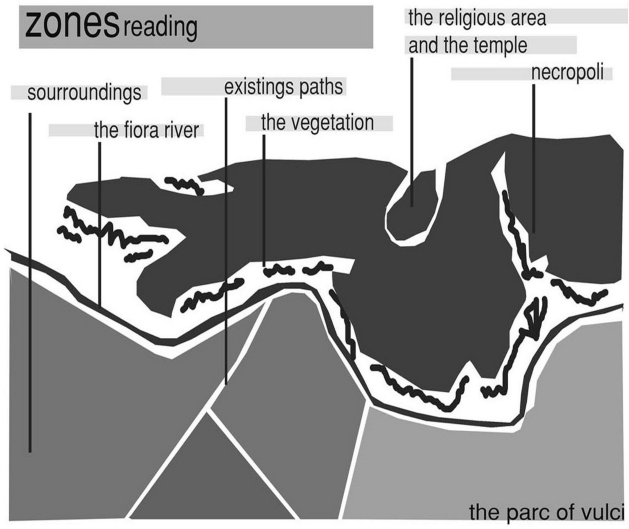

Fig. 2: Zones reading, Archaeological Park of Vulci

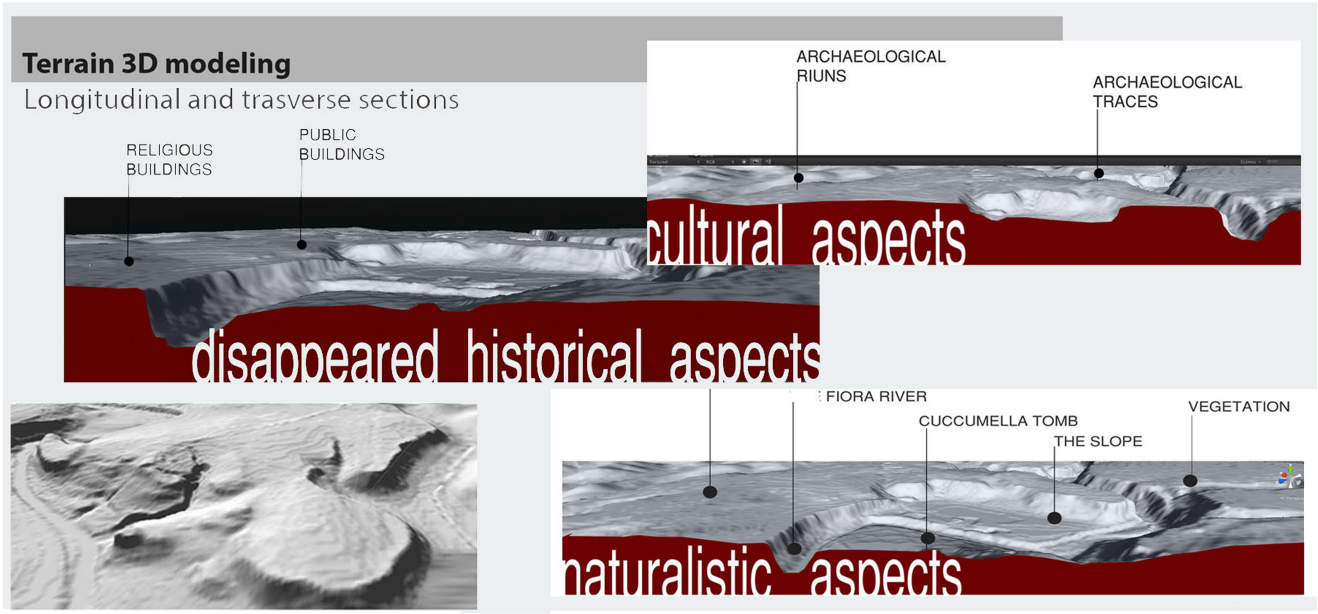

Fig.3: Sections about The Archaeological Park of Vulci

[2] Brandi, C. Retrieved from: http://restaurars.altervista.org)

visitor react? How to fill the emptiness of what is not visible without affecting the inestimable value of passage of time on the work? "I like ruins because what remains is not the total design, but the clarity of thought, the naked structure, the spirit of the thing"[3]. This is precisely the reason why the archaeological site is preserved without altering its character of ruin, in fact the research aims at creating a virtual path consisting in several stages. The stages realized are: The video trailer, the Mobile Application, The real time model and the pdf 3D. This is a communicative method flexible and sustainable because editable at any time depending on the cultural reality examined. In this research the reconstruction of the ancient landscape is, in all the designed output, a layer that is virtually superimposed on the actual landscape but without altering their characteristics. This approach brings with it two fundamental aspects: on the one hand we respect the cultural property, its current status and its relationship with the passage of time, on the other hand it is given to the visitor the opportunity to explore some aspects of the past only if and when considered interesting.

1.3 The Real Time Model

Among the various stages composing the virtual path, in the following paragraph, the real time model is considered and in particular its psychological characteristics are analyzed. The real time model has been designed focusing on the following aspects: The first aspect is *The sense of being there*. "Computer games offer substantial attractions to the player to the provision of choices. These are too numerous to canvass fully here, but include challenges or tasks responsive to the user's level of knowledge; sociality with other players; discovery through exploration; and a sense of being there, or presence"[4]. Being able to interact, whether it's a serious game or real time explorable model , the viewer is leaded to take an active role. He is no more an outside visitor of that landscape but an inner one. Of fundamental psychological value, in order to create a *sense of being there* is also the introduction of natural elements such as the vegetation and the water which move under the action of the wind and thus contribute to the perception of the atmosphere. The virtual tour is enriched to become more and more an all-round experience . Both static and dynamic elements cohexist. A Fundamental element to keep in mind during the design of the reconstructed landscape is also the "type of use". In fact the utilization follows the real process of discovering a new place, which is revealed to the visitor as in reality step by step."One aspect that makes such games so interesting is that the environment, the roads, the bridges and the paths cannot be perceived as a whole all at once by the player. Building up knowledge requires commitment to a series of spectorial voyages - an extensive exploration of terrain through panoramas. Through these sets of spatial negotiations, players become involved in the sequential unfolding of a record of signposts embedded in the landscape"[5]. The sense of *being there* therefore regards the *sense of discovery*. The user is surprised by landscape and unexpected views with great emotional impact like exploring a real city .

The second aspect of Real Time model is *contextualizing the object*. An object, a work of art or a piece of architecture have the common characteristic of being part of an original historical contest. Often, however, this aspect is underestimated in museums because we are dealing with objects on display in the showcases next to each other arranged in a row, under glass aseptically. In this research, the virtual model is a large container in which objects regain their original context. The virtual model created is a layered landscape. The visitor also has the opportunity to turn off completely the reconstructed model to see the actual archaeological landscape and not to lose the relationship between reality and virtuality. This exchange is carried out through the creation of specific *scripts* to be applied within the software.

The third aspect of the model is the *3D Immersion*. The engagement of the user is obtained due to the application of *Oculus* to the 3D model created. Oculus is currently the focus of the technological landscape. About Oculus, present at the Electronic Entertainment Expo 2015 (E3), the largest fair in the games in Los

[3] Ando, T. (2012). Retrieved from: http:// www.ilikearchitecture.net/2013/02/quote-52-tadao-ando/

[4] Flynn, B. (2007). The Morphology of Space in Virtual Heritage. In F. Cameron and S.Kenderdine, Teorizing Digital Cultural Heritage (pp.354). London, The MIT Press.

[5] Flynn, B. (2007). The Morphology of Space in Virtual Heritage. In F. Cameron and S.Kenderdine, Teorizing Digital Cultural Heritage (pp.355). London, The MIT Press.

Angeles, speaks Auriea Harvey: "With the virtual reality you feel space even if your body is not there. It is a sensory fracture, an asynchrony. The basis for endless narrative experimentations"[6]. The sense of *3D immersion* is also supported by the *Practice of mouvement*. The involvement, in this research is not just a theoretical concept but it's a concrete element transformed in reality. Michel de Certeau writing about the art of doing, makes the distinction between space and place where place is a stable and distinct location, and space is composed of the intersection of mobile elements, taking into consideration vectors of direction, velocities, and time variables. Using the Certeau's terms, the user enunciates space though the practice of movement. Navigation as practice creates a sense of enchantment or wonder through the occupation of space"[7]. The aspect of 3D Immersion is also achieved thanks to the user's participation. This point regards principally the user's role. The action of doing stimulates participation which stimulates involvement. Mentioning the British Audio Visual Society Research, Anne Fahynotes "whilst we only remember ten percent of what we read, we remember ninety percent of what we say and do"[8]. And to quote Susan Hazan: "A great value consist in encouraging interactive participation, whether analog or digital. The labels, texts, and various display techniques come together to engage not only the hand, but also the mind, in order to enable access to the intellectual scaffolding of that curatorial message"[9].

2. Practical Aspects

In the present research, for the Vulci archeological site, it was decided to design four different steps. The 4 stages together create the virtual path which overlaps the real path by creating a new, richer and customized experience.

2.1 The Virtual Path: 4 steps

The first step is an introductory *Narrative Video Trailer* which consists in an exploratory cultural heritage virtual tour. As it happens in movies, the trailer's task is telling a short story using a few and specific images, sounds and words. This tool has the ambition to create a

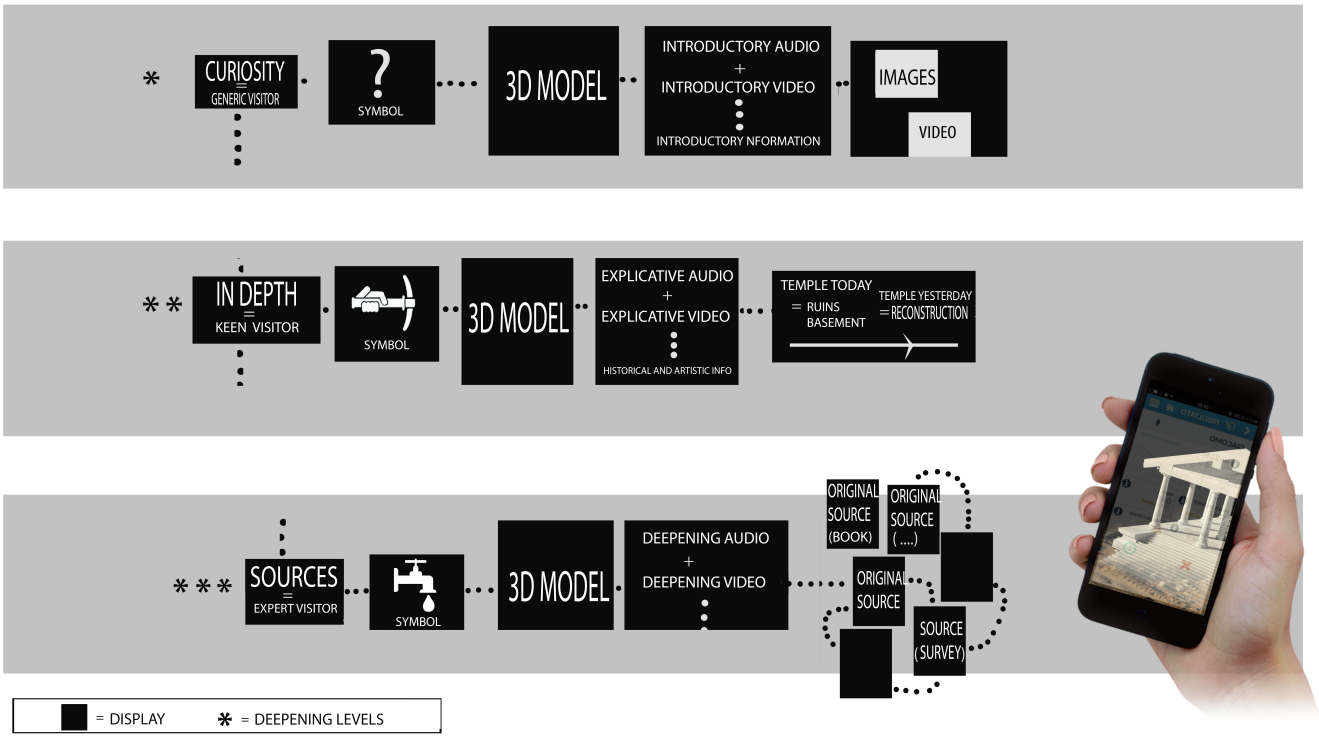

Fig.4: Mobile Application's project.

[6] D'Alessandro, J. (2015). In Quella nuova realtà (virtuale) fra giochi e film. La Repubblica. pp 40.

[7] Flynn, B. (2010). The Morphology of Space in Virtual Heritage. In F. Cameron and S.Kenderdine, Teorizing Digital Cultural Heritage (pp 356). London, The MIT Press.

[8] Hazan, S. (2010). A Crisis of Authority: New Lamps for Old. In F. Cameron and S.Kenderdine, Teorizing Digital Cultural Heritage (pp 143). London, The MIT Press.

[9] Hazan, S. (2010). A Crisis of Authority: New Lamps for Old. In F. Cameron and S.Kenderdine, Teorizing Digital Cultural Heritage (pp 133). London, The MIT Press.

narration able to capture the visitor's interest. It was decided to project a trailer because it is a fast, rhythmic and fluid way of communication which perfectly fits with today's society. It is considered particularly interesting readapting the trailer, usually used for the cinema, at the cultural heritage service. In fact, being highly simplified and agile, this output could serve as an introductory preview shared via web. The trailer acts as a bridge between the world "off line" of cultural heritage and the world "on line" increasing dynamic in which we live.

The second step is a *Mobile Application* (Fig.4). The Application , in this research, works as a customized self-guide. It's a way for the user to deepen some argument or to find some particular and interactive explication. It is possible to analyze structural, hystorical or particular aspects such as ancient sources used during the study. The project of the whole App was settled. The realized App prototype regards the switch between *today* and *yesterday*, the user can interactively move freely between past and present thanks to a responsive touch screen function. The realized prototype also concerns the interactive communication about the wooden roof technologies of the Temple, visualizing the steps required to the building process. The App can be downloaded by the user making it possible to take it home.

The third step is a *Real-time explorable model* where the user can take an active role in the cultural landscape. In fact the 3D model of the landscape and the temple were realized. Real time space exploration allows the user freedom of movements, he passes from a traditional fixed flow to a new random flow. The peculiarity of this model compared with the standard static 3D models is to greater user involvement derived from it's become active within the path (Fig.5 and Fig.6).

The fourth stage regards the final part of the visit and concerns a *PDF 3D*, its function is a digital brochure for the visitor. The PDF is a very brief book, faster respect to the App. The main and significant elements of the Archeological site are highlighted. It is a very agile way of communication because thanks to links, the images, 3d models and narratives are connected together. This output is designed to create a moment of reflection in the visitor who can, just as it would in a library, investigate the work. This brochure is also a way to prolong the visit beyond the site and ensure that people take away with them a trace of the cultural heritage.

Each of the four steps is thought both from the technological point of view and also from psychological one. It's a *fil rouge* that guides visitors leaving them free to choose in order to get to the appropriation of the cultural place visited. In fact a path is created for the visitor's personal enrichment, who is not left alone but addressed in order to make possible the comprehension of the place by any type of user regardless his cultural background.

Fig.5: Oculus 3D. Experimentations

Fig.6: Oculus 3D and The Archaeological Park of Vulci

2.2 Technical process

The entire work moves within digital low cost technologies and, for the majority, open source programs. The workflow on the operational part of the work can be divided into three chapters: the first about survey, the second about modeling and the third about communication. In this section we focus on the analysis of the first two steps, because the communication and the output

were already mentioned in the previous paragraph.

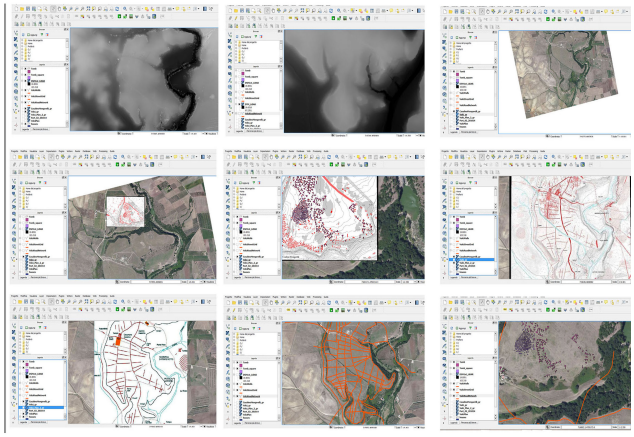

Fig.7: The GIS. Study of The Landscape

2.2.1 The first step: Survey

The Survey concerns two different scales : The landscape scale and the architectural scale. On the one hand, regarding the landscape, the work concerned the analysis and the processing of the DEM (Digital Elevation Model). On the other hand, the Great Temple has been considered. The non–contact Survey of the Great temple Basement has be done by Photomodeling.

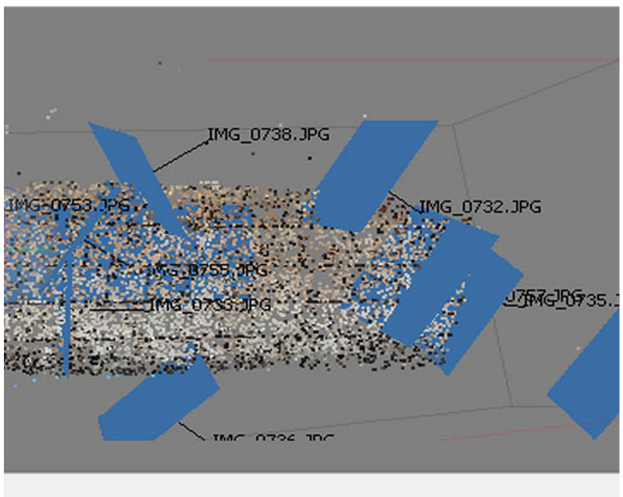

Fig.9: The Basement and the Point Cloud

For this purpose, the Software Photomodeler Scanner was used. This process concerns: the initial photographic campaign, identification of corresponding points, pictures alignment, point cloud generation, solid model generation and creation of textures. After that, a test of reliability was made, by measuring the error and the differences between real object and the model, in order to monitor the level of reliability of the survey and the accuracy of the resulting model.

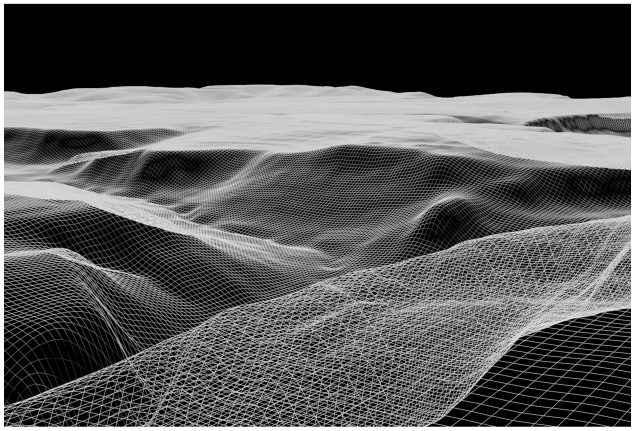

Fig.8: Wireframe Terrain Model Reconstruction

2.2.2 The second step: 3D Modelling

The first part of the modeling involves the reconstruction of the terrain (Fig.7 and Fig.8) and the second one of the temple. For the reconstruction of the terrain two main directions were followed: Initially a 3D model was created

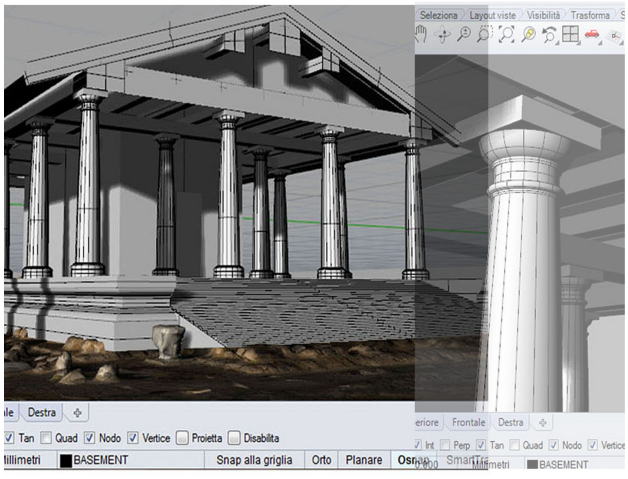

Fig.10: 3D Reconstruction. Rhinoceros 5.0

useful for the operations of study and analysis as for example: sections, measurements and overlay of the map's information. After that a second model was created used as base landscape for the real time model. The phase of analysis and the chart comparison were made possible thanks to

the use of G I S. With this method it was possible to compare the data in a very detailed and precise way thanks to the use of geographic coordinates. The creation of a GIS model is not only useful for the ongoing study but also for creating an archive and database useful for future upgrades and expansions. This is therefore a method of investigation of the territory flexible and particularly suitable to the type of archaeological site because it is characterized by the presence of superimposed layers. For the realization of the light model a DEM file was used, which allowded to transform the map of the area in an exportable format .raw readable from the game engine used in the last phase of the work.

The second part of the modeling concerns the model of the temple (Fig.9 and Fig.10). The operations are the following: Fundamental is the phase of documentation and archival research. Regarding the Etruscan architecture, most of the constructions of that time have been realized in wood and therefore no traces remain. For this, the study and the analysis of ancient sources it is crucial. From these studies were selected some significant graphics about the Etruscan order, about the temple proportions, color, materials and building techniques of those days. Among the various sources of great importance and support was the "De Architectura" by Vitruvius. In addition to the sources, the study is also based on the previous basement obtained by the survey. The *mesh* obtained through photomodelling was imported into Rhinoceros to use it as a basis on which to set the reconstruction of the temple. This modeling has led to non-textured geometric model. Subsequently, the model obtained was transformed in a simplified model that can be used in real time environment. The simplification regards the geometry and the texture. Afterwards the architectural model was realized and texturing and baking were made. This methodology proved to be particularly effective mainly with regard to the illumination on the model of the temple. With regard to the temple's roof, for example, the tiles initially molded one by one have been then replaced by a unique texture so as to greatly decrease the overall weight of the model. Finally it was possible to proceed with the import of the model generated in real time software chosen.

3. Conclusion and Future Works

The paper proposes a theoretical and practical framework designed to rethink the cultural heritage's role in today society. Future studies, following this path, will focus their attention on the possibility to develop and adapt the proposed workflow to other sites of cultural interest testing the sustainability and flexibility of the presented project. In the present research as in the future researches, the visitor is the pivotal element. In fact the user is thus able, taking advantage of the various technological installations, to take possession of that Cultural heritage. The whole work makes the visitor feel a part of the disappeared cultural landscape now alive again (Fig.11).

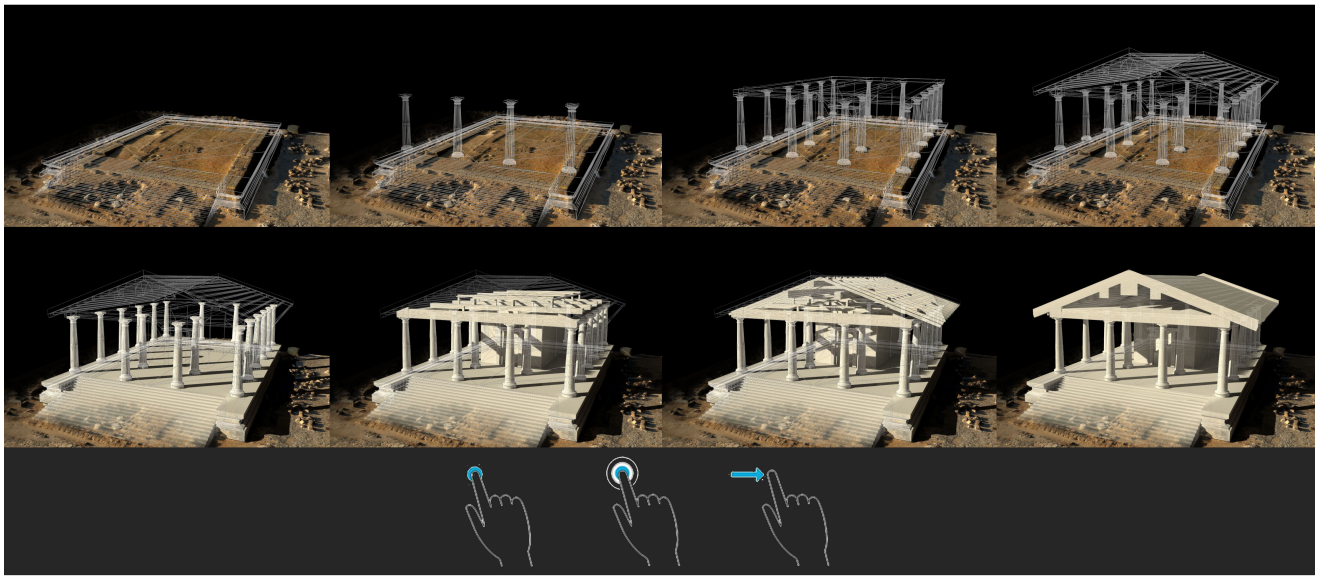

Fig.11: Responsive Mobile Application: Existing Basement and Reconstruction of The Temple

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