MAP-i 2010/2011 — Thesis Proposal

Virtual Representation and Visualization Methods for Architectural and Contextual Information in Archaeological Sites

Motivation

Despite the growing importance of non-destructive exploration methods, the archaeological excavation remains a fundamental process for collecting data from archaeological sites. Although it is an irretrievable destructive method, its purpose is not to unveil successive sediment layers, findings and structures, but to record data and produce graphical and written documentation of every finding. Such documentation will be used to understand and study the different layers and findings, to establish eventual relations between them, and to interpret the global human occupation of the archaeological site.

Another fundamental purpose that has to be achieved during an archaeological excavation is to understand how the site was built through the years, since this will explain the origin of the different sediment layers. In fact, it is not enough to excavate a site: an archaeologist must be able to explain the structures that were found, and to understand the deposit and destruction process associated to the site.

Virtual 3D models, as an instrument of the archaeological discourse, are increasingly used in the dissemination of archaeological sites. Models representing a (possible) virtual reconstruction of archaeological sites can be presented in simple multimedia kiosks or in more complex augmented reality systems, usually to present research results to a wider audience.

More important, such virtual 3D models can also be used as an auxiliary tool for archaeological research. Therefore, a model of an archaeological site that has been designed and built according to an interpretation of the archaeological data can be regarded as a virtual digital model that might be disassembled to improve the analysis and understanding of the architectural structures, the way they relate with each other and their relation with the surrounding space.

Based on the same principle, another interesting application is the visualization of an archaeological site reconstruction from the reading of successive excavation plans and architectural drawings. The asset, in this case, is the enhancement of the stratigraphic reading due to the visualization of the spatial distribution of findings and the reconstruction of architectural structures found at the site.

Goals

The main goals of the proposed work are the design and evaluation of appropriate (3D + time) representations and visualization tools for presenting and interacting both with the data from an archaeological excavation, as well as possible reconstructions of an archaeological site.

The work carried out has to take into account the needs of different target audiences: it should not only allow the presentation of virtual reconstructions for a general audience, but also empower the work of archaeologists.

A fundamental step is the development of case studies and evaluation scenarios in the context of *Bracara Augusta* and in connection with the work being carried out by the *"Unidade de Arqueologia da Universidade do Minho"*.

Tasks

The main tasks to be carried out are the following:

- Survey of current practices by Archaeology teams for handling all data related to archaeological sites and their restitution.
- Analysis of the state of the art in Archaeology and Cultural Heritage applications, including the Modelling, Visualization and Interaction methods and techniques used.
- In the context of *Bracara Augusta*, the available data and desired presentation scenarios, identification of a set of issues that can benefit from the design and development of appropriate representations and visualization methods.

- Design and evaluation of appropriate representations for the data associated to an archaeological site and its excavation process.

- Design and evaluation of visualization metaphors and tools for presenting and interacting with such representations, either using realistic (accurate 3D models) or non-realistic illustrative visualization techniques, or a combination of both.

- The developed tools have to allow the chronological reconstruction of an archaeological site, which will enable the generation and interaction with expert-dependent views and presentations of the site.

- Design of an appropriate global system architecture and implementation of a prototype application to test and evaluate the developed tools.

- Definition of one or more case studies and evaluation scenarios and proper evaluation through different user studies.

Some references

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T. Diamanti et al. ViSMan: an Open-Source Visualization Framework for Virtual Reconstructions and Data Management in Archaeology. Proc. of VAST 2010, p. 47-53

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