

# The LEAP Project: a New Approach to the (Re)Presentation of the Past by Means of Virtual Reality

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## Abstract

*This poster presents the goals and implications of the recently started EU funded project {LEAP}. This two-year research endeavour aims to build and test an innovative theoretical and methodological framework for Virtual Archaeology, based on a redefinition of the HCI concept of Cultural Presence.*

Categories and Subject Descriptors (according to ACM CCS): J.2 [Computer Applications]: Physical Sciences and Engineering—Archaeology.

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## 1. Virtual Archaeology: what is the problem?

Virtual Archaeology (VA) is nowadays a well-established area at the intersection of the wider fields of ICT and Cultural Heritage (CH). More specifically, Virtual Reality (VR) brings sensorial accuracy and interaction; and Archaeology, the ultimate aim of investigating and describing past cultures. Several publications -e.g., [Nic02]- and an international charter, The Sevilla Principles, have defined the goals and guidelines for VA.

Yet, most 3D models do not comply with several principles of this consensual document, namely: number 2 (about coherence between aims and methods); numbers 4, 5, and 7 (about authenticity and transparency); and number 8 (about evaluation of effectiveness with end-users). In other words, VA projects typically display hyper-realistic reconstructions of architectural environments, the usefulness of which is seldom assessed. But Archaeology is about people, past and present. And VR has the capacity to use different communicational approaches; include paradata; show levels of certainty; and support the understanding of the living culture (past and present) behind the reconstructions.

## 2. Convergence story

The latter partially overlaps with the concept of Cultural Presence, a notion still under development in HCI. The concept was coined in order to define a culturally meaningful context in/with which users can communicate and cooperate [RCG\*02]. Subsequently, some researchers used CH examples in order to draw the attention to the usefulness of Cultural Presence for the understanding of other cultures [Jon05]. On the CH side, several authors, such as [Dev07],

have recently laid the foundations for the development of more “ethnological” reconstructions, aimed at expressing and understanding cultural identities.

As a consequence, this has opened the door for a potential convergence between Presence and VA, in which the former brings its well established methodologies, and the later brings specific goals and meaningfulness. This complies with recent claims in the Presence field about the importance of the context of use [TT02], and the fruitfulness to expand the analytical scope of Presence with theoretical insights from other fields [KV03].

## 3. The {LEAP} Project

In this context arises {LEAP}. “LEarning of Archaeology through Presence” is a recently started EU funded project aimed at researching, implementing and evaluating an interdisciplinary theoretical and methodological framework for VA. This framework seeks to comply with the aforementioned Charter, take full advantage of VR’s capacities, and ultimately enhance the understanding of human societies by experts and audiences.

{LEAP} will be developed at the Pompeu Fabra University of Barcelona. The MIDARQ Group (Dept. of Humanities) investigates from an archaeological perspective the constellation defined by domestic technologies, material culture and social global structures. On the other hand, the SPECS Group (Dept. of ICT), studies and synthesizes the early neural, psychological, and behavioural issues that underlie perception, emotion, and cognition, with the help of computational systems.

The overall strategy of the {LEAP} project comprises three phases. The first is to import into the archaeological field the concept of Cultural Presence and adapt it to the new context of development. The main points of concern will be the definition of the concept, its goals, the potentially relevant factors (in comparison with Presence), and the associated methodology of assessment.

In its second phase, the project will build different 3D models of an archaeological site at the immersive mixed-reality space (XIM) of the SPECS Group. The chosen example is Peñalosa, an archaeological site belonging to the well-studied Bronze Age Spanish culture of El Argar. The design tools will be 3DS Max and Unity 3D, as well as iqr, a simulator for large scale neural systems, acting as a backbone for the character interaction in the VR scenarios.

Finally, the project will design a specific evaluation methodology for Cultural Presence, and compare the impact of the different virtual reconstructions on a selected group of users. Participants will be video-recorded and their physiological responses tracked. Then, they will answer a questionnaire adapted from the standard Presence questionnaires. On the other hand, learning pre/post tests will also be performed in order to measure the learning outcomes. Due to the explorative character of this project, a qualitative approach (e.g. open-end questions and video-based analysis) will be also adopted.

#### 4. Adjusting the intersection

According to {LEAP}, Cultural Presence is a means for and a measure of the suitability of a virtual environment for learning. Drawing from constructivist and media psychology theories, the starting hypothesis is that the highest the feeling of “being then and there”, the highest the emotional and learning impact. On the other hand, because tools to assess Presence and learning have been well developed in their respective fields, it should be possible to measure both and verify if a correlation exists.

Yet, in order for design and evaluation take place, two issues need to be considered. In the first place, the concept of Cultural Presence raises ethnological issues: any description of another culture is necessarily biased by the observer’s own cultural context [Eva65]. This increases in the case of Archaeology, which works with interpretations based on partially preserved sources. The proposed solution has been to limit interaction to well-known material culture, which corresponds to the concept of “passive Cultural Presence” [Cha05]. However, this brings us back to empty worlds. In any case, the inclusion of non-photorealistic rendering, paradata, or alternative reconstructions may be more compliant with scientific deontology, but it may also undermine the feeling of (Cultural) Presence. This is an issue that needs to be investigated, since early evaluations [PE08] have shown that users are more disappointed by limitations in interaction than in visual realism. It is paramount to verify which the factors intervening in Cultural Presence are, as it can now less than ever be compared against the real world; instead, it should be equated with verisimilitude (who defines it?) and include notions such as satisfaction and engagement [PC12].

The second issue is related to learning. Learning is a complex concept, comprising different kinds of knowledge, attitudes, and skills, which involve different (cognitive) processes. Therefore, as evidenced by previous studies [PE08], measuring learning in virtual environments is more than just assessing factual knowledge. It all depends on the approach adopted, which in VA has recently diversified: visualization of empty or populated worlds, spatial or chronological navigation, information retrieval, storytelling, role playing... Under these circumstances, any attempt to correlate learning and Cultural Presence needs first to assess the specific usefulness, the degree of Cultural Presence, and the factors associated to each approach.

#### 5. P for Presence, P for Present

The {LEAP} project has just started, but we would suggest that a possible way around the previous issues may be to put the emphasis in task-oriented interaction rather than in visualization, and consequently to consider and present virtual environments as simulations. This acknowledges the interpretive, contemporary aspect of VA, and reinstates Presence as measuring tool. Consequently, we may want to use VA to learn not about the past, but about how our own culture depicts it. “Cultural” in Cultural Presence refers to the present context of application.

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