

# ÇH3D: take a run and let's {LEAP} into the past!

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## Abstract

*This demo will present ÇH3D, a VR-mediated experience built in the context of the EU-funded project LEAP (Learning of Archaeology through Presence). The research project is based on a reformulation of the HCI concept of Cultural Presence, and has provided interesting results regarding its underlying factors, its correlation with learning, and its suitability as an assessment tool.*

Categories and Subject Descriptors (according to ACM CCS): J.5 [Computer Applications]: Arts and Humanities—Architecture.

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## 1. Introduction

The main goal of Virtual Heritage is currently to build 3D reconstructions of archaeological objects and sites for their general dissemination. However, thanks to the immersive and interactive character of VR, it may also allow a more direct understanding of the culture they belong to. This partially overlaps with the HCI concept of Cultural Presence [RCGM 2002]. The EU-funded LEAP project (Learning of Archaeology through Presence) aimed to develop this crossroad area in three steps. Firstly, by building a theoretical and methodological framework based on a new understanding of Cultural Presence [PC2012]. Secondly, by designing and implementing a VR-mediated experience of a renowned archaeological site. Finally, by evaluating the cognitive, emotional and learning impact of the virtual environment on a selected group of end-users. The main hypothesis to be tested, by comparing increasingly more complete visualization conditions, was that the higher the feeling of Cultural Presence, the higher learning of past societies in virtual environments.

## 2. Description of the VR-mediated experience

### 2.1. Content

“ÇH3D” is based on a virtual reconstruction of the Neolithic site of Çatalhöyük (Turkey). This iconic UNESCO World Heritage site has become a point of reference both

for the expert community as well as for non-expert audiences.



Figure 1: A screenshot of condition 5.

The environment contains a 3D terrain model for the settlement and a computer-generated nature for the environment. In addition, the interior of one building has been fully reconstructed. Material culture is represented through an array of 3D-modelled objects (e.g. baskets, pottery, stone tools, figurines, mats, grinding stones, leather bags, brooms...). Daily life is represented in different scenes including 3D animated human characters and animals, and 3D audio. One condition also contains floating message boxes displaying textual information.

### 2.2. Technical solutions for display, visualization and interaction

The ÇH3D experience is a two-display mode executable built with 3D Studio Max and Unity Game Engine. It currently runs in a Dell Alienware 17 Gaming laptop.

Peripheral devices include headset Razer OSVR HDK2; wireless gamepad Logitech F710; and standard earphones.

ÇH3D allows two types of visualization: in VR mode, users wear the headset to obtain a fully pervasive, stereoscopic vision of the virtual environment; in screen-based mode, 3D images can be displayed on any kind of screen by means of a projector. For test purposes, different levels of visual realism were introduced. Seemingly, objects with different levels of archaeological certainty were represented. In terms of interaction, ÇH3D allows spatial exploration, which is achieved by means of the wireless gamepad (3 DOF) and the HMD (3 DOF). In the screen-based version, navigation is performed by means of keyboard and mouse.



Figure 2: User evaluation (condition 1).

ÇH3D requires light, mobile equipment; therefore, it can be experienced anywhere, including eventually the original site itself. The two display modes (VR and screen-based) increase its flexibility with regard to audiences and environments. The final goal is to propose a display solution for virtual environments that while being immersive can be brought to different complementary cultural heritage environments.

### 2.3. User experience

The ÇH3D experience consists of a one-day trip to Çatalhöyük 9000 years ago. Users can explore within certain invisible limits 5 pre-defined points of interest: 2 inside a house, 1 on the rooftop, 1 in a midden, and 1 in the outskirts. Thus, the most representative cultural aspects are conveyed while ensuring all participants explore similar content. Since the model was built for scientific purposes, participants experienced one of 6 versions: architecture only; objects; hotspots with textual information; still characters; scenes; scenes with narration. At their own pace, users can change scene by pressing a specific button on the gamepad. Also, they can automatically enter a small room and exit the house by pressing another button.

### 3. Methodology

To build the virtual environment a mixture of traditional and innovative methods was used. Firstly, basic information about the site and the landscape was obtained from the excavations published monographs. Secondly, workshops with specialists were held, during which they defined

(by means of questionnaires and on-site exercises) the essential elements of Çatalhöyük as a culture and how to depict them with VR. Finally, a VR experience was implemented by an international.

### 4. Innovation

Since the purpose of ÇH3D was to compare current 3D models with more complete VR experiences, we adopted off-the-shelf technological solutions. The innovation of the project resides in testing new approaches to the past. Firstly, we wanted to find the content elements that will help users believe they are in the presence of a distinct culture. Secondly, in contrast to current 3D models seeking photo-realism and simulation of the real world, [LEAP] adopted a general feeling of sensorial verisimilitude and the notion of “Enhanced virtuality”, i.e. different forms of guidance (visual, aural, textual verbal) aimed at enhancing learning.

### 5. Conclusions

The goal of ÇH3D was to provide empirically tested design and evaluation guidelines for virtual environments that aim at enhancing understanding, relevance and enjoyment of Cultural Heritage. More specifically, it wanted to test if an enhanced feeling of Cultural Presence, that is, of “being then and there” (generated in different versions by successively introducing objects, text, characters, scenes and narrations), obtained better results in comparison with an architectural reconstruction of the site.

The statistical analyses provided interesting results that helped 1) define the factors underlying Cultural Presence; 2) establish positive but not linear correlations with learning; and 3) propose a new evaluative methodology for guidelines for archaeological virtual environments. Some of these interesting results will be presented in a poster. We would like to demonstrate in parallel the tool with which they were obtained.

### 6. Acknowledgements

The research leading to these results has received funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement n° 625537.

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