VR environment for the Intendance's palace in Quebec city

First archaeological VR exploration and digital phenomenology of the site

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Introduction

Digital tools have been slowly integrated as part of the archaeological process of information acquisition, analysis, and dissemination in Canada. We see more and more academic research and even private excavation project using photogrammetry and/or lasergrammetry to better save the information and later investigate the data. The main focus of this article is about one step after those 3D acquisitions, primary analysis and visualizations already well known in the community. The focus is on the integration of virtual reality (VR) in archaeological investigations. This inclusive methodology of digital archaeology incorporates the work already in place, but opens to new possibilities of manipulation, hypothesis visualization and interpretations. The relevance of this methodology is exposed through the case study on the Intendance's palace, an XVIIIth century archaeological site in Quebec City. The VR environment created provides new questions and perspectives that would never occur otherwise and technical advantages of gathering data in the same virtual space.

VR in archaeology

The digital domain was officially introduced in archaeology with the "virtual archaeology" concept by Reilly in 1990 and his simulation of an archaeological excavation (Reilly, 1990). After that, many case studies developed digital visualization of archaeological sites like for the tomb of Queen Nefertari presented for an exhibition in Rome in 1994 (Karlsson, 2013). For Quebec and the archaeological site of the Intendance's palace, a first 3D reconstruction was made in 1999 (Lapointe, 1999). More recently, many projects throughout Canada have been conducted to acquisition the 3D model of *in situ* features, vestiges, and artifacts found in archaeological digs (e.g., Méreuze, Jarhaus, Dawson, Friesen, 2017). What is uncommon to encounter in Canadian research is mainly the Virtual Reality component a little bit more familiar to archaeologists in Europe and in the United States. This scientific domain uses knowledge from computer science in combination with interaction interfaces to simulate a reality with entities that will behave and interact in real time engaging the user in a pseudo-natural immersion (Arnaldi, Guitton, and Moreau, 2018). In the overview of the research done so far, the conclusion is a lack of case studies to experiment the methodology digital archaeology especially in Canada and even more in Quebec. The Intendance's palace site is also in need of a better perspective on the paleoenvironment and past landscape since it is encompassed in a dense urban area. With an immersive 3D environment, the goal is to come closer to the past perceptions and way of living by doing a digital phenomenology analysis (Falconer and Scott, 2018). This project gives the opportunity to explore new archaeological questions and interpretations as well as to discuss the practical application of virtual reality.

Research problem

The questions asked in this research concern two main discussions. First, the discussion about the subject of the Intendance's palace itself : Does the 3D environment proves past interpretations, especially in regards to the symbolic architecture to demonstrate a position of power (Mercier-Méthé, 2012)? Second, the interrogations about the methodology : Does the virtual reality helps better understand hypotheses of the past landscape? Does it provides new questions and interpretations that would not occur otherwise?

Contribution

Four-part methodology

This research aims to propose a four-part methodology that embraces any new acquisition and processing technology, teamwork, 3D visualization, simulations and interactions as many developed over the years (Knabb, Schulze, Kuester, DeFanti and Levy, 2014), some core principles of public archaeology and a digital phenomenology angle. The goal is to take advantage of the technological changes that are rapidly taking over the archaeological field by not only learning how each tool works but also by changing the mindset of 3D and 4D interpretation to a more open and flexible hypothesis making process (Forte, 2016). The structure proposed consist of 1) Data acquisition and processing, 2) Analysis, 3) Virtual reality, and 4) Dissemination while respecting a scientific rigour developed by the international community in the digital heritage field (Statham, 2019)

Case study

For a period of five months an archaeologist, a graphic designer and a virtual reality programmer worked on creating a first hypothesis of the 1719 Intendance's palace with its surroundings. Historical and archaeological sources were used to reconstruct the architecture of the buildings and their position. Modern LiDAR data served as a base for the topology of the area then adjusted to the archaeological data of the specific period in time. The integration in a virtual reality environment resulted in the adding of materials and textures, the addition of a day and night lighting (with real alignment), a "ghost" navigation mode, a main menu to give informations about the project, the controls, and different options, addition of metadata and certainty level graphics accessible by clicking on each object in the scene, access to archeological maps, photogrammetry of the modern Intendance's palace and the 3D model of the entire modern city of Quebec. With this hypothesis, a North-East-South-West viewshed analysis by three different points of view was conducted linked to a digital phenomenology analysis.

Fig. 1. Test of the 3D Intendance's palace model in an immersive room.

Results

The results expose the technical advantages of the VR platform for archaeology : efficiency, variety of data in the same environment, scale visualization, night and day lighting visibility, handling without damage, etc. It also resulted in the confirmation of past interpretation in the symbolic of the architecture. The past landscape does not attenuate the emotional impact of the building but it rather gives it an even bigger contrast since the surroundings are mainly untouched and cover with vegetation. Also, it was uncovered the main staircase was built larger than previously planned on the architect's plans. This information was not mentioned in the archaeological report and leads to the hypothesis that the intention of prestige was even more important than previously understood. The phenomenological analysis also resulted in new interpretation for the surrounding buildings, mostly because of the impressive volume we were able to perceive in the immersive room. It seems that the 2D plans were not doing justice to some infrastructure that now seems to be more significant to the functioning of the palace.

Conclusion

Virtual reality facilitates the understanding of a past landscape by presenting information in an intuitive form, by providing a clear representation of structures and by organizing the data to view the progress of knowledge on the subject, in other words, to synthesise what is known and unknown (Rocheleau, 2010). The Intendance's palace project contributes to the systematization process of virtual reality integration in archaeological research as well as contributing the production of knowledge for this important historical site.

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