Chapter 7

Current Trends on the Acquisition, Virtual Representation, and Interaction of Cultural Heritage:
Exploring Virtual and Augmented Reality and Serious Games

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ABSTRACT

Cultural heritage (CH) tells us about our roots, and therefore, constitutes a rich value for the society. Its conservation, dissemination, and understanding are of utmost importance. In order to preserve CH for the upcoming generations, it needs to be documented, a process that nowadays is done digitally. Current trends involve a set of technologies (cameras, scanners, etc.) for the shape and radiometric acquisition of assets. Also, intangible CH can be digitally documented in a variety of forms. Having such assets virtualized, a proper dissemination channel is of relevance, and recently, new technologies that make use of interaction paradigms have emerged. Among them, in this chapter, the authors focus their attention in the technologies of virtual reality (VR), augmented reality (AR), and serious games (SGs). They aim to explore these technologies in order to show their benefits in the dissemination and understanding of CH. Though the work involving them is not trivial, and usually a multidisciplinary team is required, the benefits for CH make them worth it.

INTRODUCTION

Cultural Heritage (CH) is an essential expression of the richness and the diversity of our culture and therefore, its analysis, documentation, interpretation, conservation, recreation and dissemination are considered crucial tasks. The traditional way of dealing with CH is being left aside as it has become evident that past events cannot be studied only by means of static books since those events were lived by their actors in a similar way as we experience current events and CH should be studied, presented and disseminated in an interactive, appealing way.

The application of Information and Communication Technologies (ICT) to achieve digital acquisition, storage, conservation, recreation, reconstruction and representation of CH assets, both tangible and intangible, is of high interest for many different reasons, namely the accurate documentation of our cultural legacy, the increase of awareness about CH, the determination of possible mechanical alterations suffered by tangible assets, or the mere shape acquisition prior to restoration and/or reconstruction works, etc. The application of these technologies to CH is often coined as Virtual Heritage (VH), Virtual Cultural Heritage (VCH) or Virtual Archaeology when it deals with archaeological sites. The virtual representation of objects involves the process of 3D modelling and visualization. Additionally, for these Virtual Heritage objects to be successfully disseminated and accessed, the interaction paradigms are essential, i.e., how users can have access to those objects. They enhance the value of CH by means of virtually reconstructed objects/stories that can be used in computer graphic applications with several potential benefits.

However, both the way objects are virtually represented and interacted/accessed and the type of application should be correctly chosen to achieve the desired goals for the system. In this regard, VCH applications could have many different goals, and thus the application of ICT to the CH field constitutes a very broad field and different levels of immersion and realism can be provided. Luckily, these technologies have evolved very rapidly in recent years and now offer the possibility of portraying very realistic graphics, scanning objects with high detail, simulating events, and providing effective ways to perform pervasive meetings. However, realism is not the only important thing in VCH. The significance of CH is not always directly correlated with its mere visual appearance. It is also necessary to create meaningful content to engage people. The challenge, thus, is to create VCH applications that are at the same time realistic, educational and engaging. For this reason, in most of these applications, the end-user should be the focus of the process, and technology should be a mean but not an end. In this sense, it is very important also to be historically accurate, performing a comprehensive documentation and choosing proper sources before releasing a CH-related computer application, since VCH applications that fail to properly account for representing the cultural legacy could be harmful instead of beneficial.

Although there are many different approaches and technologies to deal with the digital acquisition, virtual representation and interaction of CH assets (acquisition devices, methods and techniques), many of them involve the intervention of expert technicians in different areas of knowledge. The synergies among humanities and computer science engineering is not trivial, since these fields belong to very distant areas, sometimes with different views and biases about life, history, culture and technology. Technicians are more aware of representation, implementation and technical issues, whereas historians are very much concerned about accuracy and authenticity. In addition, these interdisciplinary and highly technical requirements sometimes lead to elevated costs that not all the conservationists and professionals are able to cover. This is one of the biggest criticisms of VCH and one of the reasons why technology may be underused in this field. However, the benefits of these kinds of approaches, when

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