Chapter 67

Empirical Evaluations of Interactive Systems in Cultural Heritage:
A Review

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ABSTRACT

An increasing number of interactive systems aim to enhance the user experience (UX) of visitors at museums, archaeological places and cultural sites. This paper presents a review of empirical evaluations of interactive systems in cultural heritage (CH) based on a systematically selected sample of 53 publications from 2012-2016. Empirical evaluations examine the degree an interactive system satisfies user goals and expectations and are inherently complex activities that require careful planning and selection of methods. The review reports on (a) interactive systems of CH in terms of: purpose, technology, cultural content and location of interaction and (b) methods of empirical evaluation in terms of: dimensions of UX, general approach, data collection and participants. The paper provides discussion, critique and outlook on issues including: extending the evaluation dimensions towards the cultural value and the essence of interactivity; placing more consideration on CH professionals; identifying new evaluation methods that balance qualitative results to evidence-based approaches.

1. INTRODUCTION

Computer applications in cultural heritage (CH) mainly aim at improving the processes of digital preservation, digitization and documentation of artifacts and sites, typically in 3D (Pavlidis et al. 2007), with the consequence that their primary users are CH professionals like archaeologists, architects, and civil engineers. Nevertheless, over the last few years, we are witnessing an increasing number of 'high-tech'

interactive systems to the service of enhancing the user experience (UX) of visitors at museums, exhibitions, archaeological places and various other cultural sites including cities and places with a historic or cultural tradition. These interactive CH systems are made up of various contemporary and emerging technologies, like mobile apps, location-aware audio guides, interactive multi-touch public displays, online and mobile games, VR/AR (virtual/augmented reality) systems, 3D virtual worlds and various types of interactive installations including those with kinesthetic control. This corpus of this diverse landscape of interactive systems in CH is growing fast.

This paper reviews empirical evaluations of interactive systems in CH. The motivation of the review is two-fold. Firstly, a holistic and systematic review of the mixed landscape of empirically evaluated interactive digital CH systems can outline established or underdeveloped applications of respective interactive technologies as well as their impact on the UX. Secondly, a critical analysis of the evaluation approaches and methods employed can provide a record of which particular issues of UX and CH are indeed investigated and how rigorously are these empirical evaluations conducted so far; additionally it may provide an outlook for further research and a means to reflection and re-appreciation of researchers' own work and practice.

The paper reports on interactive systems in CH and methods of empirical evaluation based on a systematically selected sample of 53 publications from 2012-2016. It starts by presenting some background and related work on empirical evaluation methods. Then, it presents an overview of key features of interactive systems in CH, outlining their purpose and goals, main technologies, cultural content and intended users. Then, it reports on the empirical evaluations: on the dimensions examined, the overall method, the particular techniques for data collection, the users (participants) and comparative approaches. Last but not least, the paper discusses various issues stemming out of this review by acknowledging good practices, critically analyzing some identified shortcomings of the current state of the art and providing outlook in various areas.

2. BACKGROUND AND RELATED WORK

2.1. Empirical Evaluation of Interactive Systems

The evaluation of interactive systems has been extensively investigated in Human-Computer Interaction (HCI), which is an interdisciplinary field of computer science, psychology and design, "concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them" (Hewett et al. 1996). Evaluation in HCI is an activity that examines the degree to which an interactive system satisfies user goals and expectations (or more generally, the user perspective). According to MacDonald and Atwood (2013), "evaluation has been a dominant theme in HCI for decades, but it is far from being a solved problem. As interactive systems and their uses change, the nature of evaluation must change as well".

The principal epistemological standpoint to evaluation of interactive systems is empiricism, per which (Feldman, 2001) one can claim to have knowledge only when one has a true belief based on empirical evidence. Thus, empirical evaluations of interactive systems are dominant in contrast to those based on theory. An empirical evaluation yields knowledge by the direct or indirect observation of the UX; simply put, it employs users to interact with the system, while its results are derived by observation or experiment. Several methods of empirical evaluation have been analyzed in HCI textbooks (Dix et al.

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