Chapter 9
Real/Not Real:
Pseudo-Holography and Augmented Reality Applications for Cultural Heritage

Romina Nespeca
Polytechnic University of Marche, Italy

ABSTRACT
Recent advances in data acquisition techniques and modeling tools lead towards a large availability of digital 3D models. Cultural Heritage domain, and particularly Architecture and Archaeology Heritage (AAH) significantly benefits from the introduction of digital 3D modeling, which represents a means of communication and dissemination. An underlying research challenge is represented by the portability of complex artifact, making them suitable for a large set of devices (e.g. mobile devices). The aim of this chapter is to outline best practices for the correct visualization of the 3D reconstructions of architectural and cultural heritage, especially for Mobile Augmented Reality and Holographic applications. A complete methodology is presented, ranging from data acquisition, simplification and visualization, underlining the importance of fostering architectural values in a compelling way. Authors also provide state of art challenges, limitations and opportunities, arguing the dissertation through a set of ad-hoc applications developed for different case studies.

INTRODUCTION
The great development of digital mediation in Cultural Heritage (CH) domain requires high-quality contents, their usability and visual appreciation by users. Due to advances in computer sciences and availability of digital technologies, in recent years we witnessed to significant changes in architectural representation and survey field. Related to the massive diffusion of both Information and Communica-
tion Technologies (ICT) and multimedia mobile applications, a major task in CH valorisation becomes scalability and reusability of multifaceted issues.

In representation, analysis and knowledge-based application for Architectural Heritage (AH), as well as for artefacts or paintings, a key content is doubtless the 3D model. Several tools allow creating effective models for representation, visualization, exploitation, dissemination, conservation and restoration. For this purpose can be used 3D models arising from accurate acquisition processes or reconstructions strictly coherent with historical sources. In the knowledge-oriented use of 3D objects, as well as for their management, it is also mandatory that the models shall be fully-featured and semantically or hierarchically divided, portable in various environments, low-cost and derived from many authors. These are hard tasks, because they involve technical and intangible issues: a complete literature is available and today can address considerable advances in the measurement, representation, analysis, interpretation and diffusion of cultural heritage.

The present work starts from this huge availability of 3D enriched contents to develop and fully exploit the advances in mobile computing and to produce new forms of effective drawings, respecting the scientific, geometric and projective fundamentals. A very powerful tool, not deeply exploited in AH, is the augmented reality (AR): with this kind of application it is possible to develop new media and visual experiences for dissemination and valorisation of drawings and 3D architecture. The approach is both technological and theoretical, aiming at pointing out some conceptual issues on the representation field and to define new standards in content management.

The chapter focus on how (maybe also if) the model can be used, represented and shown to highlight its shapes and parts, using AR technologies: the work prioritizes the development of correct visualization of the 3D reconstructions of architectural and cultural heritage. The practice also involves how to develop interfaces with access to 3D models or different associated 2D content and how to communicate architectural values in a compelling way.

More in general, the aim of the chapter is to deal with the discussion about effective interactive solutions to serve archaeologist, architectural scholars and tourists. Augmented reality allows to discover, in an alternative way, monuments or ruins by simply scanning the neighbouring, loading contents from a remote repository and visualizing virtual objects. There would be advantages using AR solutions for both visitors and scientists: the chapter will analyse how they can be performed and, thanks to comparison with state of art methods, if they can be enhanced.

BACKGROUND

Nowadays, digitization of CH is mandatory in several approaches spreading from humanities to ICT: digital as cultural heritage is an axiom gathering from EU commission policies.

Digitization and online accessibility of cultural contents shake up traditional models, transform value chains and call for new approaches to our cultural and artistic heritage. Digitization, accessibility and interoperability enable information sharing and responsibility synergies, aiming conservation, cultural identity and awareness (EU Commission, 2014). In past digitization projects, the authors have deployed an approach that addresses the challenge to draw out the long term and sustainability value of cultural heritage, aiming to develop a more integrated approach to its preservation and valorization.

In understanding the past & co-creating the future, an immense potential in Europe relates to the continent’s rich cultural heritage and its several opportunities arise from. In contemporary societies,