Chapter 5

BIM Application in Documenting and Recreating Lost Architectural Heritage

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ABSTRACT

The digital archiving process of complex historical architectural 3D models is a key point in the field of tangible cultural heritage. A lot of research focus on the definition of methodologies and tools that exploit the full potential of ICT applied to the documentation of cultural heritage. This chapter illustrates a part of a study in this line of investigation. It focuses on the use of BIM for the reconstruction of lost architectural heritage. BIM will be applied to virtual reconstruct the nineteenth-century covered food market of Cagliari that was demolished in 1957. Thanks to the properties of BIM to enter information related to each element constituting a building, every part of the model will be accompanied by information on the degree of reliability and references adopted for its creation. In this way, each family of elements could more easily and knowingly be reused for other similar projects.

INTRODUCTION

The digital archiving process of complex historical architectural 3D models is a key point in the field of tangible cultural heritage documentation. Many completed or in progress researches focus on the definition of methodologies and tools that exploit the full potential of ICT (Information and Communications Technology) applied to the documentation, preservation, enhancement and dissemination of cultural heritage. These research activities concern existing historic buildings, urban complexes and lost monuments. This fact is increasing the need of clear standards and protocols to be easily applied in the field of archaeological and architectural heritage. The London Charter (Denard, 2012) provides important information about this subject.

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The initiatives of Europeana, CARARE, 3D Icons, the ongoing projects and those about 3D modeling applied to cultural heritage, which will soon be funded by the European Commission, prove the strong interest in these topics.

Besides, according to the literature, it should be noted that the ultimate purpose of the 3D model determines the choices for its production process. So that, it is possible to use different kind of tools for the creation of such virtual architectures.

The accuracy, the required degree of detail, the external information, related to the different parts of the model such as dating, construction phases etc., determine the choices for 3D modelling pipeline (Ogleby, 2007). This is true both in the case the result is aimed at the documentation of existing buildings, whether in the case the model is aimed to produce a virtual object useful for the community of scholars or other kinds of final public.

The virtual reconstruction of what has been lost is not a new argument in itself, especially in the archaeological research field. In fact, to drawing virtual scenarios from document interpretation has long been accepted (Barceló, Forte, & Sanders, 2000). In this sense, the 3D modelling assumes great importance and it is useful to shape the lost reality.

The chapter focuses on the definition of a study methodology for the virtual reconstruction of lost historical building using BIM (Building Information Modelling) instruments. According to the London Charter, it is necessary to clearly outline the reconstruction process. So the reconstruction workflow was carried out according to some stages summarized below.

- Search for historical and archival documentation.
- Organization and digitization (when necessary) of the collected material.
- Architectural and urban survey of the remains and their surroundings.
- Collection of information on similar existing buildings.
- Creation of the terrain model.
- Virtual reconstruction of the building.
  - Graphical, historical and critical analysis of the project, historic photos and remains. The analysis concerned:
    - The archival material about the building in itself,
    - The project drawings,
    - The urban context,
    - The historical and archival material about the architect and his work.
  - Virtual library and family creation. The following operations have been performed for each family of components:
    - Geometric Analysis and breakdown in simple elements,
    - Dimensional and constraint parameter definition and assignment,
    - Descriptive parameter assignment in order to clarify the reliability of each modelled part,
    - Materials and textures attribution,
    - URL parameter assignment to link external documents.
  - Assembly of families and fulfillment of the whole 3D model of the building. In this phase, each part is characterized assigning information about the construction phases.
  - Final rendering of the whole model.
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