

# Chapter 7

## Study on Different Graphic Representations in Architectural Heritage: Digital and Physical Modelling

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### ABSTRACT

*In recent years, cutting-edge methods have emerged to gradually replace or be used with traditional methods to carry out graphic surveys of architectural heritage; modern topographic tools such as 3D scanners and specific software. In addition, the new technologies of additive printing and three-dimensional digital representations has made architectural heritage more accessible to the general public. The main objective of this study was to conduct an analysis of each of the methods, to determine their advantages and disadvantages, as well as to carry out a comparative study of the results obtained with each of them.*

### INTRODUCTION

The graphical representation of architecture has been a necessity for centuries, either as a sign of artistic expression or as a method of documentation and study. Sketches, drawings, maps, plans, engravings and paintings were the methods of graphic representation used for centuries (Garfella, Máñez, Cabeza,

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& Soler, 2012) The advent of photography was a technical breakthrough as a method for documenting artistic and, more particularly, architectural heritage since it made it possible to capture images that were very similar to how scenes are perceived by the human eye, as well as allowing three-dimensional images and the photogrammetric rectification of buildings, which in turn enables us to take measurements directly from them (Lerma, 2002). These systems of representation have progressed exponentially with the development of both cutting edge optical and photographic optical equipment and the development of powerful computers and highly specific and advanced graphics software.

The purpose of this paper is to analyse the use of different graphic survey methods, both traditional and advanced, in the graphic surveying of architectural heritage applied to a case study, namely, the side Portal of “Nuestra Señora de la Asunción” in Vistabella del Maestrazgo in the province of Castellón (Spain). The volume and dimensions of this *retablo*-portal (Renaissance style from the XVII century) have made it an excellent testing ground for our study.

For the study, as a first step, we located several old photographs in historical archives and various publications.

Then, we carried out surveys using traditional methods, such as freehand sketches that were dimensioned manually with measuring tapes, distance meters, levels, plumb-lines and archaeologists’ combs, and the later scaling of the façade from the field data. Anaglyph images were also created using both old scanned photographs and modern digital images.

Photogrammetric surveys were also carried out, which allowed us to rectify the item using specific software. Photogrammetric restitution of the façade was also performed using the Photomodeler program, which enabled us both to create three-dimensional images of this architectural element and to generate a cloud by spatial mesh points that define this element with precision.

Another technique used was to survey the façade by means of a 3D scanner. This was performed with the aid of topographic support equipment.

Finally, we employed SfM (Structure for Motion) systems or low-cost graphic surveying systems through the use of digital photographs and different commercial software applications that enable the user a simple way to generate, like the previous systems, and edit both three-dimensional images and meshes or point clouds.

In recent years, the physical and digital modeling of three-dimensional models has entered with some urge, all accompanied by a certain evolution of software and 3D printing equipment which have become significantly cheaper (Garfella, Máñez & Martínez, 2015).

Data management software has experienced a breakthrough in the sense of seeking the integration of information, and through a simple and accessible interface, proceed to modelling, making presentations and even making videos of the documented object, with scarce resources and from a graphic point of view.

The 3D printing has lately become a powerful tool, not only of display and spatial conception, but its potential goes beyond allowing the creation of prototypes in a quick and effective manner and even allowing the manufacture of items or unique elements at a reasonable cost. Its field of enlargement is quite wide from de artistic creation, the industrial designs, the engineering, the architecture, the archaeology and the biomedicine, only to mention some of the most relevant ones.

Another functioning of the models is to serve as a perceptive instrument so that people with visual impairment can have access to graphical and visual information. In the architectural heritage domain, there is a great deal of visual information, which is practically inaccessible for a blind person. The models used as a tactile perception tool allow these people with visual impairment to obtain information through the sense of touch.

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