Chapter 3

3D Digitization of Architectural Heritage: Habana Vieja in Cuba – Approaching H-BIM

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ABSTRACT

This project’s principal intention is developing a structure from a motion thematic applied to an architecture field in both medium and large scale, in order to generate a cloud of points. These are obtained thanks to photographic footage, which can later be used during the H-BIM process. The matter of 3D digitalization is a very current issue for many countries including Cuba. The growth of such a technological application for tridimensional restitution of historical buildings is treated by giving special attention to those belonging to Havana’s architectural and cultural heritage.

INTRODUCTION

Photography, combined with new digital elaboration techniques, undertakes more and more scientific value. “Structure from motion” system’s technology allows real scene’s reconstruction starting from pictures and some basics measurements, used for scaling. Photo-modeling applied to architectural goods represent an awesome solution to document the state of existing buildings, being able to provide technicians of every necessary tool to later develop an information database which could be considered the basis for structured electronic information’s managing process. The Cuba’s concerned assignment under examination introduces photo-modeling techniques applied to complex cases in medium and large scale, leading to a wide comprehension of such techniques’ potentials and importance in architectural and urbanistic fields. Over a limited amount of time 59 buildings’ facades and decks, 2 fountains and 2 monuments afferent to five squares in Havana’s historical city center were surveyed: Plaza de Armas, Plaza Vieja, Plaza san Francisco, Plaza de la Catedral and Plaza del Cristo (Venegas Fornias, 2003).

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30,000 m² of floorings and as many vertical surfaces were analyzed overall. To carry out the survey we decided to use traditional, cheap and easily transportable mainstream tools, thanks to their low weight and space requirement, by means of which it was possible to create photo-realistic models containing geometrical information about buildings and squares material features, textures and surfaces’ colors. The investigation presented several obstacles: the need to minimally reduce every employed tool in term of conspicuity, weight and costs, to reduce times for survey and photographic shooting on field, to face all the problems gave by the continuous presence of people disturbing the operation. Least but not last the struggle deriving from the limited number of daily hours available to carry out photographic shoots as they require particular lightning conditions to be completed. The labor was regularly accompanied by a documental and archival research especially during the first phase, in order to give coherence to the paperwork by the recollection of useful information, supporting the construction of H-BIM models at the same time. Both the metric and photographic survey were fulfilled on field through traditional devices’ engagement. At first, handmade preliminary surveys and sketches were made with systematical criteria, immediately followed by the photographic set’s project (Baglioni, & Inglese, 2015). The aim is double: reducing the time for survey and recollecting every useful information for graphic restitution at the same time. During this first stage several problems emerged because of multiple immeasurable factors, like for example proper lightning conditions and immobile and mobile physical obstacles. Data and information recollection’s main characteristic was the great saving of time and money. The final work consisted in the restitution of every single element acquired on field, with the purpose of generating a substantial information body thanks to commercial hardware and software technologies. The graphic restitution stage was executed by methodological criteria as well, the aim was the obtainment of elaborations which could be implemented over the years for an holistic database’s evolution, convenient and functional for many reasons: building’s heritage restoration support, employment and development within new emerging technologies like HBIM (Heritage/Historic Building Information Modeling). The objectives are the furnishing of a new survey methodology and a shipping graphic restitution to catalogue historical, cultural and architectonical heritage; to deepen photo-modeling applied to architecture in medium and large scale topic; to generate a series of technical-documental valuable data on 3D models, including architectonic and urbanistic information on cities’ district; to show how the methodology in object was directly tested on a significant complex target such as Havana’s old town (see Figure 1) in the name of its limits, potentials and value’s authentication for the construction of an H-BIM model.

**BACKGROUND**

It is relevant to define first what do we mean by BIM, and what its application means nowadays to the world of construction. BIM it’s not a software, it is not a rendering nor a model and even a simple tri-dimensional modeling. BIM is, in fact, a process comprising the generation and managing of digitally represented physical and functional characteristics of an edifice. The expression BIM - Building Information Modeling, was coined by professor Charles M. Eastman of Georgia Institute of Technology in 1975. The term itself expresses its own meaning: B stands for building, cause that’s the main concern of this technology; I stands for information for it contains digital archives; and M stands for modeling, since it deals with digital models to exchange such information. BIM is the regulating information’s system concerning a specific building all along his life cycle.

For this reason, it is reputed that BIM works on 7 dimensions:
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