

3D Modeling Approach for Cultural Heritage Structures: The Case of Virgin of Loreto Chapel in Cusco, Peru

Authors : Rony Reátegui, Cesar Chácará, Benjamin Castañeda, Rafael Aguilar

Abstract : Nowadays, heritage building information modeling (HBIM) is considered an efficient tool to represent and manage information of cultural heritage (CH). The basis of this tool relies on a 3D model generally obtained from a cloud-to-BIM procedure. There are different methods to create an HBIM model that goes from manual modeling based on the point cloud to the automatic detection of shapes and the creation of objects. The selection of these methods depends on the desired level of development (LOD), level of information (LOI), grade of generation (GOG), as well as on the availability of commercial software. This paper presents the 3D modeling of a stone masonry chapel using Recap Pro, Revit, and Dynamo interface following a three-step methodology. The first step consists of the manual modeling of simple structural (e.g., regular walls, columns, floors, wall openings, etc.) and architectural (e.g., cornices, moldings, and other minor details) elements using the point cloud as reference. Then, Dynamo is used for generative modeling of complex structural elements such as vaults, infills, and domes. Finally, semantic information (e.g., materials, typology, state of conservation, etc.) and pathologies are added within the HBIM model as text parameters and generic models families, respectively. The application of this methodology allows the documentation of CH following a relatively simple to apply process that ensures adequate LOD, LOI, and GOG levels. In addition, the easy implementation of the method as well as the fact of using only one BIM software with its respective plugin for the scan-to-BIM modeling process means that this methodology can be adopted by a larger number of users with intermediate knowledge and limited resources since the BIM software used has a free student license.

Keywords : cloud-to-BIM, cultural heritage, generative modeling, HBIM, parametric modeling, Revit

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