

Parametric approach in BIM environment for the assessment of existing masonry buildings

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Abstract

BIM-based processes are becoming increasingly relevant in architecture, engineering and construction industries, especially for design of new engineering works. Implementation of this technology for existing buildings, Heritage BIM (HBIM), mainly focuses on the reconstruction of geometries and the collection of historical documentation, while areas of structural analyses and verifications are currently less developed.

In this context, a parametric procedure in BIM environment for the structural assessment of existing masonry buildings is proposed, starting from an innovative analysis method previously developed by the authors (E-PUSH). Combining this structural analysis program with the advantages of the BIM methodology, the management of the data is improved and the assessment process is simplified.

The proposed BIM workflow will be illustrated in detail with reference to a real case study, showing benefits of the BIM approach in the process of seismic risk assessment.

Keywords: BIM, HBIM, Masonry, Maintenance, Seismic Risk Assessment, Algorithmic Modelling

1 Introduction

A BIM model, as defined by the National BIM Standard, is a *digital representation of the physical and functional characteristics of a building that constitutes a resource for shared knowledge of information, thus providing a reliable management base to be consulted throughout the entire life cycle, starting from the design onwards* [1]. BIM is a process born to support the design and construction phases of a civil building [1, 2], which in recent years has been developing towards use in the management, maintenance and demolition of existing buildings [3], referring in this case to HBIM (Heritage Building Information Modeling). It indicates the application of the BIM process to historic buildings: the BIM model thus becomes a container of information useful throughout the life cycle of the existing building [4]. The digitization of

historical heritage data consists of creating a model representing a virtual copy of the existing construction and constituting an information database for the real one [5, 6]. The aim is to preserve the cultural significance of the building and to define optimally the intervention strategies [5, 6]. To fully exploit the potential of a BIM model, the elements that make up the model are integrated with customized parametric objects [6], linking the different information and properties to the different disciplines involved in the design and management of a building. All the information about an object is potential parameters, which can be modified either manually or by varying numerical values associated with precise mathematical rules.

HBIM can be very useful in the engineering sector, referring not only to design, but also to planning, management, preventive maintenance,