Understanding the uncertainties of a historical masonry construction: from sensitivity analysis to the test planning

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ABSTRACT

Uncertainties play a key role for the structural assessment in the existing buildings. They are mainly associated with materials, geometries and loads. For historical constructions, they also depend on the constructive evolution phases. The understanding of these uncertainties is one of the main challenges for researchers who approach this type of projects. The aim of this work is evaluating how parameters influence the structural global behaviour and how they can be investigated through non-destructive testing campaign [1]. The sensitivity analysis allows understanding which parameters are most relevant in the structural dynamic overall behaviour [2] and it is useful to the in-situ test planning. The proposed sensitivity analysis is used as cognitive evaluation, analyzing the influences of each parameter on the structural behaviour, and as improvement assessment, evaluating the effectiveness of the intervention proposals [3]. The collected information were elaborated with Heritage Building Information Modeling (H-BIM) and analyzed through finite element method (FEM) software[4]. Furthermore, such approach reduces the impact of the experimental campaign and the intervention proposals, in terms of invasiveness, time and cost. The research is carried out through the selection of a case study, the *Quartel da Tropa* (SC), Brazil. It is used to show how the proposed approach can be applicable for the structural assessment of historical buildings.

REFERENCES

[1] L. Binda and A. Saisi, "Non destructive testing applied to historic buildings : The case of some Sicilian Churches," pp. 29–46, 2001.

[2] G. Boscato, S. Russo, R. Ceravolo, and L. Z. Fragonara, "Global Sensitivity-Based Model Updating for Heritage Structures," *MICE mice12138 Dispatch January 20, 2015 CE AFL J. MSP No. No. pages 18 PE Henry Comput. Civ. Infrastruct. Eng.*, 2015.

[3] B. Asgari, S. A. Osman, and A. Adnan, "Sensitivity analysis of the influence of structural parameters on dynamic behaviour of highly redundant cable-stayed bridges," *Adv. Civ. Eng.*, vol. 2013, 2013.

[4] A. Calì, Â. Valle, and P. D. De Moraes, "Building Information Modeling and structural analysis in the knowledge path of a historical construction," *Struct. Anal. Hist. Constr.*, vol. RILEM 2019, no. RILEM Bookseries 18, 2018, pp. 2071–2079, 2018.