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SEISMIC ASSESSMENT OF MASONRY BUILDINGS ACCOUNTING FOR LIMITED KNOWLEDGE ON MATERIAL PROPERTIES BY BAYESIAN UPDATING TECHNIQUES

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The paper proposes a methodology for the seismic assessment of existing masonry buildings, taking into account the limited knowledge on material properties by means of Bayesian updating techniques.

The current approach of the Italian building code (NTC08, 2008) and Eurocode 8 Part 3 (EN1998-3, 2005) for the seismic assessment of masonry buildings is based on the selection of a knowledge level and on the reduction of material strengths through the application of the associated confidence factor. This factor is assumed to account for all the possible uncertainties related to the partial knowledge of geometry, construction details and material properties of the structure.

As demonstrated in a previous work (Tondelli et al. 2012), in the case of masonry structures, the codified approach in many cases leads to unconservative and unrealistic results. Furthermore, the definition of the values of the confidence factors does not have a clear probabilistic meaning.

A probabilistic framework for the assessment of masonry buildings allowing to solve these problems and, in addition, to consider all the sources of uncertainties has been proposed (Rota et al., 2014).

This paper focuses on the issue of imperfect knowledge on the material properties of existing buildings and describes a probabilistic methodology for the definition of values of the confidence factors for the levels of knowledge proposed by the code. The use of the Bayesian approach allows to update the values of the material properties assumed a priori as knowledge on the building increases, by taking into account all the information (experimental or judgement-based) gained during the assessment process. A large number of simulated assessments is then carried out applying Bayesian updating and the values of the confidence factors on material properties, introduced in Rota et al. (2014), are defined through the comparison between the obtained results and those of the reference structure, assumed to be perfectly known.

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