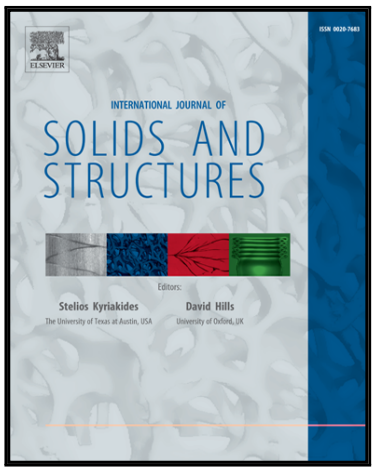

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Identification of mesoscale model parameters for brick-masonry

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Abstract

Realistic assessment of existing masonry structures requires the use of detailed nonlinear numerical descriptions with accurate model material parameters. In this work, a novel numerical-experimental strategy for the identification of the main material parameters of a detailed nonlinear brick-masonry mesoscale model is presented. According to the proposed strategy, elastic material parameters are obtained from the results of diagonal compression tests, while a flat-jack test, purposely designed for in-situ investigations, is used to determine the material parameters governing the nonlinear behaviour. The identification procedure involves: a) the definition of a detailed finite element (FE) description for the tests; b) the development and validation of an efficient metamodel; c) the global sensitivity analysis for parameter reduction; and d) the minimisation of a functional representing the discrepancy between experimental and numerical data. The results obtained by applying the proposed strategy in laboratory tests are discussed in the paper. These results confirm the accuracy of the developed approach for material parameter identification, which can be used also in combination with in-situ tests for assessing existing structures. Practical and theoretical aspects related to the proposed flat-jack test, the experimental data to be considered in the process and the post-processing methodology are critically discussed.

Keywords: Flat-jack test; diagonal compression test; surrogate models; sensitivity analysis; Genetic algorithms.

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