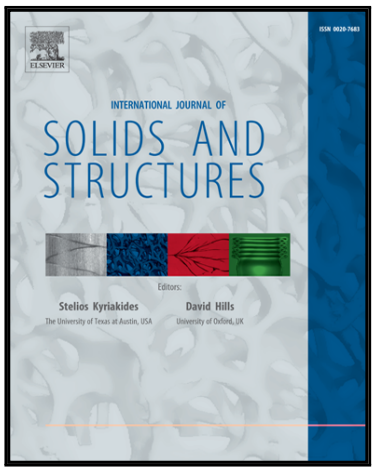

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Micro-mechanical finite element modeling of diagonal compression test for historical stone masonry structure

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Abstract

Simulating the force-deformation behavior of stone masonry is a challenging issue. This paper contributes to this topic by developing a detailed micro-modeling method using extrinsic cohesive elements. To consider contact and friction, a new node-to-node algorithm is implemented in an open-source library with a parallel framework, which allows for high performance computing. To illustrate the application of this model, we calibrate our model with a diagonal compression test of stone masonry panel. To highlight the capabilities of the modeling approach, a series of parametric studies are conducted, which illustrate the influence of mortar-interface strength ratio and the spatial variation of material properties on the force-deformation response and the failure mechanism. The challenges related with the proposed framework, i.e., suitable calibration of the material parameters and direct comparison with experiments, are also pointed out.

Keywords: stone masonry, cohesive zone modeling, meso-scale simulation, diagonal compression test, failure mechanism

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