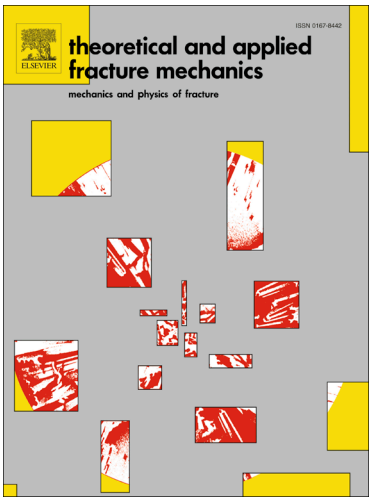

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An extrinsic cohesive shell model for dynamic fracture analyses

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Abstract

Thin-wall structures which are usually modeled by using shell finite elements have found widespread applications in various industries. It is of vital importance to evaluate the mechanical performance, including fracture behavior, of this kind of structures. In this work, an efficient extrinsic cohesive zone model is proposed for thin-shell fracture analyses. During simulations, cohesive elements are adaptively inserted into the common boundaries between shell elements when and where needed, which requires frequent manipulation of the topological data information. For the purpose of quick data retrieval, an efficient data structure is proposed by introducing a concept of edge status. The proposed data structure is compared with the widely used TopS in terms of storage and computational efficiency. Finally, the effectiveness of the proposed computational framework is validated by means of several representative numerical examples.

Keywords: Extrinsic cohesive model, Shell elements, Fracture, Data structure

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