

Massively Parallel Simulations of Dynamic Fracture and Fragmentation of Brittle Solids

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We present the results of massively parallel numerical simulations of dynamic fracture and fragmentation in brittle solids. Our approach is based on the use of cohesive models to describe processes of separation leading to the formation of new free surface. Within the framework of the conventional finite element analysis, the cohesive fracture models are introduced through cohesive elements embedded in the bulk discretizations. These cohesive elements bridge nascent surfaces and govern their separation in accordance with a cohesive law. In this work we assess the validity of the cohesive models and the computational algorithms. We present careful quantitative validation against experiments designed specifically for this purpose by A.J. Rosakis *et al.* Moreover, the branching instability is investigated numerically. Finally, in relation to the mesh dependency observed for under-resolved meshes, we explore the concept of renormalization of cohesive laws.

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