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ENERGY BALANCE IN SIMULATIONS OF DYNAMIC LOCALIZED FAILURE PROPAGATION WITH STRAIN SOFTENING

Mijo Nikolić[1,*], Xuan Nam Do[2], Adnan Ibrahimbegovic[2], Željana Nikolić[1]

[1] University of Split, Faculty of Civil Engineering, Architecture and Geodesy, 21000 Split, Croatia, *mijo.nikolic@gradst.hr

[2] Université de Technologie de Compiègne/Sorbonne Universités, Laboratoire Roberval de Mécanique, Centre de Recherche Royallieu, 60200 Compiègne, France

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In this work we present the total energy balance in dynamically driven localized failure propagation. The full energy balance is investigated on the well known benchmark problem where pre-notched plate is subjected to edge impulsive load or projectile causing the dynamic crack propagation until failure, which is experimentally shown in [1].

The localized failure in material is represented by embedded strong discontinuity formulation exhibiting the jump in the displacement field leading to correct formulation for strain softening response which remains independent on the chosen mesh. For this purpose, we give the results obtained with two different models, both using the embedded strong discontinuities. The first one is the discrete lattice model, based on Voronoi tessellation and cohesive links with enhanced kinematics [2, 3]. The other one uses constant strain triangle elements equipped with embedded strong discontinuities [4].

The total input work introduced into the system by external loads is monitored in time, while internal energy balance in damage and plasticity softening is maintained by exchanging the kinetic energy, strain energy, plastic free energy and dissipated energy in time. The role of fracture energy is also explained through the energy balance principles.

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