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Calculation technique for simulation of wave and fracture dynamics in a reinforced sheet

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Mathematical models and computer algorithms are developed to calculate dynamic stress concentration and fracture wave propagation in a reinforced composite sheet. The composite consists of a regular system alternating extensible fibers and pliable adhesive layers. In computer simulations, we derive difference algorithms preventing or minimizing the parasite distortions caused by the mesh dispersion and obtain precise numerical solutions in the plane fracture problem of a pre-stretched sheet along the fibers. Interactive effects of microscale dynamic deformation and multiple damage in fibers and adhesive are studied. Two engineering models of the composite are considered: the first assumes that adhesive can be represented by inertionless bonds of constant stiffness, while in the second one an adhesive is described by inertial medium perceived shear stresses. Comparison of results allows the evaluation of facilities of models in wave and fracture patterns analysis.

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