Stony Brook University

Department of Civil Engineering

College of Engineering and Applied Sciences

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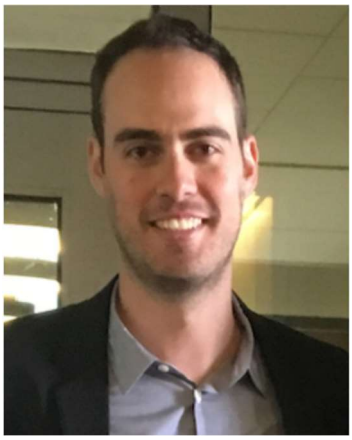
A novel phase field model of blast-induced brittle fracture

Abstract



Blast loading on structures is a highly challenging and complex problem. Its accurate numerical simulation requires a robust gas dynamics solver for the Navier-Stokes equations of compressible flow, an advanced computational method that can capture possible structural disintegration, large inelastic deformations and multi-body interaction, as well as a sophisticated fluid--structure interaction (FSI) technique that ensures the correct coupling of the two subsystems. In this presentation focus is placed on the simulation of structural disintegration through a newly developed phase field model of dynamic brittle fracture. According to the proposed model, the material damage evolves according to a hyperbolic partial differential equation. As a result, it can be stably discretized using explicit time integration without imposing crippling time step restrictions with refinement in space. The model is derived from microforce balance by including effects of microscopic inertia. The presented blast loading examples demonstrate the model's accuracy, robustness, and ability to represent extreme events such as air-blast-structure interaction.

ZOOM LINK: Meeting ID: 950 6760 3617; Passcode: 426506
https://stonybrook.zoom.us/j/95067603617?pwd=dXQybEprSkNlTFY3WHlWYjViUG95UT09