

Structural integrity under extreme loads

Topic: High fidelity models

TITLE: Development of a custom homogenized composite finite element

RESEARCH BACKGROUND:

Composite materials are intrinsically multiscale materials that present multiple failure modes, which are challenging to describe through FE models. Multiple criteria are present in the literature and commercial FE packages lack the implementation of all of them. This thesis aims to develop user-defined finite elements that implement different constitutive behavior of composite materials.

RESEARCH ACTIVITIES:

1. Literature review on composite failure, damage and single-element analysis.
2. Implementation of custom material laws through UMAT.
3. Single element analysis of custom vs built-in material laws w.r.t. different cases.
4. Full-scale numerical simulation of composite panels subjected to impact.

METHODOLOGY: Analytical-Numerical

DURATION: 6-9 months

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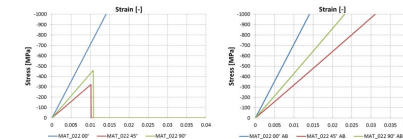
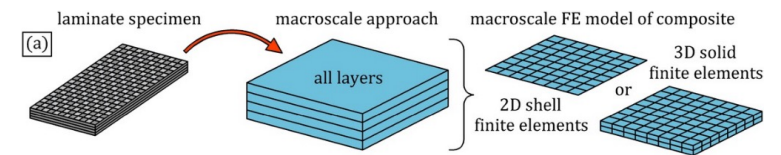
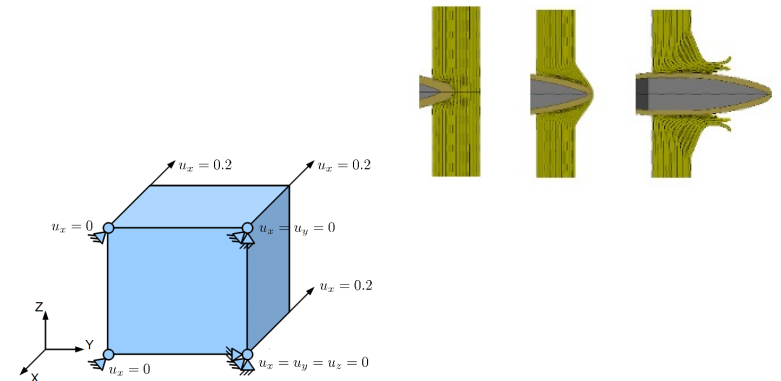
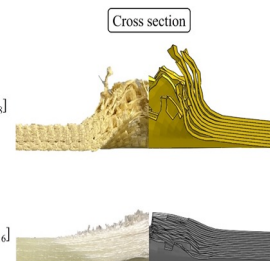
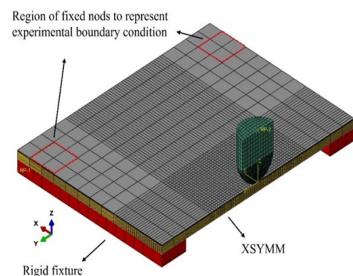


Figure 29: Single element test MAT_022: compression in 2D elements (0°, 45° and 90°)

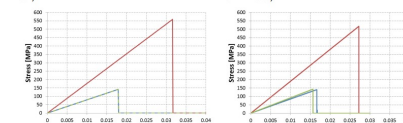


Figure 30: Single element test MAT_022: compression in ab-plane of 3D elements (0°, 45° and 90°)



Figure 31: Single element test MAT_022: shear in 2D elements (0°, 45° and 90°)

