An Inverse Approach to Identify the Constitutive Model Parameters of Aluminum Honeycomb Materials

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Summary:

Advanced crashworthiness simulations need accurate knowledge and selection of both material models and corresponding parameters. These material model parameters are usually extracted from mechanical tests and are based on idealized assumptions. However, in some cases, these assumptions overestimate the material strength. Inverse methods are then good alternatives to automatically tune the model parameters. Constitutive model parameter identification is a non-linear optimization process.

In this study, experimentally obtained material behaviour is used to predict the approximate material model parameters. Finite element model of a NHTSA 214 side impact Movable Deformable Barrier (MDB) is created by using honeycomb materials. The simulations are conducted by using a non-linear explicit dynamics numerical solver, LS-DYNA. The numerical response of the barrier model is then used as an input for the numerical optimization scheme. Considering the highly non-linear behaviour of the honeycomb material, a quadratic response surface methodology is used, where D-optimal point selection scheme is employed for the response surface approximation.

Keywords:

Inverse problem, honeycomb, response surface method.

