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Simulations of Shock Propagation in Viscoelastic Media MAURO RODRIGUEZ, ERIC JOHNSEN, University of Michigan, Ann Arbor — Understanding the mechanics of shock waves emitted by cavitation bubbles and propagating through viscoelastic media is important to various naval and medical applications, particularly in the context of cavitation damage. In such problems, the constitutive models describing the material are non-trivial, and include effects such as nonlinear elasticity, history and viscosity. Thus, the influence of the shock on the material and the response of the material to the shock are generally unknown. A novel numerical approach is proposed for simulating shock and acoustic-wave propagation in a Zener-like viscoelastic medium. The method is based on a high-order accurate weighted essentially non-oscillatory (WENO) scheme for shock capturing and introduces evolution equations for the stresses. The HLLC Riemann solver is used for upwinding, with a reconstruction of the primitive variables. The performance and accuracy of the numerical approach is presented for several one- and two-dimensional problems, including acoustic wave propagation and the Sod shock tube problem for various combinations of elasticities, viscosities and relaxation times. This work is supported by ONR grant N00014-12-1-0751.

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