MAR05-2004-003621

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Simple but effective finite difference methods for simulating shock phenomena arising in continuum mechanics[1]

PEDRO JORDAN, Naval Research Laboratory

In this talk I will discuss two relatively simple finite difference schemes that are extremely effective in capturing the finite-time blow-up exhibited by nonlinear acceleration waves under certain conditions. We will test these schemes in the context of an initial-boundary value problem that involves a sinusoidal input signal. The first considers transverse propagation in a nonlinear soft tissue model while in the second finite-amplitude acoustic waves in Darcy-type porous media are studied. With these schemes, which are implemented on a desktop PC using the software package MATHEMATICA 5.0, we are able to capture over 95% of the "shocking-up" process, as well as illustrate the acceleration wave's other possible evolutionary paths. Finally, all numerical results will be supported by analytical work.

[1]Supported by ONR/NRL funding (PE 061153N)