AN ABSORBING BOUNDARY CONDITION FOR 1-D NONLINEAR WAVE-TYPE EQUATIONS WITH APPLICATION TO IMPACT LOADING OF SHAPE MEMORY ALLOY RODS

D. C. Lagoudas†
A. Safjan
M. Newman
P. Popov

Department of Aerospace Engineering
Center for Mechanics of Composites
Texas A&M University
3141 TAMU
736 H. R. Bright Building
College Station, Texas 77843-3141

May 24, 2002

Abstract. In this paper an Absorbing Boundary Condition (ABC) method is considered for one-dimensional nonlinear wave-type equations on a unbounded spatial domain. The ABC method considered here is in some respects similar to the infinite element methods for the time domain developed by Astley et. al. for linear problems. Of particular interest is the application of this ABC method to compute stress waves in long rods consisting of nonlinear material and subjected to impact loading. In particular the rods considered here consist of NiTi Shape Memory Alloy (SMA) material. Accurate computational modeling of the stress waves in long SMA rods is important in understanding and predicting the energy absorption and vibration damping characteristics of SMA materials. Consequently, the computational accuracy and utility of this ABC method when applied to dynamic loading problems is investigated and evaluated.

Key words and phrases. finite element modeling, nonlinear waves, absorbing boundary conditions, impact loading, Shape Memory Alloys.

†Corresponding Author