1D Peridynamics Subjected to Quasi-Static Load with Adaptive Dynamic Relaxation

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Abstract

Peridynamics is a nonlocal theory of continuum mechanics, which was developed by Silling (2000). However, the utilization of explicit time integration in the peridynamics implementation introduces difficulties when it comes to problem involving quasi- static conditions. As a consequences, there exist a necessity obtain a steady-state solutions in an effort to validate the peridynamic predictions against analytical or experimental measurements. In this paper, by implementing the bond-based peridynamics method in an in- house Matlab code, combined with the utilisation of Adaptive Dynamic Relaxation, we analyse a 1-dimensional bar problem and compare with the classical analytical solution. The comparison plot between peridynamics solver and analytical solution obtained showed a very good agreement. The numerical example illustrates that successful material deformation can be achieved by using bond-based peridynamics with adaptive dynamic relaxation.

Keywords: Peridynamics; Bond-based; Dynamic relaxation.