Beam and Plate Formulations in Peridynamic Framework

Erkan Oterkus, Zhenghao Yang, Bozo Vazic and Selda Oterkus

Department of Naval Architecture, Ocean and Marine Engineering
University of Strathclyde, Glasgow, UK

Abstract

Every object in the world has a 3-Dimensional geometrical shape. Therefore, it is usually possible to model structures in a 3-Dimensional fashion although this approach can be computationally expensive. In order to reduce computational time, the 3-Dimensional geometry can be simplified as a beam, plate or shell type of structure depending on the geometry and loading. This simplification should also be accurately reflected in the formulation which is used for the analysis. In this presentation, such simplifications in the form of beam and plate formulations within peridynamic framework will be presented. The equations of motion are obtained by utilizing Euler-Lagrange equations. Moreover, it is possible to implement such formulations in finite element framework which can bring significant computational efficiency for the numerical solution process. The accuracy of the formulations is validated by considering various benchmark problems subjected to different loading and displacement/rotation boundary conditions.