COMPUTATIONAL METHODS FOR ACCURATE APPROXIMATIONS OF PERIDYNAMIC MODELS

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ABSTRACT

The presentation will briefly describe recent developments of novel high-order quadrature methods for the discretization of peridynamic models in two-dimensional domains [1] as well as coupling methods for classical linear elasticity and peridynamic models on non-matching grids [2], as an extension of our previous work on coupling methods using matching grids [3]. We will also present a novel approach [4] to reduce numerical errors in approximations of solutions to partial differential equations using neural networks. The main idea consists in computing an initial approximation to the problem using a simple neural network and in estimating, in an iterative manner, a correction by solving the problems for the residual errors with new networks of increasing complexity. This sequential process allows one to significantly decrease the error in approximations of linear and nonlinear problems and achieve, in some cases, machine precision. Some numerical examples in 1D and 2D will be presented to demonstrate the effectiveness of the proposed approach. We will also show how it can be applied to obtain solutions to problems in peridynamics.

REFERENCES

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