OPTIMIZED MESHFREE SEISMIC MODELING FOR ANISOTROPIC MEDIA

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ABSTRACT

In a meshfree method, the solution of a partial differential equation (PDE) can be approximated over scattered and possibly non-uniform nodes depending on the spatial distribution of the model parameter in the domain. Conventionally, a fixed stencil size is applied to the whole computational domain with non-uniform node-distribution, making the accuracy of the method higher in high-density node region than the accuracy in low-density node regions in the domain. In this work, we implement meshfree seismic wave modeling with variable stencil-size Radial Basis Functions-generated Finite-difference method (RBF-FD) to reduce the redundancy and enhance computational efficiency. The proposed method employs smaller stencil sizes at shorter fill distance regions compared to stencil sizes at the longer fill distance regions. The variable stencil sizes are selected such that the global accuracy is consistent for the whole model. Due to the flexibility of the meshfree discretization and the efficiency of the adaptive variable stencil-size RBF-FD, we extend our work to elastic and anisotropic wave equations to simulate more realistic and complicated wave phenomenon.

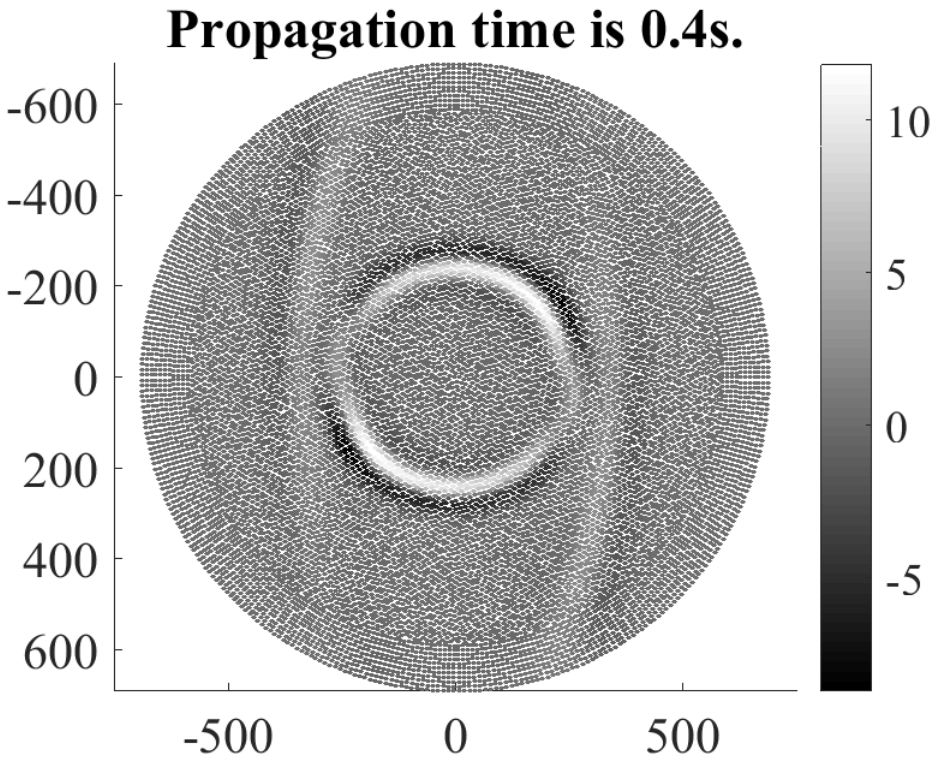

Figure 1. Snapshot of anisotropic elastic wave on the circled computation domain.