A NEW MULTISCALE FINITE ELEMENT METHOD FOR ELASTIC WAVE PROPAGATION

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Abstract. Numerical simulations of three-dimensional wave propagation in highly heterogeneous media is a challenging problem due to their computational cost. In today's scenario of increasing computing power and advent of exascale computing, the machines provide good environments to obtain solutions to tough problems. The MHM method provides numerical solutions with high-order precision by localizing computations through independent local problems. The final discrete solution is compounded by a simple post-processing of the local solutions driven by global degrees of freedom obtained from a coarse mesh. In this work, we propose the novel MHM method for the second-order elastodynamic model in time domain. Well-posedness and error estimates are provided to the method. Numerical results indicate that discrete solutions are super-convergent for the displacement, velocity and stress fields in both space and time. Also, we assess the computational performance of the MHM method in three-dimensional multiscale scenarios.

Keywords: multiscale method, finite element method, wave propagation, elastodynamics.

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