

HADAMARD INTEGRATOR FOR WAVE EQUATIONS: A MICROLOCAL-ANALYSIS-BASED ASYMPTOTIC METHOD

Speaker: Wei Yuxiao
The Hong Kong University of Science and Technology

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Abstract: Starting from the time-domain Kirchhoff-Huygens representation of wave solutions, we propose a novel Hadamard integrator for both pure initial value problems and initial-boundary value problems of the self-adjoint time-dependent wave equation in an inhomogeneous medium. By judiciously choosing the medium-dependent time step, our new Hadamard integrator can propagate highly oscillatory wavefields on linearly scaled grids beyond caustics implicitly. Due to the time-reversal symmetry of the wave equation, once constructed, the integrator can also solve final-boundary value problems, providing potential applications in time-reversal problems. Numerical examples demonstrate the accuracy and efficiency of the proposed method.