

UNIVERSITY of HOUSTON

Department of Mathematics

Scientific Computing Seminar

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An interpolated pseudodifferential preconditioner for Helmholtz problems

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1 PM- 2 PM

Room 646 PGH

Abstract: We develop a new pseudodifferential preconditioner for the Helmholtz equation in variable media. The pseudodifferential operator is associated with the multiplicative inverse to the symbol of the Helmholtz operator. The novel idea for the fast evaluation of the preconditioner is to interpolate its symbol, not as a function of the (high-dimensional) phase-space variables, but as a function of the wave speed itself. Since the wave speed is a real-valued function, this approach allows us to interpolate in a univariate setting even when the original problem is posed in a multidimensional physical space. The overall computational complexity is log-linear. Numerical results for ultrasound wave propagation in biomedical scenarios are presented. Possible extensions are also discussed.