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Numerical inverse wave problem in anisotropic elastic media

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We consider the quantitative inverse problem for the reconstruction of physical properties of a medium from wave measurements. We consider linear viscoelasticity to model the propagation of waves in solid materials, taking into account attenuation and anisotropy of the media. In this work, we employ the time-harmonic wave equations to facilitate working with different attenuation models, which are frequency-dependent. For numerical discretization, we use the hybridizable discontinuous Galerkin (HDG) method which employs static condensation to reduce the computational cost. We perform quantitative inversion by following a minimization algorithm where the elastic properties are iteratively updated. We carry out reconstructions with attenuation model uncertainty, and highlight the importance of considering anisotropy in the model. We provide synthetic experiments for ultrasound imaging of breast samples.