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Padé approximation for identification of Q-factor of a viscoelastic medium

The talk discusses an inverse problem for estimating Q-factor of a viscoelastic medium from complex effective modulus. The approach is based on the reconstruction of the spectral measure in the analytic Stieltjes integral representation of the complex effective modulus using Padé approximation. The spectral measure contains information about the relaxation spectrum of the medium and is uniquely determined if the spectral function is known on an arc in the complex plane.

However, the problem of reconstruction of the spectral measure is ill-posed and requires regularization. A discrete $[p, q]$-Padé approximation of the spectral measure is derived from a constrained least squares minimization problem with regularization. Numerical examples are given to demonstrate the validity of the inversion method.

This is a joint work with Michael P. Lamoureux and Gary Margrave at the University of Calgary.