FIR Filter Design via Spectral Factorization and Convex Optimization

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Chapter 5 in *Applied and Computational Control, Signals and Circuits*, Biswa Datta, editor, 1:215-245, 1998.
A shorter, and somewhat different version appeared as *FIR filter design via semidefinite programming and spectral factorization*, *IEEE Conference on Decision and Control*, 1:271-276, December 1996.

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We consider the design of finite impulse response (FIR) filters subject to upper and lower bounds on the frequency response magnitude. The associated optimization problems, with the filter coefficients as the variables and the frequency response bounds as constraints, are in general nonconvex. Using a change of variables and spectral factorization, we can pose such problems as linear or nonlinear convex optimization problems. As a result we can solve them efficiently (and globally) by recently developed interior-point methods. We describe applications to filter and equalizer design, and the related problem of antenna array weight design.