A CLASS OF
INVERSE MONIC
QUADRATIC EIGENVALUE PROBLEMS
ARISING IN
FINITE ELEMENT MODEL UPDATING

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Abstract

In this talk, the following problems arising in finite element model updating are considered:

Problem I **Given** $\Lambda = \mathbf{diag}\{\lambda_1, \cdots, \lambda_p\} \in C^{p\times p}$ **,** $\lambda_i \neq \lambda_j$ **for** $i \neq j$**,** $i, j = 1, \cdots, p$**,** $X = [x_1, \cdots, x_p] \in C^{n\times p}$**,** $\mathbf{rank}(X) = p$**, and both** Λ **and** X **are closed under complex conjugation in the sense that** $\lambda_{2j} = \bar{\lambda}_{2j-1} \in C$**,** $x_{2j} = \bar{x}_{2j-1} \in C^n$ **for** $j = 1, \cdots, l$**, and** $\lambda_k \in R$**,** $x_k \in R^n$ **for** $k = 2l + 1, \cdots, p$**. Find real-valued symmetric matrices** D **and** K **such that**

$$X\Lambda^2 + DX\Lambda + KX = O.$$

Problem II **Given** $\tilde{D}, \tilde{K} \in R^{n\times n}$**. Find** $(\hat{D}, \hat{K}) \in S_{DK}$ **such that**

$$\|(\hat{D}, \hat{K}) - (\tilde{D}, \tilde{K})\|_{W_X} = \inf_{(D,K)\in S_I} \|(D, K) - (\tilde{D}, \tilde{K})\|_{W_X},$$

where $\|\cdot\|_{W_X}$ **is weighted Frobenius norm, and** S_I **denotes the solution set of Problem I.**

A general form of the solution set of Problem I, and the expression of the unique solution $(\hat{D}, \hat{K})$ **of Problem II are given. The numerical method is described and a numerical experiment is included.**