On a class of inverse palindromic eigenvalue problem

Jiao Xu¹ and Yongxin Yuan¹

¹Hubei Normal University

October 6, 2020

Abstract

In this paper we first give the general solution of the following inverse palindromic eigenvalue problem (IPEP): Given matrices $\Lambda = \text{diag}\{\lambda_1, \dots, \lambda_p\} \in \mathbb{C}^{p \times p}$, $\lambda_i \neq \lambda_j$ for $i \neq j$, $i, j = 1, \dots, p$, $X = [x_1, \dots, x_p] \in \mathbb{C}^{n \times p}$ with $\text{rank}(X) = p$, and both Λ and X are closed under complex conjugation in the sense that $\lambda_{2i} = \bar{\lambda}_{2i-1} \in \mathbb{C}$, $x_{2i} = \bar{x}_{2i-1} \in \mathbb{C}$ for $i = 1, \dots, m$, and $\lambda_j \in \mathbb{R}$, $x_j \in \mathbb{R}$ for $j = 2m+1, \dots, p$, find a matrix $A \in \mathbb{R}^{n \times n}$ such that $AX = A^{\text{top}} X \Lambda$. We then consider a best approximation problem (BAP): Given $\tilde{A} \in \mathbb{R}^{n \times n}$, find $\hat{A} \in \mathcal{S}_A$ such that $\|\hat{A} - \tilde{A}\| = \min_{A \in \mathcal{S}_A} \|A - \tilde{A}\|$, where $\|\cdot\|$ is the Frobenius norm and $\mathcal{S}_A$ is the solution set of IPEP. We show that the best approximation solution $\hat{A}$ is unique and derive an explicit formula for it.

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