A few domain perturbation problems for the eigenvalues of the Reissner-Mindlin system

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Abstract

Let Ω be a bounded open set in $\mathbb{R}^2$, $t > 0$. According to the Reissner-Mindlin model, the free vibration modes of a moderately thin clamped plate $\Omega \times (-t/2, t/2)$ with midplane Ω and thickness t, are given by the system

$$\begin{cases} -\frac{\mu}{12}\Delta\beta - \frac{\mu+\lambda}{12}\nabla\mathrm{div}\beta - \frac{\mu k}{t^2}(\nabla w - \beta) = \frac{\gamma t^2}{12}\beta, & \text{in } \Omega, \\ -\frac{\mu k}{t^2}(\Delta w - \mathrm{div}\beta) = \gamma w, & \text{in } \Omega, \\ \beta = 0, \quad w = 0, & \text{on } \partial\Omega, \end{cases}$$

in the unknowns $(\beta, w) = (\beta_1, \beta_2, w)$ (the eigenvector) and γ (the eigenvalue). Here λ and μ are the Lamé constants, $k > 0$ the correction factor, w represents the transverse displacement of the midplane, $\beta = (\beta_1, \beta_2)$ the fiber rotation and γt^2 the vibration frequency.

The above problem has a divergent sequence of positive eigenvalues of finite multiplicity $\gamma_{n,t}[\Omega]$, $n \in \mathbb{N}$.

In this talk we discuss some results obtained in [1] concerning the dependence of $\gamma_{n,t}[\Omega]$ on Ω.

[1] D. Buoso and P.D. Lamberti, Shape sensitivity analysis of the eigenvalues of the Reissner-Mindlin system. SIAM J. Math. Anal. 47 (2015), no. 1, 407–426.

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