Title: On the principal eigenvalue of a biharmonic system

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Abstract: The biharmonic equation arises in many applications such as in the motion of fluids, free boundary problems, and nonlinear elasticity. In this paper, we prove the existence, positivity, simplicity, uniqueness up to nonnegative eigenfuctions, and isolation of the principle eigenvalue of the (p, q)-biharmonic system

$$\begin{cases} \Delta\left(|\Delta u|^{p-2}\Delta u\right) = \lambda a(x)|u|^{p-2}u + \lambda c(x)|u|^{\alpha-1}|v|^{\beta+1}u & \text{in } \Omega, \\ \Delta\left(|\Delta v|^{q-2}\Delta v\right) = \lambda b(x)|v|^{q-2}v + \lambda c(x)|u|^{\alpha+1}|v|^{\beta-1}v & \text{in } \Omega, \\ u = \Delta u = 0,\ v = \Delta v = 0 & \text{on } \partial\Omega, \end{cases}$$

where $\Omega \subset \mathbb{R}^N$, with $N \geq 1$, is a bounded and connected set, $\lambda > 0$ is a parameter, $p > 1$, $q > 1$, $\max\{p, q\} < N/2$, $\alpha \geq 0$, $\beta \geq 0$, and a, b, c are nonnegative functions defined in Ω and $c \not\equiv 0$ in Ω.

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