

Optimal Positioning of an Obstacle in an Eigenvalue Problem

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Abstract

Let Ω_1 be a ball in \mathbb{R}^N and let Ω_0 be a smaller ball inside it. Let $\Omega = \Omega_1 \setminus \overline{\Omega_0}$. It is shown that the first eigenvalue of the Laplacian (with homogeneous Dirichlet boundary conditions on $\partial\Omega$) in Ω is maximal if, and only if, the two balls are concentric and minimal when the inner ball touches the boundary of Ω_1 . A variant of the method of moving planes is used to prove this result. Generalizations are indicated.