A nonlinear eigenvalue-transmission problem with Neumann boundary condition

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Abstract

Let $\Omega \subset \mathbb{R}^N$, $N \geq 2$, be a bounded domain which is divided into two sub-domains Ω_1 and Ω_2. Consider in Ω an eigenvalue-transmission problem associated with the p-Laplacian acting in Ω_1 and the q-Laplacian acting in Ω_2, $1 < p < q$, with Dirichlet-Neumann conditions on the interface separating the two sub-domains Ω_1 and Ω_2. The main result states the existence of a sequence of eigenvalues for this eigenvalue problem. The proof is based on the Ljusternik-Schnirelman principle. Using the method of Lagrange multipliers for constrained minimization problems, we show that if $2 \leq p < q$ then there exists an eigenfunction in any level set of some integral functional. The case of Robin conditions on $\partial\Omega$ and the Riemannian setting are also addressed.