Leibniz Universität Hannover

Oberseminar Analysis und Theoretische Physik

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Spectral asymptotics of Robin Laplacians on polygonal domains

Let $\Omega \subset \mathbb{R}^2$ be a curvilinear polygon and Q_Ω^γ be the Laplacian in $L^2(\Omega)$, $Q_\Omega^\gamma u = -\Delta u$, with the Robin boundary condition $\partial_\nu u = \gamma u$ on $\partial\Omega$, where ∂_ν is the outer normal derivative and $\gamma > 0$. We are interested in the behavior of the eigenvalues of Q_Ω^γ as γ becomes large. We prove that there exists $N_\Omega \in \mathbb{N}$ such that the asymptotics of the N_Ω first eigenvalues of Q_Ω^γ is determined at the leading order by those of model operators associated with the vertices: the Robin Laplacians acting on the tangent sectors associated with $\partial\Omega$. The associated eigenfunctions are concentrated near the convex vertices of Ω. Beyond the critical number N_Ω, we can show that for any fixed $j \in \mathbb{N}$ there holds $E_{N_\Omega+j}(Q_\Omega^\gamma) \sim -\gamma^2$ as $\gamma \to +\infty$ and obtaining a more precise asymptotics is a difficult task in general. Nevertheless, under some additional geometric assumptions, we are able to prove the existence of an effective self-adjoint operator acting on $\partial\Omega$ with boundary conditions at the vertices which leads the asymptotic behavior of any eigenvalue beyond the critical number.

Dienstag, 23.10.2018, 15:00 Uhr, Raum c311
Hauptgebäude der Leibniz Universität

Dazu laden herzlich ein:

Prof. Dr. Wolfram Bauer, Prof. Dr. Joachim Escher,
Prof. Dr. Elmar Schrohe, Prof. Dr. Christoph Walker