Spectral geometry of the Laplacian

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Abstract

We are interested in the interplay between the geometry of Euclidean domains and the spectrum of the associated Dirichlet Laplacian. We consider the lowest eigenvalues, fundamental gap and nodal set of eigenfunctions as the spectral quantities, and study their relation to geometric properties of the domain such as the isoperimetric constant, support function, curvature, etc. We focus on the generalization to arbitrary dimensions of Pólya and Szegö's upper bound for the first eigenvalue of planar star-shaped domains, and on the proof of Payne's nodal-line conjecture for thin curved tubes. This is a joint work with Pedro Freitas.