Computing Eigenvalues of the Laplacian on Rough Domains

Frank Rößler  
Cardiff University  
roslerf@cardiff.ac.uk
Alexei Stepanenko  
Cardiff University  
stepanenkoa@cardiff.ac.uk

We discuss a recent work in which we prove a general Mosco convergence theorem for bounded Euclidean domains satisfying a set of mild geometric hypotheses. For bounded domains, this notion implies norm-resolvent convergence for the Dirichlet Laplacian which in turn ensures spectral convergence. A key element of the proof is the development of a novel, explicit Poincaré-type inequality, which is of independent interest.

These results are applied to construct a universal algorithm capable of computing the eigenvalues of the Dirichlet Laplacian on a wide class of rough domains. This immediately leads to new classifications in the so-called “Solvability Complexity Index Hierarchy” recently introduced by Hansen et al.