COMPUTATION OF MEMBRANE EIGENVALUES AND THEIR SHAPE DERIVATIVES USING CONFORMAL MAPPING

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ABSTRACT

We consider the eigenvalues of vibrating membranes. The membrane eigenvalues [Laplacian eigenvalues of planar domains] are the characteristic values of the boundary integral operators. We approximate the boundary integral operators by computable matrices following a two-step procedure: the frequency expansion of the integration kernel and the basis expansion with geometric density functions. As a result, we propose a computation scheme for the membrane eigenvalues of arbitrary-shaped simply connected domains. Based on the Gohberg–Sigal theory, we derive its *a priori* error bounds that depend on the Hölder constants of the boundaries. Our computational results include the membrane eigenvalues and their shape derivatives for dumbbell-shaped domains.

REFERENCES

1. Jiho Hong and Mikyoung Lim, "Asymptotic analysis and numerical computation of the Laplacian eigenvalues using the conformal mapping", *arXiv:2112.11026v1*.