

Can the Drumhead be Decomposed from Spectra? - An Application for the Chesapeake Bay

Kevin Mcilhany , Physics Dept. , US Naval Academy

Reza Malek-Madani , Math Dept., US Naval Academy

In 1966, mathematician Mark Kac proposed the question "Can One Hear the Shape of a Drum?" in an article for American Mathematical Monthly. This famous problem has led to many productive research paths, including the idea of "iso-spectral drums", but essentially, the answer has been "no". In other words, from a single frequency spectra of amplitudes, the exact shape of a drum's spatial wave cannot be decomposed. In attempting to resolve the Chesapeake Bay from an eigenfunctional approach, a one-to-one mapping of this famous problem has been identified. This work will re-write the question from "Can One Hear the Shape of a Drum from a Single Point-Sampled Spectra?", no; to "Can One Hear the Shape of a Drum from Multiple Point-Sampled Spectra?", yes. This problem will be presented with challenges to COMSOL and its interpretations regarding stability of the solution, error analysis and meshing issues.