Isogeometric approximation of the eigenfrequencies of membranes with cracks and application to shape identification

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The eigenfrequencies of a vibrating membrane generally depend on its shape. The associated inverse problem which became famous through the work of Kac has been widely discussed in the literature. We look at this problem in the context of cracks. Is it possible to identify a crack in a membrane when the eigenfrequencies are known? At current stage, we work with a model that is based on simulated eigenvalues, for which we need good quality simulations of vibrating membranes with cracks. Therefore we use Isogeometric Analysis (IGA) in combination with graded meshes. IGA produces better results than FEM for one-dimensional eigenvalue problems. Some two-dimensional comparisons will be shown in the talk. Mesh grading techniques help to recover the optimal convergence order despite existing singularities in the domain and have been proven effective for multipatch discontinuous Galerkin IGA schemes. We provide numerical examples to show the effectiveness of mesh grading for eigenvalue problems in a single patch IGA framework.

References:

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