Spectral Element Methods in Motion

David Kopriva
Florida State University
kopriva@math.fsu.edu

Accurate computation of wave scattering from moving, perfectly reflecting objects, or embedded objects with material properties that differ from the surrounding medium, requires methods that accurately represent the boundary location and motion, propagate the scattered waves with low dissipation and dispersion errors, and don't introduce errors or artifacts from the movement of a mesh. Discontinuous Galerkin spectral element methods are especially suited to problems where wave propagation accuracy is needed and the locations of material discontinuities are known. Applying the methods to an ALE (Arbitrary Lagrangian-Eulerian) formulation extends them to moving boundary problems. In this talk, we discuss the issues and choices for the development of a DGSEM-ALE approximation for the accurate approximation of wave propagation problems with moving boundaries. Examples from acoustics, fluid dynamics and electromagnetics will be presented to illustrate the application of the methods.