On robust discontinuous Galerkin techniques for the simulation of interaction between compressible flow and nonlinear elasto-dynamic problems

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This lecture will be concerned with the numerical solution of compressible flow and dynamic elasticity by the discontinuous Galerkin (DG) method. We consider the linear case as well as the linear model, nonlinear St. Venant-Kirchhoff model and neo-Hookean model for the description of elastic dynamic deformations. The space discretization is carried out by the DG method. For the time discretization several techniques are applied and tested. The DG method is also applied to the solution of the compressible Navier-Stokes equations in time dependent domains. The dependence of the domain occupied by fluid on time is taken into account with the aid of the arbitrary Eulerian-Lagrangian (ALE) method. The applicability of the developed techniques is demonstrated by several numerical experiments and applied to the simulation of elastic bodies vibrations induced by compressible flow. Particularly the vocal fold vibrations induced by the air flow through vocal tract will be discussed.

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