Discontinuous Galerkin Methods Applied to Convection-Diffusion Problems in Time-Dependent Domains

Khalid Adrigal[1]   Gunar Matthies[2]

We consider convection-diffusion equations in time-dependent domains where the movement of the domain boundary is presribed. The time change of the domain is handled by the arbitrary Lagrangian-Eulerian (ALE) formulation. It prevents strong mesh distortions which may occur for pure Lagragian formulations since the given velocity of the domain boundary is extended to the mesh velocity inside domain in such a way that the mesh quality is preserved.

We will present conservative and non-conservative formulations of time-dependent convection-diffusion equations in time-dependent domains where special attention is paid to the time derivative and the mesh velocity.

To discretise in time, the discontinuous Galerkin methods (dG) as higher order variational time discretisation schemes is applied. We will present stability and error estimates for the semi-discretisation in time and the fully discrete problem.

[1] Universität Kassel, FB 10, Institut für Mathematik, Kassel, Germany,
`adrigal@mathematik.uni-kassel.de`

[2] Universität Kassel, FB 10, Institut für Mathematik, Kassel, Germany,
`matthies@mathematik.uni-kassel.de`