Higher order temporal derivarives of the initial conditions for time-dependent generalized Stokes problems

Gunar Matthies[1]

We consider the two-parametric family of variational time discretizations that generalizes the well-known discontinuous Galerkin (dG) and continuous Galerkin-Petrov (cGP) methods. This family of time discretizations allows for higher order schemes with higher order regularity, provided that sufficiently accurate approximations of the higher order derivatives of the solution at initial time are known.

We will discuss how these accurate approximations can be obtained for generalized time-dependent Stokes problems. Two different scenarios will be considered. We start with standard inf-sup stable finite element discretizations in space and show optimal error bounds for the higher order time derivatives of both velocity and pressure at initial time. The second setting deals with pressure-robust inf-sup stable spatial discretizations. We use a reconstruction operator to ensure pressure robustness. For this case, we prove optimal error estimates for higher order time derivatives of velocity at initial time that are completely independent of pressure.

[1]Technische Universität Dresden, Institut für Numerische Mathematik
gunar.matthies@tu-dresden.de