

**Title:** Numerical solution of the Navier-Stokes equations with a generalized state equation

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**Abstract:** In the present work we study the simulation of viscous compressible flow. We consider a generalized model of gas described by a generalized state equation. We firstly summarize construction of this generalized equation and its consequences for the existence and uniqueness of the solution of the compressible flow problem. We suggest particular ways how define this generalized relations. Afterwards, we solve the Navier-Stokes problem by the discontinuous Galerkin method. Considering the properties of the generalized model we choose explicit time discretization. Finally, we compare new generalized model with the standard model (ideal gas) for different flow regimes around the NACA0012 profil.

**Keywords:** viscous compressible flow, Navier-Stokes equations, discontinuous Galerkin method, generalized state equation