1171-65-247 **Jue Yan***, 396 Carver Hall, Ames, IA 50011-2067, and **Mustafa Danis**. *A new direct discontinuous Galerkin method with interface correction for two-dimensional compressible Navier-Stokes equations.*

We propose a new formula for the nonlinear viscous numerical flux and extend the direct discontinuous Galerkin method with interface correction (DDGIC) to compressible Navier-Stokes equations. The new DDGIC framework is based on the observation that the nonlinear diffusion can be represented as a sum of multiple individual diffusion processes corresponding to each conserved variable. A set of direction vectors corresponding to each individual diffusion process is defined and approximated by the average value of the numerical solution at the cell interfaces. The new framework only requires the computation of conserved variables' gradient, which is linear and approximated by the original direct DG numerical flux formula. The proposed method greatly simplifies the implementation, and thus, can be easily extended to general equations and turbulence models. Numerical experiments with P_1, P_2, P_3 and P_4 polynomial approximations are performed to verify the optimal $(k+1)^{th}$ high-order accuracy of the method. The new DDGIC method is shown to be able to accurately calculate physical quantities such as lift, drag, and friction coefficients as well as separation angle and Strouhal number. (Received August 17, 2021)