Title: **A Stable and Efficient Hybrid Scheme for Viscous Problems in Complex Geometries**

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In this work, a hybrid scheme for the advection-diffusion equation is presented. The main goal of the authors is to obtain a stable treatment of the interface between a high-order finite difference method (HOFDM) and the unstructured finite volume method (UFVDM) and the corresponding boundary conditions.

The solution that gives a stable interface is based on schemes consistent with summation by parts operators. The resultant, stable, hybrid method can be applied to arbitrary geometries covered by meshes with arbitrary interfaces between them.

Hybrid methods such as the one presented by Gong and Nordström are applicable to Navier-Stokes equation and, because of their ability to handle two different types of approximation, suitable for the efficient solution of aerodynamic-aeroacoustic problems. This work follows a previous work by the same authors[1] on hyperbolic problems.

The paper is very detailed and the numerical examples given cover the cases of single domain and multiple domains with both, UFVM and HOFDM meshes. Solutions for the two dimensional Burgers' equation and the heat distribution around rods are also presented as examples. Calculations shown by the authors verify that the hybrid method is efficient, accurate and truly stable.

1. J. Nordström and J. Gong, *A stable hybrid method for hyperbolic problems*, Journal of Computational Physics, vol. 212, pp. 436–453, 2006.

Related:

- J. Nordström and M.H. Carpenter, *High-order finite differences methods, multidimensional linear problems and curvilinear coordinates*, Journal of Computational Physics, vol. 173, 2001.

- M. Svärd, *On coordinate transformation and summation by parts operators*, Journal of Scientific Computing, vol. 18, 2003.