High order CG schemes for KdV and Saint-Venant flows

R. Pasquetti*,† and S. Minjeaud†

† Université Côte d'Azur, CNRS, INRIA
Lab. J.A. Dieudonné, Parc Valrose, 06000 Nice, France
e-mail: richard.pasquetti/sebastian.minjeaud@unice.fr

ABSTRACT

Hyperbolic systems and dispersive equations remain challenging for the FEM community. On the basis of an arbitrarily high order FEM, namely the spectral element method (SEM), here we address:

- The Korteweg-de Vries equation, to explain how high order derivative terms can be efficiently handled with a C^0 continuous Galerkin approximation. Two strategies are proposed, both of them allowing the SEM approximation of the high order derivative term to remain in the usual H^1 space. The conservation of the invariants is also focused on, especially by using in time embedded implicit-explicit Runge Kutta schemes [1].

- The 2D shallow water equations, to show how a stabilized SEM can solve problems involving shocks. Moreover, we especially focus on flows involving dry-wet transitions and propose to this end an efficient variant of the entropy viscosity method [2, 3].

Results obtained for well known benchmark problems are provided to illustrate the capabilities of the proposed high order algorithms.

REFERENCES

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