TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

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Jet Schemes for Advection Problems

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Abstract.

The accurate advection of field quantities is a fundamental challenge in front propagation problems and the simulation of flows. Jet schemes represent a new systematic methodology to develop high order accurate numerical approaches for linear advection problems. Through the tracking of parts of the jet of the solution along characteristic curves, combined with suitable Hermite interpolations, high order is achieved in an optimally local fashion, i.e. the update for the data at any grid point uses information from a single grid cell only. This property leads to fundamental advantages in the treatment of boundaries, for an efficient parallelization, and for adaptive mesh refinement. The accuracy and computational cost of jet schemes is compared with WENO and Discontinuous Galerkin schemes. Furthermore, in level set approaches, jet schemes possess a certain level of sub-grid resolution. The benefits of this feature are demonstrated with a two-phase fluid flow simulation.