Spring 2018
Mathematical Sciences/RTG Colloquium

High order Semi-Lagrangian Methods for Transport Problems with Applications to Nonlinear Vlasov Dynamics

The semi-Lagrangian (SL) scheme for transport problems gains more and more popularity in the computational science community due to its attractive properties. For example, the SL scheme, compared with the Eulerian approach, allows extra large time step evolution by incorporating characteristics tracing mechanism, hence achieving great computational efficiency. In this talk, we introduce a family of high order SL methods coupled with the finite element discontinuous Galerkin (DG) method. The proposed SLDG method is locally mass conservative, highly accurate, free of operator splitting errors, and allows for extra large time stepping sizes with numerical stability and robustness. When applied to nonlinear dynamics, such as the Vlasov model in plasma physics and the incompressible Euler equations for fluid dynamics, high order characteristics tracing schemes are incorporated. We also introduce an adaptive time stepping strategy to enhance the robustness of the method. The method has been extensively tested and benchmarked with classical test problems for transport, Vlasov models in plasma physics and incompressible Euler system.

Speaker: Jingmei Qiu

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Monday, April 30, 2018

Time: 4:00 – 5:00 PM

Where: Lally 104

Refreshements 3:30-4:00pm
Amos Eaton 4th Floor Lounge