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The Hong Kong University of Science and Technology

Department of Mathematics

Seminar on Scientific Computation

Consistency of finite volume approximation to hyperbolic balance laws

By

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Abstract

For numerical approximations to differential equations, the No. 1 issue is about how a numerical scheme is consistent to the corresponding governing equations. The consistency is often measured in term of local truncation errors, by taking the Taylor series expansions. Many powerful numerical tools are made *a priori* based on this concept. For example, the Lax Equivalence Theorem states that the stability of a numerical scheme is equivalent to the convergence if it it *CONSISTENT* for linear partial differential equations (PDEs).

This is no doubt if solutions are sufficiently regular (smooth). However, this classical concept of consistency becomes questionable if solutions contain discontinuities, such as shocks/contact discontinuities in fluid dynamics, and material interfaces in the field of multi-material problems. Reasons are obvious: (i) the governing equations are understood at least in the weak sense, such as the distributional sense. In the context of fluid dynamics, the governing equations are balance laws in integral form rather than in PDE form. (ii) The Taylor expansion is not valid any more and the concept of truncation errors does not apply here in a straightforward way.

This lecture will take the compressible fluid dynamics as the background to address this issue and define compact finite volume approximations to hyperbolic balance laws.

Date: ***Wednesday, 2 August 2017***

Time: ***3:00p.m.-4:00p.m.***

Venue: ***Room 2131B, Academic Building (near lift 19), HKUST***

All are welcome!