THE UNIVERSITY OF HONG KONG

Institute of Mathematical Research
Department of Mathematics

Numerical Analysis Seminar

Energy dissipation preserving Runge-Kutta methods for phase-field models

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Abstract

As energy gradient flows, energy dissipation is an intrinsic property of phase-field models. High performance energy stability preserving numerical schemes are highly desired. Recent decades, many well-known such numerical schemes are developed, such as convex splitting, stabilization technique, IEQ approach, SAV approach, and etc. Basically, most high-order energy stability preserving schemes are multistep methods and the so-called energy stability is established via modified energy. In this talk, I will introduce several single step linear Runge-Kutta (RK) methods, including explicit RK (EX-RK) methods, implicit explicit RK (IMEX-RK) methods and exponential time differencing Runge-Kutta (ETD-RK) methods. All these RK methods are shown to preserve the original energy decaying property. For EX-RK and IMEX-RK methods, only using the butcher table we provide a systematical framework to determine whether a scheme can preserve the energy stability or not. We prove the original energy stability based on the Lipchitz continuity assumption of the nonlinear terms and the transformation of the nonlinear stability into quadratic form stability via a novel technique.

Date:	October 26, 2022 (Wednesday)
Time:	4:00 – 5:00pm (Hong Kong Time)
Venue:	ZOOM: https://hku.zoom.us/j/ Meeting ID: 913 6532 3891 Password: 310656

All are welcome