THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

DEPARTMENT OF APPLIED MATHEMATICS
應 用 數 學 系

The Hong Kong Polytechnic University
Department of Applied Mathematics

Colloquium

An exponential Runge-Kutta method with dimensional splitting technique for multidimensional fractional Allen-Cahn equations

By

Prof. Haiwei Sun
University of Macau

Abstract

In this talk, we study numerical methods for solving the multidimensional Allen-Cahn equations with spatial fractional Riesz derivatives. A fully discrete numerical scheme is proposed using an exponential Runge-Kutta method with the dimensional splitting strategy for the time integration with finite difference discretization in space. Theoretically, we prove that the proposed numerical scheme can unconditionally preserve the discrete maximum principle. The error estimate is also established in the fully discrete sense. In practical computation, the proposed algorithm can be carried out by computing linear systems and the matrix exponential associated with only 1D discretized matrices that possess the Toeplitz structure. Meanwhile, fast methods for inverting the Toeplitz matrix and computing the Toeplitz exponential multiplying a vector are exploited to reduce the complexity. Numerical examples are given to illustrate the effectiveness and efficiency of the proposed scheme.

Date: 24 September 2021 (Friday)
Time: 10:00-11:00 (Hong Kong Standard Time GMT +8)
Venue: Online Talk via Zoom (Meeting ID: 924 7958 0247)
Speaker: Prof. Haiwei Sun, University of Macau
Host: Prof. Zhonghua Qiao, The Hong Kong Polytechnic University
Click to join:
https://polyu.zoom.us/j/92479580247?pwd=dm0rL0FtSFNWOEY1NWQ0L2dHQXg4QT09

Click to join (Zoom)

* * * ALL ARE WELCOME * * *
For enrolment, please send your name and email to wai-yan.moon@polyu.edu.hk on or before 23 September 2021