The Hong Kong University of Science and Technology

Department of Mathematics

Seminar on Applied Mathematics

Second-order semi-implicit methods for Landau-Lifschitz equation

by

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Abstract

In ferromagnets, the intrinsic magnetic order, known as magnetization, makes these materials ideal for information storage and manipulation. From the modeling perspective, magnetization dynamics is described by the Landau-Lifshitz equation with pointwise length constraint. From the numerical perspective, typically, second-order in time schemes are either explicit with strong stability restriction on the stepsize due to the high nonlinearity or implicit with a nonlinear system of equations to be solved at each step. In the talk, we will introduce several second-order semi-implicit schemes based on the second-order backward-differentiation-formula and the one-sided interpolation from former steps with a projection step. For these schemes, we are able to prove the uniqueness of the numerical solution to the linear system of equations at each step. For one of these schemes, we then prove its second-order accuracy under the mild condition that the stepsize in time is proportional to the gridsize in space. Examples in 1D and 3D are given to verify the analysis results. A benchmark problem from National Institute of Standards and Technology is also tested to verify the applicability of these schemes.

Date: **Tuesday, 6 August 2019**

Time: **3:00p.m. – 4:00p.m.**

Venue: **Room 3472, Academic Building (Lifts 25-26), HKUST**

All are welcome!