Structure-preserving Scheme for the Landau-Lifshitz Equation and Applications

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In this talk we present new higher-order implicit-explicit (IMEX) schemes for the Landau-Lifshitz equation. These schemes are linear, length preserving and only require solving one elliptic equation with constant coefficients at each time step. We show that numerical solutions of these schemes are uniformly bounded without any restriction on the time step size, and establish rigorous error estimates of orders 1 to 5 in a unified framework. Finally numerical examples are presented to validate the proposed schemes.