NUMERICAL INTEGRATION OF THE LANDAU-LIFSHITZ-GILBERT EQUATION IN COMPUTATIONAL MICROMAGNETICS

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Micromagnetic phenomena on a ferromagnetic sample $\Omega \subset \mathbb{R}^3$ are described by the Landau-Lifshitz-Gilbert equation (LLG) which is a nonlinear time-dependent PDE. One popular algorithm for the numerical integration of LLG is the tangent plane scheme [1]. The tangent plane scheme is an unconditionally convergent time-marching scheme which employs lowest-order Courant finite elements in space. Despite the non-linearity of LLG, it only requires the solution of one linear system per time-step. However, this linear system is not solved in the full FEM space, but only in a time-dependent discrete tangent plane subspace. In our talk, we discuss different strategies for the efficient solution of the linear systems, including preconditioning. We also put emphasis on our implementation which is based on the NGSolve/Python package [2] and the BEM++ library [3].

References

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