Determination of precession and dissipation parameters in the micromagnetics

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March 21, 2007

We aim at determination of the precession and the dissipation parameter (β and α, resp.) in the Landau-Lifshitz (LL) model of micromagnetism

$$\partial_t \mathbf{m} = -\beta \mathbf{m} \times \mathbf{H}_{\text{eff}} - \alpha \mathbf{m} \times (\mathbf{m} \times \mathbf{H}_{\text{eff}}).$$

The LL equation governs the evolution of the magnetization in ferromagnets on nanoscales. Since composite materials can have space-varying magnetic properties, we consider the LL equation with space-varying coefficients α and β, representing the dissipation and the precession.

We define a cost functional f involving the difference between the measured data and the computed solution in an appropriate norm. Further f includes a regularization term; we consider two cases, one with the L^2-regularization and one with the total variation regularization.

A primal-dual approach is used for obtaining an explicit formula for the derivative Df.

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