The Landau-Lifshitz-Gilbert equation in micromagnetics

Michele Ruggeri

November 20, 2013

Abstract

Magnetic processes play an important role in a variety of technological applications, e.g., magnetic sensors, recording heads, and magnetoresistive storage devices. On a microscale, the quantity of interest to describe the magnetic condition of a ferromagnetic body is the magnetization, a three-dimensional vector field.

In the literature, it is well-accepted that the dynamics of the magnetization is governed by the Landau-Lifshitz-Gilbert equation (LLG), which describes the behavior of the magnetization under the influence of the so-called effective field, which is characterized by a multitude of physical effects. Mathematical challenges of this evolution equation are given by a strong nonlinearity, possibly complicated and nonlocal field contributions, as well as an inherent non-convex side constraint which enforces length preservation.

In this talk, we introduce and describe the model. Then, we give an overview of the available results from both an analytical and a numerical point of view.