Stochastic modelling of thermal effects in a cristal

Subject

In nano electronics, magnetic effects are prime importance for ferromagnetic components. In oder to model these effects, the micromagnetism theory, introduced by W.-F. Brown during 30', is nowadays actively exploited [1,2]. Nevertheless, a phenomena still fails to be understood: the heat effects. To understand this important phenomena, which can lead to the local vanishing of magnetic effects, the ideal tool is stochastic modelling. In this context, a first study has been performed, theoretical and numerical, for an isolated magnetic spin modelling the behaviour of one atom [3]. The goal of this internship is then to continue this project for particles assemblies using studies performed in a deterministic framework [4] for controlability of magnetic state of a finite set of magnetic spins.
The internship will include a theoretical part highly based on the theory of Stochastic Differential Equations and a numerical part leading to the development of a simulation software in Python to illustrate the theoretical results.

Framework

The internship will take place in Laboratoire Jean Kuntzmann.

Contacts

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Bibliography

[1] William Fuller Brown, Micromagnetics. Interscience. 1962.

[2] Laurence Halpern et Stéphane Labbé, La théorie du micromagnétisme. Modélisation et simulation du comportement des matériaux magnétiques, MATAPLI, 66, 2001.

[3] Pierre Etoré, Stéphane Labbé et Jérôme Lelong, Long time behaviour of a stochastic nano particle, Journal of Differential Equations, 257, 6, 2115-2135, 2014.

[4] Shruti Agarwall, Gilles Carbou, Stéphane Labbé et Christophe Prieur, Control of a network of magnetic ellipsoidal samples, Mathematical Control and Related Fields, 1, 2, 129-147, 2011.