



Global Existence of Weak Solutions to a Fractional Landau-Lifshitz-Gilbert Equation

Chahid Ayouch¹, El-Hassan Essoufi¹ and Mouhcine Tilioua^{2*}

¹ Hassan I University, FST Settati, MISI Laboratory, 26000 Settati, Morocco

² Moulay Ismaïl University, FST Errachidia, M2I Laboratory, MAMCS Group, P.O. Box: 509 Boutalamine, 52000 Errachidia, Morocco

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Abstract: We discuss global existence of weak solutions to a one dimensional periodical fractional Landau-Lifshitz-Gilbert equation. A Faedo-Galerkin/penalization method is employed to get approximate solutions and a fractional calculus inequality is used to deal with the convergence of nonlinear terms. We also study the asymptotic behavior of the obtained solutions when the vertical spin stiffness parameter tends to zero.

Keywords: *fractional Landau-Lifshitz-Gilbert equation; Zygmund operator; fractional calculus; global existence; weak solutions.*

Mathematics Subject Classification (2010): 35D30, 78A25, 35B40, 82D40.

1 Introduction

In the last decades the study of magnetization processes in magnetic materials has been the focus of considerable research for its application to magnetic recording technology. In fact, the design of currently widespread magnetic storage devices, such as the hard-disks, requires the knowledge of the microscopic phenomena occurring within magnetic media. In this respect, it is known that ferromagnetic materials present spontaneous magnetization which is the result of spontaneous alignment of the elementary magnetic moments that constitute the medium. The magnetic recording technology exploits the magnetization of ferromagnetic media to store information. The first example of magnetic storage device was the magnetic core memory prototype, realized by IBM in 1952. After magnetic core memories, magnetic tapes have been used, but the most widespread

* Corresponding author: <mailto:m.tilioua@fste.umi.ac.ma>