

Preface

The phrase “micromagnetics” was brought up by William Fuller Brown Jr. in 1958, now it has become mainstream theory for computational applied magnetism. Brown wrote the first book named as *Micromagnetics* in 1963, he summarized the “magnetization curve theory” and “domain theory” before the 1960s, which are still the main parts of today’s micromagnetics. In micromagnetics, the magnetic materials are discretized into micromagnetic cells, the equation of motion for magnetic moments in cells is the Landau-Lifshitz equation, and the magnetostatic interactions among all cells are calculated following the spirit of Maxwell’s equations.

In the 1980s, two main computational micromagnetic methods were developed: finite difference method (FDM) and finite element method (FEM). In this book, two improvements of the FDM-FFT method are introduced. In the calculation of M-H loops, microstructures of polycrystalline thin films are included, thus the magnetic properties of hard magnetic media, FeCo soft magnetic thin film, and TMR multilayers can be solved in the same frame. In the domain calculation of devices, analytical demagnetizing matrices of polyhedron cells are found, thus the improved FDM-FFT method can be used to solve domains in arbitrary-shaped devices.

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