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Magnetostatic Modelling of Thin Layers Using the Method of Moments and Its Implementation in OCTAVE/MATLAB

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Foreword

For the last forty years, magnetic thin layers became the key engineering materials for development of magnetic sensors and electronic components. Unfortunately, possibility of modelling the magnetostatic properties of such layers was limited to very specific cases. Description of these cases was complex and time-consuming.

This book addresses the problem of the magnetostatic modelling of thin layers on the basis of the method of moments. Presented analysis starts from the basic principles of the method and simple examples, and moves towards more complex cases. Finally, the generalization of the method of moments for uniformly meshed thin layers is presented, considering nonlinear characteristics of magnetic materials, based on the Jiles–Atherton model. The presented guidelines enable modelling of thin layer magnetic components such as fluxgate sensor cores or magnetic concentrators.

The book presents not only theoretical analysis, but also practical implementation of the developed method utilizing modern methods of computing, such as low-level BLAS procedures. Implementation was conducted in open-source scripts for OCTAVE/MATLAB. Software presented in the book may be easily validated by other researchers as well as used for commercial purposes by small- or medium-size enterprises during the development process of advanced magnetic sensors.

I recommend this book as an interesting and useful tool for scientists and engineers working in the field of magnetic thin layers. I can foresee that the presented methods will become a basis for further development of magnetic components and numerical methods of magnetostatic modelling.

Bratislava, Slovak Republic

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