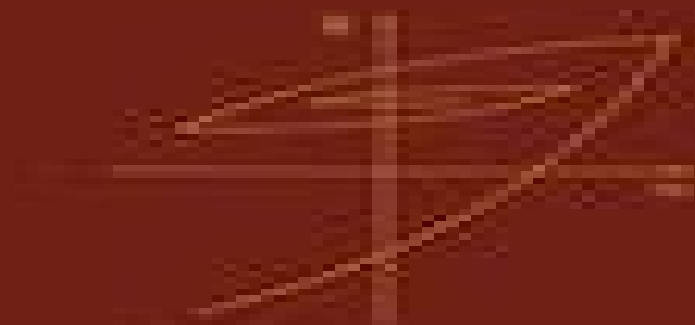


L.D. Mayergoyz

Mathematical Models of Hysteresis



Springer-Verlag

Mathematical Models Of Hysteresis

J.F. Rodriques



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Mathematical Models of Hysteresis and their Applications Isaak D. Mayergoyz, 2003-10-01 This new edition has been significantly revised and updated to reflect advances in the field since the publication of the first edition such as the systematic experimental testing of Preisach models of hysteresis The author has however retained the two most salient features of the original the emphasis on the universal nature of mathematical models of hysteresis and their applicability to the description of hysteresis phenomena in various areas of science technology and economics and its accessibility to a broad audience of researchers engineers and students Provides a unique emphasis on the development of universal mathematical models of hysteresis Accessibility to a broad audience using simple and complex mathematical tools application to various areas of science Presents new theoretical and experimental results

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generic feature they are constructed as superpositions of simplest hysteresis nonlinearities rectangular loops The discussion is by and large centered around the following topics various generalizations and extensions of the classical Preisach model with special emphasis on vector generalizations finding of necessary and sufficient conditions for the representation of actual hysteresis nonlinearities by various Preisach type models solution of identification problems for these models and numerical implementation and experimental testing of Preisach type models Although the study of Preisach type models constitutes the main subject of the book some effort is also made to establish some interesting connections between these models and such topics as the critical state model for superconducting hysteresis the classical Stoner Wohlfarth model for vector magnetic hysteresis thermal activation type models for viscosity magnetostrictive hysteresis and neural networks

Mathematical Models of Hysteresis, 1991 The research described in this proposal is currently being supported by the US Department of Energy under the contract Mathematical Models of Hysteresis Thus before discussing the proposed research in detail it is worthwhile to describe and summarize the main results achieved in the course of our work under the above contract Our ongoing research has largely been focused on the development of mathematical models of hysteretic nonlinearities with nonlocal memories The distinct feature of these nonlinearities is that their current states depend on past histories of input variations It turns out that memories of hysteretic nonlinearities are quite selective Indeed experiments show that only some past input extrema leave their marks upon future states of hysteretic nonlinearities Thus special mathematical tools are needed in order to describe nonlocal selective memories of hysteretic nonlinearities Our research has been primarily concerned with Preisach type models of hysteresis All these models have a common generic feature they are constructed as superpositions of simplest hysteretic nonlinearities rectangular loops Our study has by and large been centered around the following topics various generalizations and extensions of the classical Preisach model finding of necessary and sufficient conditions for the representation of actual hysteretic nonlinearities by various Preisach type models solution of identification problems for these models numerical implementation and experimental testing of Preisach type models Although the study of Preisach type models has constituted the main direction of the research some effort has also been made to establish some interesting connections between these models and such topics as the critical state model for superconducting hysteresis the classical Stoner Wohlfarth model of vector magnetic hysteresis thermal activation type models for viscosity magnetostrictive hysteresis and neural networks

Systems with Non-Smooth Inputs Jürgen Appell, Nguyen Thi Hien, Lyubov Petrova, Irina Pryadko, 2021-03-08 The authors present a completely new and highly application oriented field of nonlinear analysis The work covers the theory of non smooth input output systems and presents various methods to non standard applications in mathematics and physics A particular focus lies on hysteresis and relay phenomena electric circuits with diode nonlinearities and biological systems with constraints

Mathematical Models of Hysteresis . Progress Report No. 4, January 1, 1991--December 31, 1991, 1991 The research described in this proposal is

currently being supported by the US Department of Energy under the contract Mathematical Models of Hysteresis Thus before discussing the proposed research in detail it is worthwhile to describe and summarize the main results achieved in the course of our work under the above contract Our ongoing research has largely been focused on the development of mathematical models of hysteretic nonlinearities with nonlocal memories The distinct feature of these nonlinearities is that their current states depend on past histories of input variations It turns out that memories of hysteretic nonlinearities are quite selective Indeed experiments show that only some past input extrema leave their marks upon future states of hysteretic nonlinearities Thus special mathematical tools are needed in order to describe nonlocal selective memories of hysteretic nonlinearities Our research has been primarily concerned with Preisach type models of hysteresis All these models have a common generic feature they are constructed as superpositions of simplest hysteretic nonlinearities rectangular loops Our study has by and large been centered around the following topics various generalizations and extensions of the classical Preisach model finding of necessary and sufficient conditions for the representation of actual hysteretic nonlinearities by various Preisach type models solution of identification problems for these models numerical implementation and experimental testing of Preisach type models Although the study of Preisach type models has constituted the main direction of the research some effort has also been made to establish some interesting connections between these models and such topics as the critical state model for superconducting hysteresis the classical Stoner Wohlfarth model of vector magnetic hysteresis thermal activation type models for viscosity magnetostrictive hysteresis and neural networks

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Mathematical Models of Hysteresis (Dynamic Problems in Hysteresis). , 2006 Differential Models of Hysteresis Augusto Visintin, 2013-06-29 Hysteresis effects occur in science and engineering plasticity ferromagnetism ferroelectricity are well known examples Modelling and mathematical analysis of

hysteresis phenomena have been addressed by mathematicians only recently but are now in full development This volume provides a self contained and comprehensive introduction to the analysis of hysteresis models and illustrates several new results in this field First the classical models of Prandtl Ishlinskii Preisach and Duhem are formulated and studied using the concept of hysteresis operator A new model of discontinuous hysteresis is introduced Several partial differential equations containing hysteresis operators are studied in the framework of Sobolev spaces **Mathematical Models of Hysteresis. Progress Report, January 1993--December 1993** ,1993 Progress is reported in 7 areas development of vector Preisach type models of hysteresis modeling of rotational hysteretic losses experimental testing of generalized vector Preisach models of hysteresis development of Preisach type models for aftereffect analytical investigation of penetration of electromagnetic fields into superconductors with gradual resistive transitions computation of magnetic fields in hysteretic media and development of new techniques for calculating 3 D eddy current problems **Mathematical Models for Phase Change Problems** J.F. Rodriques,2013-03-07 This monograph collects research and expository articles reflecting the interaction and the cooperation of different groups in several European institutions concerning current research on mathematical models for the behaviour of materials with phase change These papers were presented and discussed in a Workshop held at Obidos Portugal during the first three days of October 1988 and grew out of a two year period of intensive exploitation of different abilities and mathematical experiences of the six participating groups namely in the University of Augsburg which was the coordination center of this project the Laboratoire Central des Ponts et Chaussées of Paris the Aristoteles University of Thessaloniki the University of Florence the University of Lisbon and the University of Oxford This project was carried out under the title Mathematical Models of Phase Transitions and Numerical Simulation in the framework of twinning program for stimulation of cooperation and scientific interchange sponsored by the European Community The underlying idea of the project was to create and study the mathematical models arising in applied engineering problems with free boundaries in a broad sense namely in melting and freezing problems diffusion reaction processes solid solid phase transition hysteresis phenomena mushy region descriptions contact problems with friction and/or adhesion elastoplastic deformations etc vi This large spectrum of applied problems have in common the main feature of brusque transitions of their qualitative behaviour that correspond in general to non classical discontinuous monotone or non monotone strong nonlinearities in the mathematical equations **The Science of Hysteresis: Hysteresis in materials** I. D. Mayergoyz,2006 Volume 1 covers Mathematical models Differential equations Stochastic aspects of hysteresis Binary detection using hysteresis Models of unemployment in economics Volume 2 covers Physical models of magnetic hysteresis All aspects of magnetisation dynamics Volume 3 covers Hysteresis phenomena in materials Over 2100 pages rich with supporting illustrations figures and equations Contains contributions from an international list of authors from a wide range of disciplines Covers all aspects of hysteresis from differential equations and binary detection to models of unemployment and magnetisation dynamics **Mathematical**

Models for the Design of Electrical Machines Frédéric Dubas, Kamel Boughrara, 2021-03-15 This book is a comprehensive set of articles reflecting the latest advances and developments in mathematical modeling and the design of electrical machines for different applications The main models discussed are based on the i Maxwell Fourier method i e the formal resolution of Maxwell s equations by using the separation of variables method and the Fourier s series in 2 D or 3 D with a quasi Cartesian or polar coordinate system ii electrical thermal and magnetic equivalent circuit iii hybrid model In these different papers the numerical method and the experimental tests have been used as comparisons or validations **A**

Mathematical Model for Hysteresis Michael Negin, 1965 **The Science of Hysteresis** Giorgio Bertotti, Isaak D. Mayergoyz, 2005-12-20 Volume 1 covers Mathematical models Differential equations Stochastic aspects of hysteresis Binary detection using hysteresis Models of unemployment in economics Volume 2 covers Physical models of magnetic hysteresis All aspects of magnetisation dynamics Volume 3 covers Hysteresis phenomena in materials Over 2100 pages rich with supporting illustrations figures and equations Contains contributions from an international list of authors from a wide range of disciplines Covers all aspects of hysteresis from differential equations and binary detection to models of unemployment and magnetisation dynamics **Mathematical Models of Hysteresis. Progress Report, January 1992--December 1992** , 1992 This report discusses the mathematical models of the hysteresis of magnet materials and superconducting materials LSP **The Science of Hysteresis** , 2006 **Noise-Driven Phenomena in Hysteretic Systems** Mihai Dimian, Petru Andrei, 2013-11-04 Noise Driven Phenomena in Hysteretic Systems provides a general approach to nonlinear systems with hysteresis driven by noisy inputs which leads to a unitary framework for the analysis of various stochastic aspects of hysteresis This book includes integral differential and algebraic models that are used to describe scalar and vector hysteretic nonlinearities originating from various areas of science and engineering The universality of the authors approach is also reflected by the diversity of the models used to portray the input noise from the classical Gaussian white noise to its impulsive forms often encountered in economics and biological systems and pink noise ubiquitous in multi stable electronic systems The book is accompanied by HysterSoft a robust simulation environment designed to perform complex hysteresis modeling that can be used by the reader to reproduce many of the results presented in the book as well as to research both disruptive and constructive effects of noise in hysteretic systems *Mathematical Modelling of Continuum Physics* Angelo Morro, Claudio Giorgi, 2023-03-19 This monograph provides a comprehensive and self contained treatment of continuum physics illustrating a systematic approach to the constitutive equations for wide ranging classes of materials Derivations of results are detailed through careful proofs and the contents have been developed to ensure a self contained and consistent presentation Part I reviews the kinematics of continuous bodies and illustrates the general setting of balance laws Essential preliminaries to continuum physics such as reference and current configurations transport relations singular surfaces objectivity and objective time derivatives are covered in detail A chapter on balance equations then develops the balance

laws of mass linear momentum angular momentum energy and entropy as well as the balance laws in electromagnetism Part II is devoted to the general requirements on constitutive models emphasizing the application of objectivity and consistency with the second law of thermodynamics Common models of simple materials are then reviewed and in this framework detailed descriptions are given of solids thermoelastic elastic and dissipative and fluids elastic thermoelastic viscous and Newtonian A wide variety of constitutive models are investigated in Part III which consists of separate chapters focused on several types of non simple materials materials with memory aging and higher order grade materials mixtures micropolar media and porous materials The interaction of the electromagnetic field with deformation is also examined within electroelasticity magnetoelasticity and plasma theory Hysteretic effects and phase transitions are considered in Part IV A new approach is established by treating entropy production as a constitutive function in itself as is the case for entropy and entropy flux This proves to be conceptually and practically advantageous in the modelling of nonlinear phenomena such as those occurring in hysteretic continua e g plasticity electromagnetism and the physics of shape memory alloys Mathematical Modelling of Continuum Physics will be an important reference for mathematicians engineers physicists and other scientists interested in research or applications of continuum mechanics

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