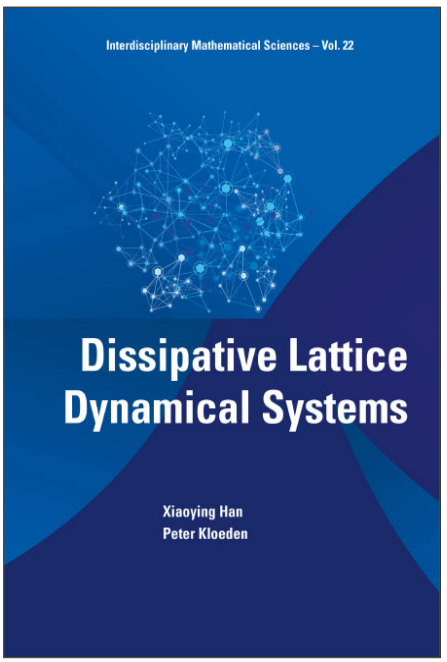
Dissipative Lattice Dynamical Systems



By: Xiaoying Han
(*Auburn University, USA*)

Peter Kloeden
(*Universität Tübingen, Germany*)

ISBN 9789811267758
Extent: 380pp, HB
Pub Date: 2023
Price: US$138
Subject: Mathematics

ABOUT THE BOOK

There is an extensive literature in the form of papers (but no books) on lattice dynamical systems. The book focuses on dissipative lattice dynamical systems and their attractors of various forms such as autonomous, nonautonomous and random. The existence of such attractors is established by showing that the corresponding dynamical system has an appropriate kind of absorbing set and is asymptotically compact in some way.

There is now a very large literature on lattice dynamical systems, especially on attractors of all kinds in such systems. We cannot hope to do justice to all of them here. Instead, we have focused on key areas of representative types of lattice systems and various types of attractors. Our selection is biased by our own interests, in particular to those dealing with biological applications. One of the important results is the approximation of Heaviside switching functions in LDS by sigmoidal functions.

Nevertheless, we believe that this book will provide the reader with a solid introduction to the field, its main results and the methods that are used to obtain them.

READERSHIP

Researchers ranging from doctoral students to professors in mathematics and related areas. Can also be used in lecture for a graduate course.

CONTENTS

- **Background:**
  - Lattice Dynamical Systems: A Preview
  - Dynamical Systems
- **Laplacian LDS:**
  - Lattice Laplacian Models
  - Approximation of Attractors of LDS
  - Non-Autonomous Laplacian Lattice Systems in Weighted Sequence Spaces
- **A Selection of Lattice Models:**
  - Lattice Dynamical Systems with Delays
  - Set-Valued Lattice Models
  - Second Order Lattice Dynamical Systems
  - Discrete Time Lattice Systems
  - Three Topics in Brief
- **Stochastic and Random LDS:**
  - Random Dynamical Systems
  - Stochastic LDS with Additive Noise
  - Stochastic LDS with Multiplicative Noise
  - Stochastic Lattice Models with Fractional Brownian Motions
- **Hopfield Lattice Models:**
  - Hopfield Neural Network Lattice Model
  - The Hopfield Lattice Model in Weighted Spaces
  - A Random Hopfield Lattice Model
- **LDS in Biology:**
  - FitzHugh-Nagumo Lattice Model
  - The Amari Lattice Neural Field Model
  - Stochastic Neural Field Models with Nonlinear Noise
  - Lattice Systems with Switching Effects and Delayed Recovery

ABOUT THE AUTHORS

Professor Xiaoying Han is Professor of Mathematics at Auburn University. Her main research interests are in random and nonautonomous dynamical systems and their applications. In addition to mathematical analysis of dynamical systems, she is also interested in modeling and simulation of applied dynamical systems in biology, chemical engineering, ecology, material sciences, etc. She is the coauthor of the books, *Applied Nonautonomous and Random Dynamical Systems* (with T Caraballo) and *Attractors under Discretisation* (with P E Kloeden), both published by SpringerBriefs, as well as *Random Ordinary Differential Equations and their Numerical Solution* (with P E Kloeden) published by Springer in 2017.

Professor Peter E Kloeden has wide interests in the applications of mathematical analysis, numerical analysis, stochastic analysis and dynamical systems. He is the coauthor of several influential books on nonautonomous dynamical systems, metric spaces of fuzzy sets, and in

particular *Numerical Solution of Stochastic Differential Equations* (with E Platen) published by Springer in 1992 and *An Introduction to the Numerical Simulation of Stochastic Differential Equations* (with Des Higham) published by SIAM in 2021.

Professor Kloeden is a Fellow of the Society of Industrial and Applied Mathematics and was awarded the W T & Idalia Reid Prize from Society of Applied and Industrial Mathematics in 2006. He is the retired Professor of Applied and Instrumental Mathematics at the Goethe University in Frankfurt am Main and is currently a visiting researcher at the Universität Tübingen and an Affiliated Professor at Auburn University. His current interests focus on nonautonomous and random dynamical systems and their applications in the biological sciences.