
Contents

Part I Computation of Invariant Manifolds

A New Model Reduction Method for Nonlinear Dynamical Systems Using Singular PDE Theory	
<i>N. Kazantzis, C. Kravaris</i>	3
A Versatile Algorithm for Computing Invariant Manifolds	
<i>H. W. Broer, A. Hagen, G. Vegter</i>	17
Covering an Invariant Manifold with Fat Trajectories	
<i>M. E. Henderson</i>	39
“Ghost” ILDM-Manifolds and Their Identification	
<i>S. Borok, I. Goldfarb, V. Gol'dshtein, U. Maas</i>	55
Dynamic Decomposition of ODE Systems: Application to Modelling of Diesel Fuel Sprays	
<i>V. Bykov, I. Goldfarb, V. Gol'dshtein, S. Sazhin, E. Sazhina</i>	81
Model Reduction of Multiple Time Scale Processes in Non-standard Singularly Perturbed Form	
<i>N. P. Vora, M.-N. Contou-Carrere, P. Daoutidis</i>	99

Part II Coarse-Graining and Ideas of Statistical Physics

Basic Types of Coarse-Graining	
<i>A. N. Gorban</i>	117
Renormalization Group Methods for Coarse-Graining of Evolution Equations	
<i>A. Degenhard, J. Rodríguez-Laguna</i>	177

A Stochastic Process Behind Boltzmann's Kinetic Equation and Issues of Coarse Graining	
<i>H. C. Öttinger</i>	207
Finite Difference Patch Dynamics for Advection Homogenization Problems	
<i>G. Samaey, D. Roose, I. G. Kevrekidis</i>	225
Coarse-Graining the Cyclic Lotka-Volterra Model: SSA and Local Maximum Likelihood Estimation	
<i>C. P. Calderon, G. A. Tsekouras, A. Provata, I. G. Kevrekidis</i>	247
Relations Between Information Theory, Robustness and Statistical Mechanics of Stochastic Uncertain Systems via Large Deviation Theory	
<i>C. D. Charalambous, A. Kyprianou, F. Rezaei</i>	269
<hr/> Part III Kinetics and Model Reduction <hr/>	
Exactly Reduced Chemical Master Equations	
<i>M. R. Roussel, R. Zhu</i>	295
Model Reduction in Kinetic Theory	
<i>H. Struchtrup</i>	317
Novel Trajectory Based Concepts for Model and Complexity Reduction in (Bio)Chemical Kinetics	
<i>D. Lebiedz, V. Reinhardt, J. Kammerer</i>	343
Dynamics of the Plasma Sheath	
<i>M. Slemrod</i>	365
<hr/> Part IV Mesoscale and Multiscale Modeling <hr/>	
Construction of Stochastic PDEs and Predictive Control of Surface Roughness in Thin Film Deposition	
<i>D. Ni, P. D. Christofides</i>	375
Lattice Boltzmann Method and Kinetic Theory	
<i>S. Ansumali, S. S. Chikatamarla, C. E. Frouzakis, I. V. Karlin, I. G. Kevrekidis</i>	403
Numerical and Analytical Spatial Coupling of a Lattice Boltzmann Model and a Partial Differential Equation	
<i>P. Van Leemput, W. Vanroose, D. Roose</i>	423

Modelling and Control Considerations for Particle Populations in Particulate Processes Within a Multi-Scale Framework	
<i>N. Bianco, C. D. Immanuel</i>	443
Diagnostic Goal-Driven Reduction of Multiscale Process Models	
<i>E. Németh, R. Lakner, K. M. Hangos</i>	465
Understanding Macroscopic Heat/Mass Transfer Using Meso- and Macro-Scale Simulations	
<i>D. V. Papavassiliou</i>	489
An Efficient Optimization Approach for Computationally Expensive Timesteppers Using Tabulation	
<i>A. Varshney, A. Armaou</i>	515
A Reduced Input/Output Dynamic Optimisation Method for Macroscopic and Microscopic Systems	
<i>C. Theodoropoulos, E. Luna-Ortiz</i>	535

Model Reduction and Coarse-Graining Approaches for
Multiscale Phenomena

Gorban, A.N.; Kazantzis, N.; Kevrekidis, Y.G.; Öttinger,
H.C.; Theodoropoulos, K. (Eds.)

2006, XI, 560 p., Hardcover

ISBN: 978-3-540-35885-5