

Coping With Complexity: Model Reduction And Data Analysis

[DOWNLOAD HERE](#)

1;Preface;6 2;Contents;8 3;Contributors;10 4;Averaging of Fast-Slow Systems;14 4.1;1 Introduction;14 4.2;2 Systems of Ordinary Differential Equations;15 4.3;3 The Algorithm;17 4.4;4 An Example;18 4.5;References;20 5;The Use of Global Sensitivity Methods for the Analysis, Evaluation and Improvement of Complex Modelling Systems;21 5.1;1 Introduction;22 5.1.1;1.1 Examples of Complex Systems;23 5.2;2 Global Sensitivity and Uncertainty Analysis Based on QRS-HDMR;24 5.2.1;2.1 Why Use Uncertainty and Sensitivity Analysis?;24 5.2.2;2.2 High Dimensional Model Representation;24 5.2.3;2.3 QRS-HDMR;25 5.2.4;2.4 QRS-HDMR Extensions;26 5.2.5;2.5 Calculation of the Sensitivity Indices;26 5.3;3 Case Studies;27 5.3.1;3.1 The Potential for Complexity Reduction Using the Extended HDMR Methods;28 5.3.1.1;3.1.1 Premixed Flame Case Study;28 5.3.1.2;3.1.2 Low Temperature Oxidation Study;29 5.3.2;3.2 The Presence of Nonlinear Effects;32 5.3.2.1;3.2.1 Premixed Flame Study;32 5.3.2.2;3.2.2 Low Temperature Oxidation Study;33 5.3.3;3.3 Parameter Tuning, Fundamental Studies and Combined Approaches;34 5.3.3.1;3.3.1 High Pressure Ignition Delays for Carbon Monoxide (CO) Hydrogen (H₂) Mixtures;35 5.3.3.2;3.3.2 Addressing Structural Problems: The Low Temperature Oxidation Case;38 5.3.4;3.4 Model Robustness;40 5.3.4.1;3.4.1 Reactive Plume Scenario;41 5.4;4 Overall Conclusions;45 5.5;References;45 6;Optimisation and Linear Control of Large Scale Nonlinear Systems: A Review and a Suite of Model Reduction-Based Techniques;49 6.1;1 Introduction;49 6.1.1;1.1 Overview of Recent Developments;50 6.1.2;1.2 A Novel Framework for Optimisation and Control of Nonlinear Systems;54 6.2;2 Steady State Optimisation Using Black-BoxDynamic Solvers;55 6.2.1;2.1 The Recursive Projection Reduced Hessian Algorithm;55 6.2.2;2.2 Case Study;57 6.3;3 Dynamic Optimisation with Black-Box Integrators;58 6.3.1;3.1 Overview of the Methodology and Algorithmic Details;58 6.3.2;3.2 Case Study;62 6.4;4 Steady State Optimisation with Black-Box Steady State Solvers;63 6.4.1;4.1 Methodology and Algorithmic Details;63 6.4.2;4.2 Case Study;65 6.5;5 Model Reduction and Linear Control of Non-Linear Systems;67 6.5.1;5.1 Methodology and Algorithmic Details;68 6.5.2;5.2 Case Study;69 6.6;6 Conclusions;70 6.7;References;71 7;Universal Algorithms, Mathematics of Semirings and Parallel

Computations;74 7.1;1 Introduction;75 7.2;2 Universal Algorithms;77 7.3;3 Universal Algorithms and Accuracy of Computations;78 7.4;4 Mathematics of Semirings;79 7.4.1;4.1 Basic Definitions;79 7.4.2;4.2 Closure Operations;80 7.4.3;4.3 Matrices Over Semirings;80 7.4.4;4.4 Discrete Stationary Bellman Equations;81 7.4.5;4.5 Weighted Directed Graphs and Matrices Over Semirings;82 7.5;5 Universal Algorithms of Linear Algebra Over Semirings;84 7.6;6 The Idempotent Correspondence Principle;89 7.7;7 The Superposition Principle and Parallel Computing;91 7.8;8 The Correspondence Principle for Computations;92 7.9;9 The Correspondence Principle for Hardware Design;93 7.10;10 The Correspondence Principle for Software Design;95 7.11;11 Interval Analysis in Idempotent Mathematics;96 7.12;References;97 8;Scaling Invariant Interpolation for Singularly Perturbed Vector Fields (SPVF);101 8.1;1 Introduction;101 8.1.1;1.1 Multi-Scales Hierarchy and Manifold' Methods;102 8.1.2;1.2 General Problems of Model Reduction;104 8.1.3;1.3 Mathematical Model of Reacting Flows;106 8.2;2 Mathematics of Model Reduction;107 8.2.1;2.1 SPS as a Mathematical Model of Multi-Scales Behavior;107 8.2.2;2.2 Transformation to the SPS: Choice of New Coordinates;110 8.2.2.1;2.2.1 Semenov's Thermal Explosion;110 8.2.3;2.3 ILDM Method: Slow Manifold;112 8.3;3 Coordinate Free Singular Perturbations: SPVF;114 8.3.1;3.1 Linearly Decomposed Vector Fields: GQL;115 8.3.2;3.2 Scaling Invariant Form;116 8.3.3;3.3 Discussion;118 8.4;4 Conclusions;119 8.5;References;119 9;Think Globally, Move Locally: EAN/ISBN : 9783642149412 Publisher(s): Springer, Berlin Format: ePub/PDF Author(s): Gorban, Alexander N. - Roose, Dirk

[DOWNLOAD HERE](#)

Similar manuals: