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Optimization, simulation and control play an increasingly important role in science and industry. Because of their numerous applications in various disciplines, research in these areas is accelerating at a rapid pace. This volume brings together the latest developments in these areas of research as well as presents applications of these results to a wide range of real-world problems. The book is composed of invited contributions by experts from around the world who work to develop and apply new optimization, simulation and control techniques either at a theoretical level or in practice. Some key topics presented include: equilibrium problems, multi-objective optimization, variational inequalities, stochastic processes, numerical analysis, optimization in signal processing, and various other interdisciplinary applications. This volume can serve as a useful resource for researchers, practitioners, and advanced graduate students of mathematics and engineering working in research areas where results in optimization, simulation and control can be applied.

Photovoltaic generation is one of the cleanest forms of energy conversion available. One of the advantages offered by solar energy is its potential to provide sustainable electricity in areas not served by the conventional power grid. Optimisation of Photovoltaic Power Systems details explicit modelling, control and optimisation of the most popular stand-alone applications such as pumping, power supply, and desalination. Each section is concluded by an example using the MATLAB® and Simulink® packages to help the reader understand and evaluate the performance of different photovoltaic systems. Optimisation of Photovoltaic Power Systems provides engineers, graduate and postgraduate students with the means to understand, assess and develop their own photovoltaic systems. As such, it is an essential tool for all those wishing to specialise in stand-alone photovoltaic systems. Optimisation of Photovoltaic Power Systems aims to enable all researchers in the field of electrical engineering to thoroughly understand the concepts of photovoltaic systems; find solutions to their problems; and choose the appropriate mathematical model for optimising photovoltaic energy.

The Handbook of Simulation Optimization presents an overview of the state of the art of simulation optimization, providing a survey of the most well-established approaches for optimizing stochastic simulation models and a sampling of recent research advances in theory and methodology. Leading contributors cover such topics as discrete optimization via simulation, ranking and selection, efficient simulation budget allocation, random search methods, response surface methodology, stochastic gradient estimation, stochastic approximation, sample average approximation, stochastic constraints, variance reduction techniques, model-based stochastic search methods and Markov decision processes. This single volume should serve as a reference for those already in the field and as a means for those new to the field for understanding and applying the main approaches. The intended audience includes researchers, practitioners and graduate students in the business/engineering fields of operations research, management science, operations management and stochastic control, as well as in economics/finance and computer science.

This book features selected contributions in the areas of modeling, simulation, and optimization. The contributors discusses requirements in problem solving for modeling, simulation, and optimization. Modeling, simulation, and optimization have increased in demand in exponential ways and how potential solutions might be reached. They describe how new technologies in computing and engineering have reduced the dimension of data coverage worldwide, and how recent inventions in information and communication technology (ICT) have inched towards reducing the gaps and coverage of domains globally. The chapters cover how the digging of information in a large data and soft-computing techniques have contributed to a strength in prediction and analysis, for decision making in computer science, technology, management, social computing, green computing, and telecom. The book provides an insightful reference to the researchers in the fields of engineering and computer science. Researchers, academics, and professionals will benefit from this volume. Features selected expanded papers in modeling, simulation, and optimization from COMPSE 2016; Includes research into soft computing and its application in engineering and technology; Presents contributions from global experts in academia and industry in modeling, simulation, and optimization.

This book provides essential background knowledge on the development of model-based real-world solutions in the field of control and decision making for water systems. It presents system engineering methods for modelling surface water and groundwater resources as well as water transportation systems (rivers, channels and pipelines). The models in turn provide information on both the water quantity (flow rates, water levels) of surface water and groundwater and on water quality. In addition, methods for modelling and predicting water demand are described. Sample applications of the models are presented, such as a water allocation decision support system for semi-arid regions, a multiple-criteria control model for run-of-river hydropower plants, and a supply network simulation for public services.

Simulation-Based Optimization: Parametric Optimization Techniques and Reinforcement Learning introduce the evolving area of static and dynamic simulation-based optimization. Covered in detail are model-free optimization techniques – especially designed for those discrete-event, stochastic systems which can be simulated but whose analytical models are difficult to find in closed mathematical forms. Key features of this revised and improved Second Edition include: · Extensive coverage, via step-by-step recipes, of powerful new algorithms for static simulation optimization, including simultaneous perturbation, backtracking adaptive search and nested partitions, in addition to traditional methods, such as response surfaces, Nelder-Mead search and meta-heuristics (simulated annealing, tabu search, and genetic algorithms) · Detailed coverage of the Bellman equation framework for Markov Decision Processes (MDPs), along with dynamic programming (value and policy iteration) for discounted, average, and total reward performance metrics · An in-depth consideration of dynamic simulation optimization via temporal differences and Reinforcement Learning: Q-Learning, SARSA, and R-SMART algorithms, and policy search, via API, Q-P-Learning, actor-critics, and learning automata · A special examination of neural-network-based function approximation for Reinforcement Learning, semi-Markov decision processes (SMDPs), finite-horizon problems, two time scales, case studies for industrial tasks, computer codes (placed online) and convergence proofs, via Banach fixed point theory and Ordinary Differential Equations Themed around three areas in separate sets of chapters – Static Simulation Optimization, Reinforcement Learning and Convergence Analysis – this book is written for researchers and students in the fields of engineering (industrial, systems, electrical and computer), operations research, computer science and applied mathematics.

This book presents the state of the art in designing high-performance algorithms that combine simulation and optimization in order to solve complex optimization problems in science and industry, problems that involve time-consuming simulations and expensive multi-objective function evaluations. As traditional optimization approaches are not applicable per se, combinations of computational intelligence, machine learning, and high-performance computing methods are popular solutions. But finding a suitable method is a challenging task, because numerous approaches have been proposed in this highly dynamic field of research. That's where this book comes in: It covers both theory and practice, drawing on the real-world insights gained by the contributing authors, all of whom are leading researchers. Given its scope, if offers a comprehensive reference guide for researchers, practitioners, and advanced-level students interested in using computational intelligence and machine learning to solve expensive optimization problems.

This edited monograph offers a summary of future mathematical methods supporting the recent energy sector transformation. It collects current contributions on innovative methods and algorithms. Advances in mathematical techniques and scientific computing methods are presented centering around economic aspects, technical realization and large-scale networks. Over twenty authors focus on the mathematical modeling of such future systems with careful analysis of desired properties and arising scales. Numerical investigations include efficient methods for the simulation of possibly large-scale interconnected energy systems and modern techniques for optimization purposes to guarantee stable and reliable future operations. The target audience comprises research scientists, researchers in the R&D field, and practitioners. Since the book highlights possible future research directions, graduate students in the field of mathematical modeling or electrical engineering may also benefit strongly. .

This edited monograph collects research contributions and addresses the advancement of efficient numerical procedures in the area of model order reduction (MOR) for simulation, optimization and control. The topical scope includes, but is not limited to, new out-of-the-box algorithmic solutions for scientific computing, e.g. reduced basis methods for industrial problems and MOR approaches for electrochemical processes. The target audience comprises research experts and practitioners in the field of simulation, optimization and control, but the book may also be beneficial for graduate students alike.