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Kevin M. Passino

Swarm Stability and Optimization

 Springer

Swarm Stability And Optimization

Lin Liu



Swarm Stability And Optimization:

Swarm Stability and Optimization Veysel Gazi, Kevin M. Passino, 2011-02-01 Swarming species such as flocks of birds or schools of fish exhibit fascinating collective behaviors during migration and predator avoidance Similarly engineered multi agent dynamic systems such as groups of autonomous ground underwater or air vehicles vehicle swarms exhibit sophisticated collective behaviors while maneuvering In this book we show how to model and control a wide range of such multi agent dynamic systems and analyze their collective behavior using both stability theoretic and simulation based approaches In particular we investigate problems such as group aggregation social foraging formation control swarm tracking distributed agreement and engineering optimization inspired by swarm behavior Metaheuristic and Evolutionary Computation: Algorithms and Applications Hasmat Malik, Atif Iqbal, Puneet Joshi, Sanjay Agrawal, Farhad Ilahi Bakhsh, 2020-10-08 This book addresses the principles and applications of metaheuristic approaches in engineering and related fields The first part covers metaheuristics tools and techniques such as ant colony optimization and Tabu search and their applications to several classes of optimization problems In turn the book s second part focuses on a wide variety of metaheuristics applications in engineering and or the applied sciences e g in smart grids and renewable energy In addition the simulation codes for the problems discussed are included in an appendix for ready reference Intended for researchers aspiring to learn and apply metaheuristic techniques and gathering contributions by prominent experts in the field the book offers readers an essential introduction to metaheuristics its theoretical aspects and applications **Particle Swarm Optimization Stability Analysis** Ouboti Seydou Eyanaa Djaneye-Boundjou, OhioLINK Electronic Theses and Dissertations Center, 2013 Optimizing a multidimensional function uni modal or multi modal is a problem that regularly comes about in engineering and science Evolutionary Computation techniques including Evolutionary Algorithm and Swarm Intelligence SI are biological systems inspired search methods often used to solve optimization problems In this thesis the SI technique Particle Swarm Optimization PSO is studied Convergence and stability of swarm optimizers have been subject of PSO research Here using discrete time adaptive control tools found in literature an adaptive particle swarm optimizer is developed An error system is devised and a controller is designed to adaptively drive the error to zero The controller features a function approximator used here as a predictor to estimate future signals Through Lyapunov s direct method it is shown that the devised error system is ultimately uniformly bounded and the adaptive optimizer is stable Moreover through LaSalle Yoshizawa theorem it is also shown that the error system goes to zero as time evolves Experiments are performed on a variety of benchmark functions and results for comparison purposes between the adaptive optimizer and other algorithms found in literature are provided *Particle Swarm Optimisation* Jun Sun, 2016-04-19 Although the particle swarm optimisation PSO algorithm requires relatively few parameters and is computationally simple and easy to implement it is not a globally convergent algorithm In Particle Swarm Optimisation Classical and Quantum Perspectives the authors introduce

their concept of quantum behaved particles inspired by quantum mechanics which leads to the quantum behaved particle swarm optimisation QPSO algorithm This globally convergent algorithm has fewer parameters a faster convergence rate and stronger searchability for complex problems The book presents the concepts of optimisation problems as well as random search methods for optimisation before discussing the principles of the PSO algorithm Examples illustrate how the PSO algorithm solves optimisation problems The authors also analyse the reasons behind the shortcomings of the PSO algorithm Moving on to the QPSO algorithm the authors give a thorough overview of the literature on QPSO describe the fundamental model for the QPSO algorithm and explore applications of the algorithm to solve typical optimisation problems They also discuss some advanced theoretical topics including the behaviour of individual particles global convergence computational complexity convergence rate and parameter selection The text closes with coverage of several real world applications including inverse problems optimal design of digital filters economic dispatch problems biological multiple sequence alignment and image processing MATLAB Fortran and C source codes for the main algorithms are provided on an accompanying downloadable resources Helping you numerically solve optimisation problems this book focuses on the fundamental principles and applications of PSO and QPSO algorithms It not only explains how to use the algorithms but also covers advanced topics that establish the groundwork for understanding

Advances in Metaheuristics Timothy Ganesan, Pandian Vasant, Irraivan Elamvazuthi, 2016-11-28 Advances in Metaheuristics Applications in Engineering Systems provides details on current approaches utilized in engineering optimization It gives a comprehensive background on metaheuristic applications focusing on main engineering sectors such as energy process and materials It discusses topics such as algorithmic enhancements and performance measurement approaches and provides insights into the implementation of metaheuristic strategies to multi objective optimization problems With this book readers can learn to solve real world engineering optimization problems effectively using the appropriate techniques from emerging fields including evolutionary and swarm intelligence mathematical programming and multi objective optimization The ten chapters of this book are divided into three parts The first part discusses three industrial applications in the energy sector The second focusses on process optimization and considers three engineering applications optimization of a three phase separator process plant and a pre treatment process The third and final part of this book covers industrial applications in material engineering with a particular focus on sand mould systems It also includes discussions on the potential improvement of algorithmic characteristics via strategic algorithmic enhancements This book helps fill the existing gap in literature on the implementation of metaheuristics in engineering applications and real world engineering systems It will be an important resource for engineers and decision makers selecting and implementing metaheuristics to solve specific engineering problems

Computational Intelligence Rudolf Kruse, Christian Borgelt, Christian Braune, Sanaz Mostaghim, Matthias Steinbrecher, 2016-09-16 This textbook provides a clear and logical introduction to the field covering the fundamental

concepts algorithms and practical implementations behind efforts to develop systems that exhibit intelligent behavior in complex environments This enhanced second edition has been fully revised and expanded with new content on swarm intelligence deep learning fuzzy data analysis and discrete decision graphs Features provides supplementary material at an associated website contains numerous classroom tested examples and definitions throughout the text presents useful insights into all that is necessary for the successful application of computational intelligence methods explains the theoretical background underpinning proposed solutions to common problems discusses in great detail the classical areas of artificial neural networks fuzzy systems and evolutionary algorithms reviews the latest developments in the field covering such topics as ant colony optimization and probabilistic graphical models **Physicomimetics** William M. Spears, Diana F.

Spears, 2012-01-05 Standard approaches to understanding swarms rely on inspiration from biology and are generally covered by the term biomimetics This book focuses on a different complementary inspiration namely physics The editors have introduced the term physicomimetics to refer to physics based swarm approaches which offer two advantages First they capture the notion that nature is lazy meaning that physics based systems always perform the minimal amount of work necessary which is an especially important advantage in swarm robotics Second physics is the most predictive science and can reduce complex systems to simple concepts and equations that codify emergent behavior and help us to design and understand swarms The editors consolidated over a decade of work on swarm intelligence and swarm robotics organizing the book into 19 chapters as follows Part I introduces the concept of swarms and offers the reader a physics tutorial Part II deals with applications of physicomimetics in order of increased complexity Part III examines the hardware requirements of the presented algorithms and demonstrates real robot implementations Part IV demonstrates how the theory can be used to design swarms from first principles and provides a novel algorithm that handles changing environments finally Part V shows that physicomimetics can be used for function optimization moving the reader from issues of swarm robotics to swarm intelligence The text is supported with a downloadable package containing simulation code and videos of working robots This book is suitable for talented high school and undergraduate students as well as researchers and graduate students in the areas of artificial intelligence and robotics *Application of Big Data, Blockchain, and Internet of Things for Education Informatization* Yinjun Zhang, Nazir Shah, 2024-06-30

The five volume set LNICST 580 584 constitutes the proceedings of the Third EAI International Conference on Application of Big Data Blockchain and Internet of Things for Education Informatization BigIoT EDU 2023 held in Liuzhou China during August 29 31 2023 The 272 full papers presented in these proceedings were carefully reviewed and selected from 718 submissions With a primary focus on research fields such as Digitization of education Smart classrooms and Massive Online Open Courses MOOCs these papers are organized in the following topical sections across the five volumes Part I Application of data mining in smart education Application of intelligent algorithms in English teaching Part II Application of decision tree algorithm in intelligent management system of

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Ravindra Kumar,K. P. Vineesh,Sunil Kumar Sharma,2025-09-30 This book presents advances in railway engineering including railway wheels wheel failure mechanisms innovations in railway track designs and axle failures It covers rail wheel traction characteristics under various environmental conditions for full scale test conditions including braking systems It provides an understanding of the applications of digital twin technology in railway systems predictive maintenance performance optimization and overall system efficiency It also emphasizes sustainable practices energy efficient technologies and environmental impact assessments Features Comprehensively reviews various aspects of railway engineering technology Discusses major failure mechanisms and various types of braking systems Covers the modernization of railways and high speed trains Explores emerging topics such as digital twin technology sustainable practices and autonomous technologies Includes case studies of railway component failures and accidents This book is aimed at researchers and professionals in railway and mechanical engineering as well as transportation systems *Applications of Flower Pollination Algorithm and its Variants* Nilanjan Dey,2021-03-17 This book presents essential concepts of traditional Flower Pollination Algorithm FPA and its recent variants and also its application to find optimal solution for a variety of real world engineering and medical problems Swarm intelligence based meta heuristic algorithms are extensively implemented to solve a variety of real world optimization problems due to its adaptability and robustness FPA is one of the most successful swarm intelligence procedures developed in 2012 and extensively used in various optimization tasks for more than a decade The mathematical model of FPA is quite straightforward and easy to understand and enhance compared to other swarm approaches Hence FPA has attracted attention of researchers who are working to find the optimal solutions in variety of domains such as N dimensional numerical optimization constrained unconstrained optimization and linear nonlinear optimization problems Along with the traditional bat algorithm the enhanced versions of FPA are also considered to solve a variety of optimization problems in science engineering and medical applications **Applications of Evolutionary Computation** Paul

Kaufmann,Pedro A. Castillo,2019-04-10 This book constitutes the refereed proceedings of the 22nd International Conference on Applications of Evolutionary Computation EvoApplications 2019 held in Leipzig Germany in April 2019 co located with the Evo 2019 events EuroGP EvoCOP and EvoMUSART The 44 revised full papers presented were carefully reviewed and

selected from 66 submissions They were organized in topical sections named Engineering and Real World Applications Games General Image and Signal Processing Life Sciences Networks and Distributed Systems Neuroevolution and Data Analytics Numerical Optimization Theory Benchmarks and Applications Robotics *Spatial Modelling and Failure Analysis of Natural and Engineering Disasters through Data-based Methods - Volume II* Faming Huang,Zizheng Guo,Huokun Li,Hai Lin,2023-08-01 *Advanced Intelligent Computing Theories and Applications* De-Shuang Huang,Laurent Heutte,Marco Loog,2007-07-31 This volume in conjunction with the two volumes CICS 0002 and LNCS 4681 constitutes the refereed proceedings of the Third International Conference on Intelligent Computing held in Qingdao China in August 2007 The 139 full papers published here were carefully reviewed and selected from among 2 875 submissions These papers offer important findings and insights into the field of intelligent computing **Artificial Intelligence and Soft Computing, Part II** Leszek Rutkowski,Rafał Scherer,Ryszard Tadeusiewicz,Lotfi A. Zadeh,Jacek M. Zurada,2010-06 This volume constitutes the proceedings of the 10th International Conference on Artificial Intelligence and Soft Computing ICAISC 2010 held in Zakopane Poland in June 13 17 2010 The articles are organized in topical sections on Fuzzy Systems and Their Applications Data Mining Classification and Forecasting Image and Speech Analysis Bioinformatics and Medical Applications Volume 6113 together with Neural Networks and Their Applications Evolutionary Algorithms and Their Applications Agent System Robotics and Control Various Problems aof Artificial Intelligence Volume 6114 **Cyber Security Intelligence and Analytics** Zheng Xu,Reza M. Parizi,Octavio Loyola-González,Xiaolu Zhang,2021-03-10 This book presents the outcomes of the 2021 International Conference on Cyber Security Intelligence and Analytics CSIA 2021 an international conference dedicated to promoting novel theoretical and applied research advances in the interdisciplinary field of cyber security particularly focusing on threat intelligence analytics and countering cybercrime The conference provides a forum for presenting and discussing innovative ideas cutting edge research findings and novel techniques methods and applications on all aspects of cyber security intelligence and analytics Due to COVID 19 Authors Keynote Speakers and PC committees will attend the conference online **Handbook of Metaheuristics** Michel Gendreau,Jean-Yves Potvin,2018-09-20 The third edition of this handbook is designed to provide a broad coverage of the concepts implementations and applications in metaheuristics The book s chapters serve as stand alone presentations giving both the necessary underpinnings as well as practical guides for implementation The nature of metaheuristics invites an analyst to modify basic methods in response to problem characteristics past experiences and personal preferences and the chapters in this handbook are designed to facilitate this process as well This new edition has been fully revised and features new chapters on swarm intelligence and automated design of metaheuristics from flexible algorithm frameworks The authors who have contributed to this volume represent leading figures from the metaheuristic community and are responsible for pioneering contributions to the fields they write about Their collective work has significantly enriched the field of optimization in general and combinatorial

optimization in particular Metaheuristics are solution methods that orchestrate an interaction between local improvement procedures and higher level strategies to create a process capable of escaping from local optima and performing a robust search of a solution space In addition many new and exciting developments and extensions have been observed in the last few years Hybrids of metaheuristics with other optimization techniques like branch and bound mathematical programming or constraint programming are also increasingly popular On the front of applications metaheuristics are now used to find high quality solutions to an ever growing number of complex ill defined real world problems in particular combinatorial ones This handbook should continue to be a great reference for researchers graduate students as well as practitioners interested in metaheuristics

Computational Intelligence Juan Julián Merelo, Agostinho Rosa, José M. Cadenas, António Dourado Correia, Kurosh Madani, António Ruano, Joaquim Filipe, 2016-11-21 This book includes a selection of revised and extended versions of the best papers from the seventh International Joint Conference on Computational Intelligence IJCCI 2015 held in Lisbon Portugal from 12 to 14 November 2015 which was composed of three co located conferences The International Conference on Evolutionary Computation Theory and Applications ECTA the International Conference on Fuzzy Computation Theory and Applications FCTA and the International Conference on Neural Computation Theory and Applications NCTA The book presents recent advances in scientific developments and applications in these three areas reflecting the IJCCI s commitment to high quality standards

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Automotive, Mechanical and Electrical Engineering Lin Liu, 2017-06-26 The 2016 International Conference on Automotive Engineering Mechanical and Electrical Engineering AEMEE 2016 was held December 9 11 2016 in Hong Kong China AEMEE 2016 was a platform for presenting excellent results and new challenges facing the fields of automotive mechanical and electrical engineering Automotive Mechanical and Electrical Engineering brings together a wide range of contributions from industry and governmental experts and academics experienced in engineering design and research Papers have been categorized under the following headings Automotive Engineering and Rail Transit Engineering Mechanical Manufacturing Process Engineering Network

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Sengupta, Abhijit Chakrabarti, 2018-09-03 Electricity Pricing Regulated Deregulated and Smart Grid Systems presents proven methods for supplying uninterrupted high quality electrical power at a reasonable price to the consumer Illustrating the evolution of the power market from a monopoly to an open access system this essential text Covers voltage stability analysis of longitudinal power supply systems using an artificial neural network ANN Explains how to improve performance using flexible alternating current transmission systems FACTS and high voltage direct current HVDC Takes into account operating constraints as well as generation cost line overload and congestion for expected and inadvertent loading stress Goes beyond FACTS and HVDC to provide multi objective optimization algorithms for the deregulated power market Proposes the use of stochastic optimization techniques in the smart grid preparing the reader for future development Electricity Pricing Regulated Deregulated and Smart Grid Systems offers practical solutions for improving stability reliability and efficiency in real time systems while optimizing electricity cost

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