

Kevin M. Passino

Biomimicry for Optimization, Control, and Automation



Springer

Biomimicry For Optimization Control And Automation

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Biomimicry For Optimization Control And Automation:

Biomimicry for Optimization, Control, and Automation Kevin M. Passino, 2004-08-27 There are many highly effective optimization feedback control and automation systems embedded in living organisms and nature Evolution persistently seeks optimal robust designs for biological feedback control systems and decision making processes From this comprehensive text you will gain knowledge of how mimicry of such biological processes can be used to solve optimization control and automation problems encountered in the construction of high technology systems Mathematical stability analysis is treated for a number of cases from attentional systems to social foraging swarm cohesion properties Bio inspired optimization and control methods are compared to conventional techniques with an objective to provide a balanced viewpoint A companion web site continually updated by the author will provide you with further examples and design problems solution hints lecture slides a running lab and ongoing self study problems and resources MATLAB code is provided to solve a number of key problems Focus lies on verifying correct operation of technologies via a process of mathematical modelling and analysis complimented by computer simulations Written from an engineering perspective methods are applied to extensive real world applications from ship steering to cooperative control of a group of autonomous robots Aimed primarily at graduate courses and research much of the material has been successfully used for undergraduate courses This dynamic textbook sends an injection of new ideas into engineering technology and the academic community **Stigmergic Optimization** Ajith

Abraham, Crina Grosan, Vitorino Ramos, 2006-07-18 First studied in social insects like ants indirect self organizing interactions known as stigmergy occur when one individual modifies the environment and another subsequently responds to the new environment The implications of self organizing behavior extend to robotics and beyond This book explores the application of stigmergy for a variety of optimization problems The volume comprises 12 chapters including an introductory chapter conveying the fundamental definitions inspirations and research challenges Nature-Inspired Computing for

Control Systems Hiram Eredín Ponce Espinosa, 2015-12-16 The book presents recent advances in nature inspired computing giving a special emphasis to control systems applications It reviews different techniques used for simulating physical chemical biological or social phenomena at the purpose of designing robust predictive and adaptive control strategies The book is a collection of several contributions covering either more general approaches in control systems or methodologies for control tuning and adaptive controllers as well as exciting applications of nature inspired techniques in robotics On one side the book is expected to motivate readers with a background in conventional control systems to try out these powerful techniques inspired by nature On the other side the book provides advanced readers with a deeper understanding of the field and a broad spectrum of different methods and techniques All in all the book is an outstanding practice oriented reference guide to nature inspired computing addressing graduate students researchers and practitioners in the field of control engineering **Biomimicry and Business** Margo Farnsworth, 2020-10-20 Biomimicry the practice of observing then

mimicking nature's strategies to solve business challenges offers a path to healthy profit while working in partnership and even reciprocity with the natural world. Other books have described biomimicry, its uses and its benefits. This book is the first to show readers how they can successfully bring biomimicry and bioinspired design into their companies based on what other businesses have already achieved. Fashioned through storytelling, this book blends snapshots of five successful companies: Nike, Interface Inc, PAX Scientific, Sharklet Technologies, and Encycle, which decided to partner with nature by deploying biomimicry. The book details how they discovered the practices, introduced them to staff engaged in the process, and measured outcomes. The book concludes with challenges for readers to determine their own next steps in business and offers practical and useful resources to get there. By revealing the stories of each professional's journey with lessons they learned, then providing resources and issuing a challenge and pathway to do business better, this book serves as a tool for entrepreneurs, seasoned professionals, and students to emulate nature's brilliance, apply it at work, and contribute to a healthier, more prosperous world.

Biomimicry and Sustainable Building Performance Olusegun Aanuoluwapo Oguntona, Clinton, Ohio, Aigbavboa, 2024-02-01. This book on biomimicry assessment tools studies the concepts of sustainability, sustainable construction practices, and the evaluation categories that constitute a sustainability assessment tool. By exploring and drawing lessons from biomimicry principles, the book provides a nature-inspired assessment tool to aid and guide the sustainable transformation of the built environment. The book encapsulates the attributes of the conceptualised biomimicry assessment tool, which is aimed at helping practitioners, regulatory bodies, and governmental and non-governmental agencies in greening the built environment. Owing to the dire need for country-specific and tailor-made tools that address developing countries' needs, this book serves as a practical reference and theoretical springboard for the development of sustainability assessment tools for the built environment. Furthermore, the book serves as a guide in navigating the path towards achieving the greening agendas of the built environment and other sectors and seeks to align the new biomimicry assessment tool with the UN Sustainable Development Goals (SDGs). It is important reading for academics, professionals, and advanced students in the built environment, engineering, and sustainable development.

Mobile Robots for Dynamic Environments Marco Ceccarelli, Emin Faruk Kececi, 2015-06-09. For several decades now, mobile robots have been integral to the development of new robotic systems for new applications, even in nontechnical areas. Mobile robots have already been developed for such uses as industrial automation, medical care, space exploration, demining operations, surveillance, entertainment, museum guides, and many other industrial and non-industrial applications. In some cases, these products are readily available on the market. A considerable amount of literature is also available, not all of which pertains to technical issues as listed in the chapters of this book and its companion. Readers will enjoy this book and its companion. They will utilize the knowledge gained with satisfaction and will be assisted by its content in their interdisciplinary work for engineering developments of mobile robots in both old and new applications. This book and its companion can be used as a

graduate level course book or a guide book for the practicing engineer who is working on a specific problem which is described in one of the chapters The companion volume for this book Designs and Prototypes of Mobile Robots is also available from Momentum Press

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

Springer Handbook of Automation Shimon Y. Nof, 2023-06-16 This handbook incorporates new developments in automation It also presents a widespread and well structured conglomeration of new emerging application areas such as medical systems and health transportation security and maintenance service construction and retail as well as production or logistics The handbook is not only an ideal resource for automation experts but also for people new to this expanding field

MICAI 2009: Advances in Artificial Intelligence Arturo Hernández Aguirre, Raúl Monroy Borja, Carlos Albetro Reyes García, 2009-11-02 This book constitutes the refereed proceedings of the 8th Mexican International Conference on Artificial Intelligence MICAI 2009 held in Guanajuato Mexico in November 2009 The 63 revised full papers presented together with one invited talk were carefully reviewed and selected from 215 submissions The papers are organized in topical sections on logic and reasoning ontologies knowledge management and knowledge based systems uncertainty and probabilistic reasoning natural language processing data mining machine learning pattern recognition computer vision and image processing robotics planning and scheduling fuzzy logic neural networks intelligent tutoring systems bioinformatics and medical applications hybrid intelligent systems and evolutionary algorithms

Metamaterial Inspired Electromagnetic Applications Balamati Choudhury, 2017-05-04 This book focuses on the role of soft computing based electromagnetic computational engines in design and optimization of a wide range of electromagnetic applications In addition to the theoretical background of metamaterials and soft computing techniques the book discusses novel electromagnetic applications such as tensor analysis for invisibility cloaking metamaterial structures for cloaking applications broadband radar absorbers and antennas The book will prove to be a valuable resource for academics and professionals as well as military researchers working in the area of metamaterials

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