

# **Brownian Agents And Active Particles Collective Dynamics In The Natural And Social Sciences Springer Series In Synergetics**

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*Cities and Complexity* - Michael Batty 2005  
Michael Batty offers a comprehensive view of urban dynamics in the context of complexity theory, presenting models that demonstrate how complexity theory can embrace a myriad of processes and elements that combine into organic wholes.

**Quantum Signatures of Chaos** - Fritz Haake  
2010-04-21

This classic text provides an excellent introduction to a new and rapidly developing field of research. Now well established as a textbook in this rapidly developing field of research, the new edition is much enlarged and covers a host of new results.

Robots and Lattice Automata - Georgios Ch. Sirakoulis 2014-10-11

The book gives a comprehensive overview of the state-of-the-art research and engineering in theory and application of Lattice Automata in design and control of autonomous Robots. Automata and robots share the same notional

meaning. Automata (originated from the latinization of the Greek word “αυτόματον”) as self-operating autonomous machines invented from ancient years can be easily considered the first steps of robotic-like efforts. Automata are mathematical models of Robots and also they are integral parts of robotic control systems. A Lattice Automaton is a regular array or a collective of finite state machines, or automata. The Automata update their states by the same rules depending on states of their immediate neighbours. In the context of this book, Lattice Automata are used in developing modular reconfigurable robotic systems, path planning and map exploration for robots, as robot controllers, synchronisation of robot collectives, robot vision, parallel robotic actuators. All chapters are written in an accessible manner and lavishly illustrated. The book will help computer and robotic scientists and engineers to understand mechanisms of decentralised functioning of robotic collectives and to design

future and emergent reconfigurable, parallel and distributed robotic systems.

**Dissipative Solitons: From Optics to Biology and Medicine** - Nail Akhmediev 2008-08-26

The dissipative soliton concept is a fundamental extension of the concept of solitons in conservative and integrable systems. It includes ideas from three major sources, namely standard soliton theory developed since the 1960s; nonlinear dynamics theory; and Prigogine's ideas of systems far from equilibrium. These three sources also correspond to the three component parts of this novel paradigm. This book explains the above principles in detail and gives the reader various examples.

**Synchronization in Oscillatory Networks** - Grigory V. Osipov 2007-08-10

This work systematically investigates a large number of oscillatory network configurations that are able to describe many real systems such as electric power grids, lasers or even the heart muscle, to name but a few. The book is

conceived as an introduction to the field for graduate students in physics and applied mathematics as well as being a compendium for researchers from any field of application interested in quantitative models.

*Agent-Based Spatial Simulation with NetLogo* - Arnaud Banos 2015-08-26

Agent-based modeling is a flexible and intuitive approach that is close to both data and theories, which gives it a special position in the majority of scientific communities. Agent models are as much tools of understanding, exploration and adaptation as they are media for interdisciplinary exchange. It is in this kind of framework that this book is situated, beginning with agent-based modeling of spatialized phenomena with a methodological and practical orientation. Through a governing example, taking inspiration from a real problem in epidemiology, this book proposes, with pedagogy and economy, a guide to good practices of agent modeling. The reader will thus be able to

understand and put the modeling into practice and acquire a certain amount of autonomy. Featuring the following well-known techniques and tools: Modeling, such as UML, Simulation, such as the NetLogo platform, Exploration methods, Adaptation using participative simulation

**Parallel Computing Technologies** - Victor Malyshkin 2015-07-24

This book constitutes the proceedings of the 13th International Conference on Parallel Computing Technologies, PaCT 2015, held in Petrozavodsk, Russia, during August / September 2015. The 37 full papers and 14 short papers presented were carefully reviewed and selected from 87 submissions. The papers are organized in topical sections on parallel models, algorithms and programming methods; unconventional computing; cellular automata; distributed computing; special processors programming techniques; applications.

**Mathematical Models and Methods for**

**Planet Earth** - Alessandra Celletti 2014-03-05

In 2013 several scientific activities have been devoted to mathematical researches for the study of planet Earth. The current volume presents a selection of the highly topical issues presented at the workshop “Mathematical Models and Methods for Planet Earth”, held in Roma (Italy), in May 2013. The fields of interest span from impacts of dangerous asteroids to the safeguard from space debris, from climatic changes to monitoring geological events, from the study of tumor growth to sociological problems. In all these fields the mathematical studies play a relevant role as a tool for the analysis of specific topics and as an ingredient of multidisciplinary problems. To investigate these problems we will see many different mathematical tools at work: just to mention some, stochastic processes, PDE, normal forms, chaos theory.

Nonlinear Waves and Solitons on Contours and Closed Surfaces - Andrei Ludu 2007-09-09

The present volume is an introduction to nonlinear waves and soliton theory in the special environment of compact spaces such as closed curves and surfaces and other domain contours. The first part of the book introduces the mathematical concept required for treating the manifolds considered. An introduction to the theory of motion of curves and surfaces is given. The second and third parts discuss the modeling of various physical solitons on compact systems. Active Motion and Swarming - Pawel Romanczuk 2011

Recently, there has been an increasing focus on various biological and physical systems known as "active matter". Examples of such systems range from individual units, such as motile cells or artificial self-propelled particles, to large systems of interacting active particles or individuals. The emergence of large-scale collective motion, as exhibited by flocks of birds or bacterial colonies, is just one prominent and fascinating example of self-organization in active

matter systems. In this work, we discuss different individual-based models of active matter using the concept of active Brownian motion. The first part of this work explores the dynamical behavior of single active particles with a particular emphasis on the impact of so-called active fluctuations. The second part extends the scope of this study to interacting active Brownian particles and their collective behavior. First, a systematic derivation of kinetic equations for active Brownian particles with velocity alignment is presented. Further on, motivated by recent biological observations, a new type of "escape-pursuit" model of collective motion is introduced and successfully employed in modeling collective locust behavior.

Brownian Agents and Active Particles - Frank Schweitzer 2007-08-29

This book lays out a vision for a coherent framework for understanding complex systems. By developing the genuine idea of Brownian agents, the author combines concepts from

informatics, such as multiagent systems, with approaches of statistical many-particle physics. It demonstrates that Brownian agent models can be successfully applied in many different contexts, ranging from physicochemical pattern formation to swarming in biological systems.

### **The Complex Dynamics of Economic**

**Interaction** - Mauro Gallegati 2012-12-06

The economy is examined by the authors as a complex interactive system. The emphasis is on the direct interaction between agents rather than on the indirect and autonomous interaction through the market mechanism. Contributions from economists and physicists emphasise the consequences for aggregate behaviour of the interaction between agents with limited rationality. Models of financial markets which exhibit many of the stylised facts of empirical markets such as bubbles, herd behaviour and long memory are presented. This includes contributions on bargaining, buyer-seller relations, the evolution of economic networks

and several aspects of macro-economic behaviour. This book will be of interest to all those interested in the foundations of collective social and economic behaviour and in particular, to those concerned with the dynamics of market behaviour and recent applications of physics to economics.

[Highlights on Practical Applications of Agents and Multi-Agent Systems](#) - Juan Manuel

Corchado Rodríguez 2013-04-17

This book constitutes the refereed proceedings of the Workshops which complemented the 11th International Conference on Practical Applications of Agents and Multi-Agent Systems, PAAMS 2013, held in Salamanca, Spain, in May 2013. This volume presents the papers that have been accepted for the workshops: Workshop on Agent-based Approaches for the Transportation Modeling and Optimization, Workshop on Agent-Based Solutions for Manufacturing and Supply Chain, Workshop on User-Centric Technologies and Applications, Workshop on Conflict

Resolution in Decision Making, Workshop on Multi-Agent System Based Learning Environments, Workshop on Multi-agent based Applications for Sustainable Energy Systems, Workshop on Agents and multi-agent Systems for AAL and e-Health

Reaction-Transport Systems - Vicenc Mendez  
2010-06-10

This book is an introduction to the dynamics of reaction-diffusion systems, with a focus on fronts and stationary spatial patterns. Emphasis is on systems that are non-standard in the sense that either the transport is not simply classical diffusion (Brownian motion) or the system is not homogeneous. A important feature is the derivation of the basic phenomenological equations from the mesoscopic system properties. Topics addressed include transport with inertia, described by persistent random walks and hyperbolic reaction-transport equations and transport by anomalous diffusion, in particular subdiffusion, where the mean

square displacement grows sublinearly with time. In particular reaction-diffusion systems are studied where the medium is in turn either spatially inhomogeneous, compositionally heterogeneous or spatially discrete. Applications span a vast range of interdisciplinary fields and the systems considered can be as different as human or animal groups migrating under external influences, population ecology and evolution, complex chemical reactions, or networks of biological cells. Several chapters treat these applications in detail.

**Collective Emotions** - Christian von Scheve  
2014-01-30

Although collective emotions have a long tradition in scientific inquiry, for instance in mass psychology and the sociology of rituals and social movements, their importance for individuals and the social world has never been more obvious than in the past decades. The Arab Spring revolution, the Occupy Wall Street movement, and mass gatherings at music

festivals or mega sports events clearly show the impact collective emotions have both in terms of driving conflict and in uniting people. But these examples only show the most obvious and evident forms of collective emotions. Others are more subtle, although less important: shared moods, emotional atmospheres, and intergroup emotions are part and parcel of our social life. Although these phenomena go hand in hand with any formation of sociality, they are little understood. Moreover, there still is a large gap in our understanding of individual emotions on the one hand and collective emotional phenomena on the other hand. This book presents a comprehensive overview of contemporary theories and research on collective emotions. It spans several disciplines and brings together, for the first time, various strands of inquiry and up-to-date research in the study of collective emotions and related phenomena. In focusing on conceptual, theoretical, and methodological issues in

collective emotion research, the volume narrows the gap between the wealth of studies on individual emotions and inquiries into collective emotions. The book catches up with a renewed interest into the collective dimensions of emotions and their close relatives, for example emotional climates, atmospheres, communities, and intergroup emotions. This interest is propelled by a more general increase in research on the social and interpersonal aspects of emotion on the one hand, and by trends in philosophy and cognitive science towards refined conceptual analyses of collective entities and the collective properties of cognition on the other hand. The book includes sections on: Conceptual Perspectives; Collective Emotion in Face-to-Face Interactions; The Social-Relational Dimension of Collective Emotion; The Social Consequences of Collective Emotions; Group-Based and Intergroup Emotion; Rituals, Movements, and Social Organization; and Collective Emotions in Online Social Systems.

Including contributions from psychologists, philosophers, sociologists, and neuroscience, this volume is a unique and valuable contribution to the affective sciences literature.

*Agent-Based Modeling* - Norman Ehrentreich  
2007-10-25

This book reconciles the existence of technical trading with the Efficient Market Hypothesis. By analyzing a well-known agent-based model, the Santa Fe Institute Artificial Stock Market (SFI-ASM), it finds that when selective forces are weak, financial evolution cannot guarantee that only the fittest trading rules will survive. Its main contribution lies in the application of standard results from population genetics which have widely been neglected in the agent-based community.

*Agent-Based Approaches in Economic and Social Complex Systems VII* - Tadahiko Murata  
2013-05-14

Agent-based modeling/simulation is an emergent approach to the analysis of social and economic

systems. It provides a bottom-up experimental method to be applied to social sciences such as economics, management, sociology, and politics as well as some engineering fields dealing with social activities. This book includes selected papers presented at the Seventh International Workshop on Agent-Based Approaches in Economic and Social Complex Systems held in Osaka, Japan, in 2012. At the workshop, 24 reviewed full papers were presented, and of those, 17 were selected to be included in this volume. The papers are divided into two groups as "Fundamentals of Agent-Based Modeling" and "Applications of Agent-Based Modeling".

**Managing Organizational Complexity** - Kurt A. Richardson 2005-06-01

**Stochastic Reactive Distributed Robotic Systems** - Gregory Mermoud 2013-10-01

This monograph presents the development of novel model-based methodologies for engineering self-organized and self-assembled

systems. The work bridges the gap between statistical mechanics and control theory by tackling a number of challenges for a class of distributed systems involving a specific type of constitutive components, namely referred to as Smart Minimal Particles. The results described in the volume are expected to lead to more robust, dependable, and inexpensive distributed systems such as those endowed with complex and advanced sensing, actuation, computation, and communication capabilities.

**Information—Consciousness—Reality** - James B. Glattfelder 2019-04-10

This open access book chronicles the rise of a new scientific paradigm offering novel insights into the age-old enigmas of existence. Over 300 years ago, the human mind discovered the machine code of reality: mathematics. By utilizing abstract thought systems, humans began to decode the workings of the cosmos. From this understanding, the current scientific paradigm emerged, ultimately discovering the

gift of technology. Today, however, our island of knowledge is surrounded by ever longer shores of ignorance. Science appears to have hit a dead end when confronted with the nature of reality and consciousness. In this fascinating and accessible volume, James Glattfelder explores a radical paradigm shift uncovering the ontology of reality. It is found to be information-theoretic and participatory, yielding a computational and programmable universe.

**Leveraging Applications of Formal Methods, Verification and Validation. Adaptation and Learning** - Tiziana Margaria 2022-10-19

This four-volume set LNCS 13701-13704 constitutes contributions of the associated events held at the 11th International Symposium on Leveraging Applications of Formal Methods, ISoLA 2022, which took place in Rhodes, Greece, in October/November 2022. The contributions in the four-volume set are organized according to the following topical sections: specify this - bridging gaps between program specification

paradigms; x-by-construction meets runtime verification; verification and validation of concurrent and distributed heterogeneous systems; programming - what is next: the role of documentation; automated software re-engineering; DIME day; rigorous engineering of collective adaptive systems; formal methods meet machine learning; digital twin engineering; digital thread in smart manufacturing; formal methods for distributed computing in future railway systems; industrial day.

Articulated Motion and Deformable Objects - Francisco Jose Perales Lopez 2012-06-26

This book constitutes the refereed proceedings of the 7th International Conference on Articulated Motion and Deformable Objects, AMDO 2012, held in Port d'Andratx, Mallorca, Spain, in July 2012. The 27 papers presented were carefully reviewed and selected from 44 submissions. The volume also contains one full paper length invited talk. The conference dealt with the following topics: advanced computer

graphics (human modeling and animation); human motion (analysis, tracking, 3D reconstruction and recognition); multimodal user interaction and applications; and affective interfaces (recognition and interpretation of emotions, ECAs -- embodied conversational agents in HCI).

Physics of the Human Mind - Ihor Lubashevsky 2017-02-12

This book tackles the challenging question which mathematical formalisms and possibly new physical notions should be developed for quantitatively describing human cognition and behavior, in addition to the ones already developed in the physical and cognitive sciences. Indeed, physics is widely used in modeling social systems, where, in particular, new branches of science such as sociophysics and econophysics have arisen. However, many if not most characteristic features of humans like willingness, emotions, memory, future prediction, and moral norms, to name but a few,

are not yet properly reflected in the paradigms of physical thought and theory. The choice of a relevant formalism for modeling mental phenomena requires the comprehension of the general philosophical questions related to the mind-body problem. Plausible answers to these questions are investigated and reviewed, notions and concepts to be used or to be taken into account are developed and some challenging questions are posed as open problems. This text addresses theoretical physicists and neuroscientists modeling any systems and processes where human factors play a crucial role, philosophers interested in applying philosophical concepts to the construction of mathematical models, and the mathematically oriented psychologists and sociologists, whose research is fundamentally related to modeling mental processes.

*Physics of Stochastic Processes* - Reinhard Mahnke 2009-08-04

Based on lectures given by one of the authors

with many years of experience in teaching stochastic processes, this textbook is unique in combining basic mathematical and physical theory with numerous simple and sophisticated examples as well as detailed calculations. In addition, applications from different fields are included so as to strengthen the background learned in the first part of the book. With its exercises at the end of each chapter (and solutions only available to lecturers) this book will benefit students and researchers at different educational levels. Solutions manual available for lecturers on [www.wiley-vch.de](http://www.wiley-vch.de)

*The Complex Networks of Economic Interactions* - Akira Namatame 2006-03-09

Understanding the mechanism of a socio-economic system requires more than an understanding of the individuals that comprise the system. It also requires understanding how individuals interact with each other, and how the aggregated outcome can be more than the sum of individual behaviors. This book contains the

papers fostering the formation of an active multi-disciplinary community on socio-economic systems with the exciting new fields of age-based modeling and econophysics. We especially intend to increase the awareness of researchers in many fields with sharing the common view many economic and social activities as collectives of a large-scale heterogeneous and interacting agents. Economists seek to understand not only how individuals behave but also how the interaction of many individuals leads to complex outcomes. Age-based modeling is a method for studying socio-economic systems exhibiting the following two properties: (1) the system is composed of interacting agents, and (2) the system exhibits emergent properties, that is, properties arising from the interactions of the agents that cannot be deduced simply by aggregating the properties of the system's components. When the interaction of the agents is contingent on past experience, and especially when the agents continually adapt to that

experience, mathematical analysis is typically very limited in its ability to derive the outcome. *Brownian Agents and Active Particles* - Frank Schweitzer 2007-08-31

When we contemplate phenomena as diverse as electrochemical deposition or the spatial patterns of urban development, it is natural to assume that they have nothing in common. After all, there are many levels in the hierarchy that builds up from atoms to human society, and the rules that govern atoms are quite different from those that govern the geographical emergence of a city. The common view among many, if not most, biologists and social scientists is that the devil is entirely in the details. This school of thought asserts that social science and biology have little or nothing in common, and indeed many biologists claim that even different fields of biology have little in common. If they are right, then science can only proceed by recording vast lists of details that no common principles will ever link together. Physics, in contrast, has

achieved a parsimonious description for a broad range of phenomena based on only a few general principles. The phenomena that physics addresses are unquestionably much simpler than those of biology or social science, and on the surface appear entirely dissimilar. A cell is far more complicated than a pendulum or an atom, and human society, being built out of great many cells, is far more complicated still. Cells and societies have many layers of hierarchical organization, with complex functional and computational properties; they have identities, idiosyncracies stemming from an accumulation of historical contingency that makes them impossible to characterize in simple mathematical terms. Their complexity is far beyond that of the simple systems usually studied in physics.

*Complex and Adaptive Dynamical Systems -*

Claudius Gros 2015-04-01

This primer offers readers an introduction to the central concepts that form our modern

understanding of complex and emergent behavior, together with detailed coverage of accompanying mathematical methods. All calculations are presented step by step and are easy to follow. This new fourth edition has been fully reorganized and includes new chapters, figures and exercises. The core aspects of modern complex system sciences are presented in the first chapters, covering network theory, dynamical systems, bifurcation and catastrophe theory, chaos and adaptive processes, together with the principle of self-organization in reaction-diffusion systems and social animals. Modern information theoretical principles are treated in further chapters, together with the concept of self-organized criticality, gene regulation networks, hypercycles and coevolutionary avalanches, synchronization phenomena, absorbing phase transitions and the cognitive system approach to the brain. Technical course prerequisites are the standard mathematical tools for an advanced

undergraduate course in the natural sciences or engineering. Each chapter includes exercises and suggestions for further reading, and the solutions to all exercises are provided in the last chapter. From the reviews of previous editions: This is a very interesting introductory book written for a broad audience of graduate students in natural sciences and engineering. It can be equally well used both for teaching and self-education. Very well structured and every topic is illustrated with simple and motivating examples. This is a true guidebook to the world of complex nonlinear phenomena. (Ilya Pavlyukevich, Zentralblatt MATH, Vol. 1146, 2008) Claudius Gros' Complex and Adaptive Dynamical Systems: A Primer is a welcome addition to the literature. A particular strength of the book is its emphasis on analytical techniques for studying complex systems. (David P. Feldman, Physics Today, July, 2009).

### **Novel Technological and Methodological Tools for the Understanding of Collective**

**Behaviors** - Elio Tuci 2020-01-23

**Flowing Matter** - Federico Toschi 2019-09-25

This open access book, published in the Soft and Biological Matter series, presents an introduction to selected research topics in the broad field of flowing matter, including the dynamics of fluids with a complex internal structure -from nematic fluids to soft glasses- as well as active matter and turbulent phenomena. Flowing matter is a subject at the crossroads between physics, mathematics, chemistry, engineering, biology and earth sciences, and relies on a multidisciplinary approach to describe the emergence of the macroscopic behaviours in a system from the coordinated dynamics of its microscopic constituents. Depending on the microscopic interactions, an assembly of molecules or of mesoscopic particles can flow like a simple Newtonian fluid, deform elastically like a solid or behave in a complex manner. When the internal constituents are

active, as for biological entities, one generally observes complex large-scale collective motions. Phenomenology is further complicated by the invariable tendency of fluids to display chaos at the large scales or when stirred strongly enough. This volume presents several research topics that address these phenomena encompassing the traditional micro-, meso-, and macro-scales descriptions, and contributes to our understanding of the fundamentals of flowing matter. This book is the legacy of the COST Action MP1305 "Flowing Matter".

Search and Foraging - Eugene Kagan  
2015-06-23

Since the start of modern computing, the studies of living organisms have inspired the progress in developing computers and intelligent machines. In particular, the methods of search and foraging are the benchmark problems for robotics and multi-agent systems. The highly developed theory of search and screening involves optimal search plans that are obtained

by standard optimization techniques while the foraging theory addresses search plans that mimic the behavior of living foragers. Search and Foraging: Individual Motion and Swarm Dynamics examines how to program artificial search agents so that they demonstrate the same behavior as predicted by the foraging theory for living organisms. For cybernetics, this approach yields techniques that enable the best online search planning in varying environments. For biology, it allows reasonable insights regarding the internal activity of living organisms performing foraging tasks. The book discusses foraging theory as well as search and screening theory in the same mathematical and algorithmic framework. It presents an overview of the main ideas and methods of foraging and search theories, making the concepts of one theory accessible to specialists of the other. The book covers Brownian walks and Lévy flight models of individual foraging and corresponding diffusion models and algorithms of search and

foraging in random environments both by single and multiple agents. It also describes the active Brownian motion models for swarm dynamics with corresponding Fokker-Planck equations. Numerical examples and laboratory verifications illustrate the application of both theories.

Nonlinear Fokker-Planck Equations - T.D. Frank  
2006-03-30

Centered around the natural phenomena of relaxations and fluctuations, this monograph provides readers with a solid foundation in the linear and nonlinear Fokker-Planck equations that describe the evolution of distribution functions. It emphasizes principles and notions of the theory (e.g. self-organization, stochastic feedback, free energy, and Markov processes), while also illustrating the wide applicability (e.g. collective behavior, multistability, front dynamics, and quantum particle distribution). The focus is on relaxation processes in homogeneous many-body systems describable by nonlinear Fokker-Planck equations. Also treated

are Langevin equations and correlation functions. Since these phenomena are exhibited by a diverse spectrum of systems, examples and applications span the fields of physics, biology and neurophysics, mathematics, psychology, and biomechanics.

*Modeling, Methodologies and Tools for Molecular and Nano-scale Communications* - Junichi Suzuki  
2017-03-15

This book reports on cutting-edge modeling techniques, methodologies and tools used to understand, design and engineer nanoscale communication systems, such as molecular communication systems. Moreover, it includes introductory materials for those who are new to the field. The book's interdisciplinary approach, which merges perspectives in computer science, the biological sciences and nanotechnology, will appeal to graduate students and researchers in these three areas. The book is organized into five parts, the first of which describes the fundamentals of molecular communication,

including basic concepts, models and designs. In turn, the second part examines specific types of molecular communication found in biological systems, such as neuronal communication in the brain. The book continues by exploring further types of nanoscale communication, such as fluorescence resonance energy transfer and electromagnetic-based nanoscale communication, in the third part, and by describing nanomaterials and structures for practical applications in the fourth. Lastly, the book presents nanomedical applications such as targeted drug delivery and biomolecular sensing.

### **Socioinformatics - The Social Impact of Interactions between Humans and IT -**

Katharina Zweig 2014-09-15

Socioinformatics is a new scientific approach to study the interactions between humans and IT. These proceedings are a collection of the contributions during a workshop of the Gesellschaft für Informatik (GI). Researchers in

this emerging field discuss the main aspects of interactions between IT and humans with respect to; social connections, social changes, acceptance of IT and the social conditions affecting this acceptance, effects of IT on humans and in response changes of IT, structures of the society and the influence of IT on these structures, changes of metaphysics influenced by IT and the social context of a knowledge society.

### *Autonomous Mobile Robots and Multi-Robot Systems - Eugene Kagan 2019-12-16*

Offers a theoretical and practical guide to the communication and navigation of autonomous mobile robots and multi-robot systems This book covers the methods and algorithms for the navigation, motion planning, and control of mobile robots acting individually and in groups. It addresses methods of positioning in global and local coordinates systems, off-line and on-line path-planning, sensing and sensors fusion, algorithms of obstacle avoidance, swarming

techniques and cooperative behavior. The book includes ready-to-use algorithms, numerical examples and simulations, which can be directly implemented in both simple and advanced mobile robots, and is accompanied by a website hosting codes, videos, and PowerPoint slides

*Autonomous Mobile Robots and Multi-Robot Systems: Motion-Planning, Communication and Swarming* consists of four main parts. The first looks at the models and algorithms of navigation and motion planning in global coordinates systems with complete information about the robot's location and velocity. The second part considers the motion of the robots in the potential field, which is defined by the environmental states of the robot's expectations and knowledge. The robot's motion in the unknown environments and the corresponding tasks of environment mapping using sensed information is covered in the third part. The fourth part deals with the multi-robot systems and swarm dynamics in two and three

dimensions. Provides a self-contained, theoretical guide to understanding mobile robot control and navigation

Features implementable algorithms, numerical examples, and simulations

Includes coverage of models of motion in global and local coordinates systems with and without direct communication between the robots

Supplemented by a companion website offering codes, videos, and PowerPoint slides

*Autonomous Mobile Robots and Multi-Robot Systems: Motion-Planning, Communication and Swarming* is an excellent tool for researchers, lecturers, senior undergraduate and graduate students, and engineers dealing with mobile robots and related issues.

*Biologically-Inspired Techniques for Knowledge Discovery and Data Mining* - Alam, Shafiq  
2014-05-31

Biologically-inspired data mining has a wide variety of applications in areas such as data clustering, classification, sequential pattern mining, and information extraction in healthcare

and bioinformatics. Over the past decade, research materials in this area have dramatically increased, providing clear evidence of the popularity of these techniques. Biologically-Inspired Techniques for Knowledge Discovery and Data Mining exemplifies prestigious research and shares the practices that have allowed these areas to grow and flourish. This essential reference publication highlights contemporary findings in the area of biologically-inspired techniques in data mining domains and their implementation in real-life problems. Providing quality work from established researchers, this publication serves to extend existing knowledge within the research communities of data mining and knowledge discovery, as well as for academicians and students in the field.

*Advances in Artificial Life* - Wolfgang Banzhaf  
2011-03-31

This book constitutes the refereed proceedings of the 7th European Conference on Artificial

Life, ECAL 2003, held in Dortmund, Germany in September 2003. The 96 revised full papers presented were carefully reviewed and selected from more than 140 submissions. The papers are organized in topical sections on artificial chemistries, self-organization, and self-replication; artificial societies; cellular and neural systems; evolution and development; evolutionary and adaptive dynamics; languages and communication; methodologies and applications; and robotics and autonomous agents.

**Designing Self-Organization in the Physical Realm** - Heiko Hamann 2020-12-31

This eBook is a collection of articles from a Frontiers Research Topic. Frontiers Research Topics are very popular trademarks of the Frontiers Journals Series: they are collections of at least ten articles, all centered on a particular subject. With their unique mix of varied contributions from Original Research to Review Articles, Frontiers Research Topics unify the

most influential researchers, the latest key findings and historical advances in a hot research area! Find out more on how to host your own Frontiers Research Topic or contribute to one as an author by contacting the Frontiers Editorial Office: [frontiersin.org/about/contact](http://frontiersin.org/about/contact).

**The Elgar Companion to Recent Economic Methodology** - J. B. Davis 2011-01-01

Economic methodology has traditionally been associated with logical positivism in the vein of Milton Friedman, Karl Popper, Imre Lakatos and Thomas Kuhn. However, the emergence and proliferation of new research programs in economics have stimulated many novel developments in economic methodology. This impressive Companion critically examines these advances in methodological thinking, particularly those that are associated with the new research programs which challenge standard economic methodology. Bringing together a collection of leading contributors to this new methodological thinking, the authors

explain how it differs from the past and point towards further concerns and future issues. The recent research programs explored include behavioral and experimental economics, neuroeconomics, new welfare theory, happiness and subjective well-being research, geographical economics, complexity and computational economics, agent-based modeling, evolutionary thinking, macroeconomics and Keynesianism after the crisis, and new thinking about the status of the economics profession and the role of the media in economics. This important compendium will prove invaluable for researchers and postgraduate students of economic methodology and the philosophy of economics. Practitioners in the vanguard of new economic thinking will also find plenty of useful information in this path-breaking book.

**Modeling Complexity in Economic and Social Systems** - Frank Schweitzer 2002-12-09  
Economics and the social sciences are, in fact, the “hard” sciences, as Herbert Simon argued,

because the complexity of the problems dealt with cannot simply be reduced to analytically solvable models or decomposed into separate subprocesses. Nevertheless, in recent years, the emerging interdisciplinary “sciences of complexity” have provided new methods and tools for tackling these problems, ranging from complex data analysis to sophisticated computer simulations. In particular, advanced methods developed in the natural sciences have recently also been applied to social and economic problems. The twenty-one chapters of this book reflect this modern development from various modeling perspectives (such as agent-based models, evolutionary game theory, reinforcement learning and neural network techniques, time series analysis, non-equilibrium macroscopic dynamics) and for a broad range of socio-economic applications (market dynamics, technological evolution, spatial dynamics and economic growth, decision processes, and agent societies). They jointly demonstrate a shift of

perspective in economics and the social sciences that is allowing a new outlook in this field to emerge. Contents:Market Dynamics:Trading Behavior and Excess Volatility in Toy Markets (M Marsili & D Challet)Percolation Models of Financial Market Dynamics (D Stauffer)Electrodynamical Model of Quasi-Efficient Financial Markets (K N Ilinski & A S Stepanenko)Multi-Agent Market Modeling of Foreign Exchange Rates (G Zimmermann et al.)Forecasting Price Increments Using an Artificial Neural Network (F Castiglione)Spectral Regularization, Data Complexity and Agent Behavior (A Ilyinsky)Technological Evolution:Dynamics of Economic and Technological Search Processes in Complex Adaptive Landscapes (W Ebeling et al.)New Results in a Self-Organized Model of Technological Evolution (A Arenas et al.)Firms' Decision-Making Process in an Evolutionary Model of Industrial Dynamics (W Kwasnicki)Spatial Dynamics and Economic

Growth:Modelling Migration and Economic Agglomeration with Active Brownian Particles (F Schweitzer)The Evolution of Industrial Clusters – Simulating Spatial Dynamics (T Brenner & N Weigel)The Growth Dynamics of German Business Firms (J Voit)A Dynamic Theory of a Firm: An Application of ‘Economic Forces’ (M Estola)Decision Processes:Adaptive Platform Dynamics in Multi-Party Spatial Voting (B M R Stadler)Subtle Nonlinearity in Popular Album Charts (R A Bentley & H D G Maschner)Dynamical Aspects in the Adoption of Agri-Environmental Measures (G Weisbuch & G Boudjema)Collective Choice and Mutual Knowledge Structures (D Richards et al.)Agent Societies:Evolutionary Study of Interethnic Co-Operation (V Kvasnicka & J Pospichal)Coalition Factor in the Evolution of Non-Kin Altruism (J-L Dessalles)Optimal Payoff Functions for Members of Collectives (D H Wolpert & K Tumer)A Day at the Beach: Human Agents Self-Organizing on the Sand Pile (H Ishii et al.) Readership:

Researchers in the field of complex system science, economists, sociologists, physicists with an interdisciplinary focus, graduates, and professionals. Keywords:

**Cyberemotions** - Janusz A. Holyst 2016-10-25  
This first monograph of its kind introduces the reader to fundamental definitions, key concepts and case studies addressing the following issues of rapidly growing relevance for online communities: What are emotions? How do they emerge, how are they transmitted? How can one measure emotional states? What are cyberemotions? When do emotions and cyberemotions become collective phenomena? How can one model emotions and their changes? What role do emotions play for on-line communities? Edited and authored by leading scientists in this field, this book is a comprehensive reference for anyone working on applications of complex systems methods in the social sciences, as well as for social scientists, psychologists, experts in on-line communities

and computer scientists. This book provides an excellent overview of the current state-of-art in research on collective emotional interactions mediated by the Internet. It introduces a reader in social phenomena occurring in cyberspace, algorithms needed for automatic sentiment detection and data driven modeling of emotional patterns observed in on-line groups. Eugene Stanley, Professor, Boston University With the explosive hyper-exponential growth of the internet suddenly new ways of communication are emerging that give rise to a digital 'Homo empathicus', each of us suddenly being able to share thoughts and feelings with millions if not billions of others. This book is a true treat, a timely milestone that gives us insight in the co-evolution of the way we interact with each other and the communication technology provided through this new seemingly endless flexible digital world. Prof. Holyst did a great job bringing together real experts in the field of

cyber emotions. Peter M.A. Sloot, Professor, University of Amsterdam, the Netherlands, Nanyang University, Singapore The book *Cyberemotions* embraces the topic of emotion studies in cyberspace from a very rich spectrum of points of view and applications. It is particularly interesting reading the theoretical foundations underlying the concepts of cyberemotions and how these concepts can be captured, modeled and implemented in real-time applications. Catherine Pelachaud, Director of Research CNRS at LTCI, TELECOM ParisTech Logical machines give us a chance to analyze our often illogical behaviors, especially in the vast meadows of the cyberspace. In this important book, authors of different backgrounds present a wide and deep image, not only of methods of analyzing our emotional behavior online but also how the computers can help to break communicational walls the same technology had built. Rafal Rzepka, Professor, Hokkaido University