

Multi Agent Systems Simulation And Applications Computational Analysis Synthesis And Design Of Dynamic Systems

Cooperative Control of Multi-Agent Systems extends optimal control and adaptive control design methods to multi-agent systems on communication graphs. It develops Riccati design techniques for general linear dynamics for cooperative state feedback design, cooperative observer design, and cooperative dynamic output feedback design. Both continuous-time and discrete-time dynamical multi-agent systems are treated. Optimal cooperative control is introduced and neural adaptive design techniques for multi-agent nonlinear systems with unknown dynamics, which are rarely treated in literature are developed. Results spanning systems with first-, second- and on up to general high-order nonlinear dynamics are presented. Each control methodology proposed is developed by rigorous proofs. All algorithms are justified by simulation examples. The text is self-contained and will serve as an excellent comprehensive source of information for researchers and graduate students working with multi-agent systems.

Multi-Agent System (MAS) is an exciting, emerging paradigm expected to play a key role in many society-changing practices. The International Conference on Principles and Practice of Multi-Agent Systems (PRIMA) is a leading scientific conference for research on intelligent agent systems and multi-agent systems, attracting high quality, state-of-the-art research from all over the world. PRIMA'09 was the 12th in the series of PRIMA conferences and was held in Nagoya, Japan. Beside a single-track main conference, PRIMA'09 also included a number of workshops which were designed to provide a forum for researchers and practitioners to present and exchange the latest developments at the MAS frontier. This book constitutes the post-proceedings of workshops under PRIMA'09. Readers will be able to explore a diverse range of topics and detailed discussions related to a number of important themes in our ever changing world. This collection plays an important role in bridging the gap between MAS theory and practice. It emphasizes the importance of MAS in the research and development of smart power grid systems, decision support systems, optimization and analysis systems for road traffic and markets, environmental monitoring and simulation, and in many other real-world applications and publicizes and extends MAS technology to many domains in this fast moving information age.

Cooperative Control of Multi-Agent Systems: An Optimal and Robust Perspective reports and encourages technology transfer in the field of cooperative control of multi-agent systems. The book deals with UGVs, UAVs, UUVs and spacecraft, and more. It presents an extended exposition of the authors' recent work on all aspects of multi-agent technology. Modelling and cooperative control of multi-agent systems are topics of great interest, across both academia (research and education) and industry (for real applications and end-users). Graduate students and researchers from a wide spectrum of specialties in electrical, mechanical or aerospace engineering fields will use this book as a key resource. Helps shape the reader's understanding of optimal and robust cooperative control design techniques for multi-agent systems Presents new theoretical control challenges and investigates unresolved/open problems Explores future research trends in multi-agent systems Offers a certain amount of analytical mathematics, practical numerical procedures, and actual implementations of some proposed approaches

"This book delivers definitive research on the use of agent technologies to advance the practice of electronic business in today's organizations, targeting the needs of enterprises in open and dynamic business opportunities to incorporate skilled use of multiple

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independent information systems. It clearly articulates the stages involved in developing agent-based e-business systems"--Provided by publisher.

This volume is based on papers accepted for the Second International Workshop on Multi-agent-based Simulation (MABS-2000) federated with the Fourth International Conference on Multi Agent Systems (ICMAS-2000) held in Boston in July 2000. The purpose of MABS-2000 was to investigate and develop the synergy between software engineering for multi-agent systems and agent-based simulation. The papers included in the MABS-2000 workshop were selected either because they explore how agent interaction can be used to build multi-agent systems or they offer examples of problem-oriented (rather than technique-oriented) systems. No paper was selected if it specified a model or an issue to make it fit a previously chosen technique. All of the papers in the volume have been reviewed and in many cases revised since the workshop. Two papers (by Edmonds and by Hales) as well as the editorial introduction have been added to those accepted for the workshop. As editors and workshop organisers, we are very grateful to the participants who engaged enthusiastically in the discussions about both individual papers and the issues facing the MABS community. Issues raised and positions taken in those discussions are reported in the editorial introduction. We are also grateful to the authors for their punctuality and the grace with which they received and responded to editorial comments and requests. Klaus Fischer, the ICMAS-2000 workshops chair, was exceptionally patient and diplomatic in reconciling our demands with the resources available.

This book presents a coherent and well-balanced survey of recent advances in software engineering approaches to the development of realistic multi-agent systems (MAS). In it, the concept of agent-based software engineering is demonstrated through examples that are relevant to and representative of real-world applications. The 15 thoroughly reviewed and revised full papers are organized in topical sections on requirements engineering, software architecture and design, modeling, dependability, and MAS frameworks. Most of the papers were initially presented at the Second International Workshop on Software Engineering for Large-Scale Multi-Agent Systems, SELMAS 2003, held in Portland, Oregon, USA, in May 2003; three papers were added in order to complete the coverage of the relevant topics.

"This book aims at giving a complete panorama of the active and promising crossing area between traffic engineering and multi-agent system addressing both current status and challenging new ideas"--Provided by publisher.

Multiagent systems (MAS) are one of the most exciting and the fastest growing domains in the intelligent resource management and agent-oriented technology, which deals with modeling of autonomous decisions making entities. Recent developments have produced very encouraging results in the novel approach of handling multiplayer interactive systems. In particular, the multiagent system approach is adapted to model, control, manage or test the operations and management of several system applications including multi-vehicles, microgrids, multi-robots, where agents represent individual entities in the network. Each participant is modeled as an autonomous participant with independent strategies and responses to outcomes. They are able to operate autonomously and interact pro-actively with their environment. In recent works, the problem of information consensus is addressed, where a team of vehicles communicate with each other to agree on key pieces of information that enable them to work together in a coordinated fashion. The problem is challenging because communication channels have limited range and there are possibilities of fading and dropout. The book comprises chapters on synchronization and consensus in multiagent systems. It shows that the joint presentation of synchronization and consensus enables readers to learn about similarities and differences of both concepts. It reviews the cooperative control of multi-agent dynamical systems interconnected by a communication network topology. Using the terminology of cooperative control, each system is endowed with its own

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state variable and dynamics. A fundamental problem in multi-agent dynamical systems on networks is the design of distributed protocols that guarantee consensus or synchronization in the sense that the states of all the systems reach the same value. It is evident from the results that research in multiagent systems offer opportunities for further developments in theoretical, simulation and implementations. This book attempts to fill this gap and aims at presenting a comprehensive volume that documents theoretical aspects and practical applications.

This book will introduce students to intelligent agents, explain what these agents are, how they are constructed and how they can be made to co-operate effectively with one another in large-scale systems.

This book highlights new trends and challenges in agent systems, and new digital and knowledge economy research, and includes 34 papers on areas such as intelligent agent interaction and collaboration, modeling, simulation and mobile agents, agent communication and social networks, business Informatics, design and implementation of intelligent agents and multi-agent systems. These papers were presented at the 12th International KES Conference on Agents and Multi-Agent Systems: Technologies and Applications (KES-AMSTA 2018) held on Australia's Gold Coast. The modern economy is driven by technologies and knowledge. Digital technologies can free, shift and multiply choices, often intruding on the space of other industries, by providing new ways of conducting business operations and creating values for customers and companies. The book addresses topics that contribute to the modern digital economy, including software agents, multi-agent systems, agent modeling, mobile and cloud computing, big data analysis, business intelligence, artificial intelligence, social systems, computer embedded systems and nature inspired manufacturing, which contribute to the modern digital economy. The results presented are of theoretical and practical value to researchers and industrial practitioners working in the fields of artificial intelligence, collective computational intelligence, innovative business models, new digital and knowledge economy and, in particular, agent and multi-agent systems, technologies, tools and applications.

The synergy between artificial intelligence and power and energy systems is providing promising solutions to deal with the increasing complexity of the energy sector. Multi-agent systems, in particular, are widely used to simulate complex problems in the power and energy domain as they enable modeling dynamic environments and studying the interactions between the involved players. Multi-agent systems are suitable for dealing not only with problems related to the upper levels of the system, such as the transmission grid and wholesale electricity markets, but also to address challenges associated with the management of distributed generation, renewables, large-scale integration of electric vehicles, and consumption flexibility. Agent-based approaches are also being increasingly used for control and to combine simulation and emulation by enabling modeling of the details of buildings' electrical devices, microgrids, and smart grid components. This book discusses and highlights the latest advances and trends in multi-agent energy systems

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simulation. The addressed application topics include the design, modeling, and simulation of electricity markets operation, the management and scheduling of energy resources, the definition of dynamic energy tariffs for consumption and electrical vehicles charging, the large-scale integration of variable renewable energy sources, and mitigation of the associated power network issues.

This book constitutes the thoroughly refereed postproceedings of the Joint International Workshop on Multi-Agent and Multi-Agent-Based Simulation, MABS 2004, held in New York, NY, USA in July 2004. The 20 revised full papers presented have gone through two rounds of reviewing, selection, and improvement; they present state-of-the-art research results in agent-based simulation and modeling. The papers are organized in topical sections on simulation of multi-agent systems, techniques and technologies, methodology and modeling, social dynamics, and application.

This book constitutes the refereed proceedings of the workshops which complemented the 12th International Conference on Practical Applications of Agents and Multi-Agent Systems, PAAMS 2014, held in Salamanca, Spain, in June 2014.

This volume presents the papers that have been accepted for the following workshops: Workshop on Agent-based Approaches for the Transportation Modeling and Optimization (AATMO 2014); Workshop on Agent-based Modeling and Simulation of Complex Systems: Engineering and Applications (ABSEA 2014); Workshop on Agents and Multi-Agent Systems for Ambient-assisted Living and e-Health (A-HEALTH 2014); Workshop on Agent-based Solutions for Manufacturing and Supply Chain (AMSC 2014); Workshop on Intelligent Systems for Context-based Information Fusion (ISCIF 2014); Workshop on Multi-Agent based Applications for Smart Grids and Sustainable Energy Systems (MASGES 2014); Workshop on Active Security Through Multi-Agent Systems (WASMAS 2014); Workshop on Intelligent Human-Agent Societies (WIHAS 2014).

This volume groups together the papers accepted for the 6th International Workshop on Multi-Agent-Based Simulation (MABS 2005), co-located with the 4th International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS 2005), which occurred in Utrecht, The Netherlands, on July 25, 2005. MABS 2005 is the sixth workshop of a series that began at ICMAS 1998 (Paris, France), and continued successively with ICMAS 2000 (Boston, USA), AAMAS 2002 (Bologna, Italia), AAMAS 2003 (Melbourne, Australia) and AAMAS 2004 (New York, USA). The revised version of the papers of these workshops appeared in Springer's Lecture Notes in Artificial Intelligence, in volumes 1534, 1979, 2581, 2927 and 3415. All information about the MABS Workshop Series can be found at <http://www.pcs.usp.br/mabs>. After some hesitations about the numbering of the volumes, we decided to set the pace right between the workshop edition and the volume name. So, this volume is called Multi-Agent-Based Simulation VI, and subsequent editions of the book series will correspond to the ordinal number of the workshop. The scientific focus of MABS lies in the confluence of

social sciences and multi-agent systems, with a strong applicational/empirical vein, and its emphasis is on (i) exploratory agent-based simulation as a principled way of undertaking scientific research in the social sciences and (ii) using social theories as an inspiration to new frameworks and developments in multi-agent systems.

The use of computer simulations to study social phenomena has grown rapidly during the last few years. Many social scientists from the fields of economics, sociology, psychology and other disciplines now use computer simulations to study a wide range of social phenomena. The availability of powerful personal computers, the development of multidisciplinary approaches and the use of artificial intelligence models have all contributed to this development. The benefits of using computer simulations in the social sciences are obvious. This holds true for the use of simulations as tools for theory building and for its implementation as a tool for sensitivity analysis and parameter optimization in application-oriented models. In both, simulation provides powerful tools for the study of complex social systems, especially for dynamic and multi-agent social systems in which mathematical tractability is often impossible. The graphical display of simulation output renders it user friendly to many social scientists that lack sufficient familiarity with the language of mathematics. The present volume aims to contribute in four directions: (1) To examine theoretical and methodological issues related to the application of simulations in the social sciences. By this we wish to promote the objective of designing a unified, user-friendly, simulation toolkit which could be applied to diverse social problems. While no claim is made that this objective has been met, the theoretical issues treated in Part 1 of this volume are a contribution towards this objective.

This book provides a description of advanced multi-agent and artificial intelligence technologies for the modeling and simulation of complex systems, as well as an overview of the latest scientific efforts in this field. A complex system features a large number of interacting components, whose aggregate activities are nonlinear and self-organized. A multi-agent system is a group or society of agents which interact with others cooperatively and/or competitively in order to reach their individual or common goals. Multi-agent systems are suitable for modeling and simulation of complex systems, which is difficult to accomplish using traditional computational approaches.

Fifteen papers were presented at the first workshop on Multi-Agent Systems and Agent-Based Simulation held as part of the Agents World conference in Paris, July 4-- 6, 1998. The workshop was designed to bring together two developing communities: the multi-agent systems researchers who were the core participants at Agents World, and social scientists interested in using MAS as a research tool. Most of the social sciences were represented, with contributions touching on sociology, management science, economics, psychology, environmental science, ecology, and linguistics. The workshop was organised in association with SimSoc, an informal group of social scientists who have arranged an irregular series of

influential workshops on using simulation in the social sciences beginning in 1992. While the papers were quite heterogeneous in substantive domain and in their disciplinary origins, there were several themes which recurred during the workshop. One of these was considered in more depth in a round table discussion led by Jim Doran at the end of the workshop on 'Representing cognition for social simulation', which addressed the issue of whether and how cognition should be modelled. Quite divergent views were expressed, with some participants denying that individual cognition needed to be modelled at all, and others arguing that cognition must be at the centre of social simulation.

The book highlights new trends and challenges in research on agents and the new digital and knowledge economy. It includes papers on business process management, agent-based modeling and simulation and anthropic-oriented computing that were originally presented at the 14th International KES Conference on Agents and Multi-Agent Systems: Technologies and Applications (KES-AMSTA 2020), being held as a Virtual Conference in June 17–19, 2020. The respective papers cover topics such as software agents, multi-agent systems, agent modeling, mobile and cloud computing, big data analysis, business intelligence, artificial intelligence, social systems, computer embedded systems and nature inspired manufacturing, all of which contribute to the modern digital economy.

PRIMA has emerged as a major platform for academic and research exchange on agent technologies. The PRIMA workshop series was initiated as a workshop of the Pacific Rim International Conference in Artificial Intelligence (PRICAI) to provide a forum that would bring together research in the areas of agent technology and multi-agent systems, both in the Pacific Rim region and beyond. The inaugural workshop in the series was held in Singapore in 1998, with subsequent meetings in Kyoto (1999), Melbourne (2000), Taipei (2001), Tokyo (2002), Seoul (2003), Auckland (2004), Kuala Lumpur (2005) and Guilin (2006). At the 10th PRIMA in Bangkok in November 2007, the Steering Committee agreed that the series had grown in size and achieved a level of maturity to become a conference series of its own.

It was therefore agreed that from Bangkok in 2007 PRIMA would stand for the Pacific Rim International Conference on Multi-Agent Systems. PRIMA 2007 received 102 valid submissions. Each submission was peer-reviewed by at least three referees selected from the Program Committee. As a result of the selection process, 22 submissions were accepted as full research papers, yielding an acceptance rate of 22.22%. In addition the program included 11 application papers and 16 short papers. A special session on Agent-Oriented Software Engineering (AOSE) was organized by Graham Low from the University of New South Wales (Australia) and Ghassan Beydoun from the University of Wollongong (Australia), where papers were invited from the AOSE community, but put through the same rigorous reviewing process.

Multiagent systems consist of multiple autonomous entities having different information and/or diverging interests. The study of multiagent systems (MAS) focuses on systems in which many intelligent agents interact with each other. The

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agents are considered to be autonomous entities, such as software programs or robots. Their interactions can be either cooperative or selfish. That is, the agents can share a common goal (e.g. an ant colony), or they can pursue their own interests. Multi-agent systems can be used to solve problems that are difficult or impossible for an individual agent or a monolithic system to solve. Intelligence may include some methodic, functional, procedural approach, algorithmic search or reinforcement learning. Although there is considerable overlap, a multi-agent system is not always the same as an agent-based model (ABM). The goal of an ABM is to search for explanatory insight into the collective behavior of obeying simple rules, typically in natural systems, rather than in solving specific practical or engineering problems. Topics where multi-agent systems research may deliver an appropriate approach include online trading, disaster response, and modelling social structures. Multi-agent systems consist of agents and their environment. Typically multi-agent systems research refers to software agents. However, the agents in a multi-agent system could equally well be robots, humans or human teams. A multi-agent system may contain combined humanagent teams. Agent systems are open and extensible systems that allow for the deployment of autonomous and proactive software components. Multi-agent systems have been brought up and used in several application domains. This book, *Multi-Agent Systems - Modeling, Control, Programming, Simulations and Applications*, is intended to provide an emphasise on the multi-agent technology, products and industrial applications.

This book constitutes the proceedings of the Third International Symposium on Agent and Multi-Agent Systems: Technologies and Applications, held in Uppsala, Sweden, during June 3-5, 2009. The 86 papers contained in this volume were carefully reviewed and selected from numerous submissions. There are 13 main tracks covering the methodology and applications of agent and multi-agent systems and 8 special sessions on specific topics within the field. The papers are divided in topical sections on social and organizational structures of agents; negotiation protocols; mobile agents and robots; agent design and implementation; e-commerce; simulation systems and game systems; agent systems and ontologies; agents for network systems; communication and agent learning systems; Web services and semantic Web; self-organization in multi-agent systems; management and e-business; mobile and intelligent agents for networks and services; engineering interaction protocols; agent-based simulation, decision making and systems optimization; digital economy; agent-based optimization (ABO2009); distributed systems and artificial intelligence applications.

This book constitutes the thoroughly refereed post-conference proceedings of the 13th International Conference on Principles and Practice of Multi-Agent Systems, PRIMA 2010, held in Kolkata, India, in November 2010. The 18 full papers presented together with 15 early innovation papers were carefully reviewed and selected from over 63 submissions. They focus on practical aspects of multiagent systems and cover topics such as agent communication,

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agent cooperation and negotiation, agent reasoning, agent-based simulation, mobile and semantic agents, agent technologies for service computing, agent-based system development, ServAgents workshop, IAHC workshop, and PRACSYS workshop.

Multi-Agent Systems Simulation and Applications CRC Press

Nowadays, engineering large-scale software systems means dealing with complex systems composed of pervasive software components that move around and adapt to nondeterministic and open environments, like the Internet, in order to achieve systems design goals through the coordination of autonomously distributed services. The agent metaphor, in particular software agents and multi-agent systems (MAS), constitutes a promising approach for covering most of the software development life cycle, from conceptual modeling and requirements specification to architectural definition, design, and implementation. This book presents 17 carefully reviewed papers arranged in order to provide a coherent survey of how to exploit agent properties and MAS issues in today's software systems. The book offers the following topical sections: - software engineering foundations - requirements engineering and software architecture - coordination and mobility - reuse -dependability -empirical studies and applications

Developments in Intelligent Agent Technologies and Multi-Agent Systems: Concepts and Applications discusses research on emerging technologies and systems based on agent and multi-agent paradigms across various fields of science, engineering and technology. This book is a collection of work that covers conceptual frameworks, case studies, and analysis while serving as a medium of communication among researchers from academia, industry and government.

This modern field of multi-agent systems has developed from two main lines of earlier research: its practitioners generally regard it as a form of distributed artificial intelligence, whereas some researchers have persistently advocated ideas from the field of artificial life. AI agents (and their designers) usually take the environment for agent interaction as granted. From the ALife perspective and for ALife agents, the environment for interaction is an active participant in agent dynamics, a first class member of the overall systems. This book originates from the First International Workshop on Environments for Multi-Agent Systems, E4MAS 2004, held in New York, NY, USA in July 2004 as a satellite workshop of AAMAS 2004. The 13 carefully selected reviewed and revised papers presented together with an introductory survey article of close to 50 pages are organized in topical sections on conceptual models, language for design and specification, simulation and environments, mediated coordination, and applications.

This volume contains a selection of the papers presented at the 11th International Workshop on Multi-Agent-Based Simulation (MABS 2010), a workshop co-located with the 9th International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS 2010), which was held on May 10-14, 2010 in Toronto, Canada. The 11 revised full papers presented were carefully reviewed and selected from 26 submissions. The workshop has been an important source of inspiration for the body of knowledge that has been produced in the field of Multi-Agent Systems (MAS). As illustrated by this volume, the workshop continues to bring together researchers interested in MAS engineering with researchers focused on finding efficient ways to model complex social systems in social, economic and organizational

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areas. In all these areas, agent theories, metaphors, models, analyses, experimental designs, empirical studies, and methodological principles all converge into simulation as a way of achieving explanations and predictions, exploring and testing hypotheses, and producing better designs and systems.

Methodological Guidelines for Modeling and Developing MAS-Based Simulations The intersection of agents, modeling, simulation, and application domains has been the subject of active research for over two decades. Although agents and simulation have been used effectively in a variety of application domains, much of the supporting research remains scattered in the literature, too often leaving scientists to develop multi-agent system (MAS) models and simulations from scratch. *Multi-Agent Systems: Simulation and Applications* provides an overdue review of the wide ranging facets of MAS simulation, including methodological and application-oriented guidelines. This comprehensive resource reviews two decades of research in the intersection of MAS, simulation, and different application domains. It provides scientists and developers with disciplined engineering approaches to modeling and developing MAS-based simulations. After providing an overview of the field's history and its basic principles, as well as cataloging the various simulation engines for MAS, the book devotes three sections to current and emerging approaches and applications. *Simulation for MAS* — explains simulation support for agent decision making, the use of simulation for the design of self-organizing systems, the role of software architecture in simulating MAS, and the use of simulation for studying learning and stigmergic interaction. *MAS for Simulation* — discusses an agent-based framework for symbiotic simulation, the use of country databases and expert systems for agent-based modeling of social systems, crowd-behavior modeling, agent-based modeling and simulation of adult stem cells, and agents for traffic simulation. *Tools* — presents a number of representative platforms and tools for MAS and simulation, including Jason, James II, SeSAM, and RoboCup Rescue. Complete with over 200 figures and formulas, this reference book provides the necessary overview of experiences with MAS simulation and the tools needed to exploit simulation in MAS for future research in a vast array of applications including home security, computational systems biology, and traffic management.

The MATSim (Multi-Agent Transport Simulation) software project was started around 2006 with the goal of generating traffic and congestion patterns by following individual synthetic travelers through their daily or weekly activity programme. It has since then evolved from a collection of stand-alone C++ programs to an integrated Java-based framework which is publicly hosted, open-source available, automatically regression tested. It is currently used by about 40 groups throughout the world. This book takes stock of the current status. The first part of the book gives an introduction to the most important concepts, with the intention of enabling a potential user to set up and run basic simulations. The second part of the book describes how the basic functionality can be extended, for example by adding schedule-based public transit, electric or autonomous cars, paratransit, or within-day replanning. For each extension, the text provides pointers to the additional documentation and to the code base. It is also discussed how people with appropriate Java programming skills can write their own extensions, and plug them into the MATSim core. The project has started from the basic idea that traffic is a consequence of human behavior, and thus humans and their behavior should be the starting point of all modelling, and with the intuition that when simulations with 100 million particles are possible in computational physics, then behavior-oriented simulations with 10 million travelers should be possible in travel behavior research. The initial implementations thus combined concepts from computational physics and complex adaptive systems with concepts from travel behavior research. The third part of the book looks at theoretical concepts that are able to describe important aspects of the simulation system; for example, under certain conditions the code becomes a Monte Carlo engine sampling from a discrete choice model. Another important aspect is the interpretation of the MATSim score as utility in the microeconomic sense, opening up a connection to benefit

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cost analysis. Finally, the book collects use cases as they have been undertaken with MATSim. All current users of MATSim were invited to submit their work, and many followed with sometimes crisp and short and sometimes longer contributions, always with pointers to additional references. We hope that the book will become an invitation to explore, to build and to extend agent-based modeling of travel behavior from the stable and well tested core of MATSim documented here.

This book highlights new trends and challenges in research on agents and the new digital and knowledge economy. It includes papers on business- process management, agent-based modeling and simulation, and anthropic-oriented computing, which were originally presented at the 13th International KES Conference on Agents and Multi-Agent Systems – Technologies and Applications (KES-AMSTA 2019) held June 17–19, 2019 at St George's Bay, St. Julians, Malta. Today's economy is driven by technologies and knowledge. Digital technologies can free, shift and multiply choices, and often intrude on the territory of other industries by providing new ways of conducting business operations and creating value for customers and companies. As such, the book covers topics such as software agents, multi-agent systems, agent modeling, mobile and cloud computing, big data analysis, business intelligence, artificial intelligence, social systems, computer embedded systems and nature inspired manufacturing, all of which contribute to the modern digital economy. The research presented is of value to researchers and industrial practitioners working in the fields of artificial intelligence, collective computational intelligence, innovative business models, the new digital and knowledge economy and, in particular, agent and multi-agent systems, technologies, tools and applications.

"This book provides theoretical frameworks and the latest empirical research findings used by medical professionals in the implementation of multi-agent systems"--Provided by publisher.

This book constitutes the proceedings of the 8th International Workshop on Programming Multi-Agent Systems held in Toronto, Canada, in May 2010 in conjunction with AAMAS 2010, the 9th International Joint Conference on Autonomous Agents and Multiagent Systems. The 7 revised full papers presented together with 1 invited paper were carefully reviewed and selected for inclusion in the book. The papers cover a broad range of mostly practical topics like decision component of agent systems; practical examples of programming languages; interaction with the environment, and are thus organized in topical sections on reasoning, programming languages, and environments.

Research on multi-agent systems is enlarging our future technical capabilities as humans and as an intelligent society. During recent years many effective applications have been implemented and are part of our daily life. These applications have agent-based models and methods as an important ingredient. Markets, finance world, robotics, medical technology, social negotiation, video games, big-data science, etc. are some of the branches where the knowledge gained through multi-agent simulations is necessary and where new software engineering tools are continuously created and tested in order to reach an effective technology transfer to impact our lives. This book brings together researchers working in several fields that cover the techniques, the challenges and the applications of multi-agent systems in a wide variety of aspects related to learning algorithms for different devices such as vehicles, robots and drones, computational optimization to reach a more efficient energy distribution in power grids and the use of social networks and decision strategies applied to the smart learning and education environments in emergent countries. We hope that this book can be useful and become a guide or reference to an audience interested in the developments and applications of multi-agent

systems.

This book highlights new trends and challenges in research on agents and the new digital and knowledge economy. It includes papers on business process management, agent-based modeling and simulation, and anthropic-oriented computing that were originally presented at the 15th International KES Conference on Agents and Multi-Agent Systems: Technologies and Applications (KES-AMSTA 2021), being held as a Virtual Conference in June 14–16, 2021. The respective papers cover topics such as software agents, multi-agent systems, agent modeling, mobile and cloud computing, big data analysis, business intelligence, artificial intelligence, social systems, computer embedded systems, and nature-inspired manufacturing, all of which contribute to the modern digital economy.

This volume contains selected papers that were presented at the eighth international workshop on Multi-Agent-Based Simulation (MABS 2007), a workshop co-located with the 6th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS 2007), held in Honolulu, Hawaii, on May 15, 2007. These papers have been revised and extended, based on discussions at the workshop, and reviewed once more. Agent technology is now a mature paradigm of software engineering. C-plex systems, which are irreducible to their components in isolation, are instead heavily characterized by the interaction between their components. Agent-based simulation is the natural way to model systems with a focus on interaction, and the circle closes by considering how the social sciences show this kind of c-plexity. The focus of this workshop series lies in this confluence of social sciences and multi-agent systems. 1 Simulation has been proposed by Axelrod as a third way of doing science, in contrast with deduction and induction: generating data that can be analyzed inductively, but coming from a rigorously specified set of rules rather than direct measurement of the real world. In this sense, to simulate a phenomenon is to generate it – constructing artificial (agent) societies. This in turn leads to questions that have already been asked for human societies. Computer scientists have adopted general terms like emerging behavior, self-organization, and evolutionary theory; even specific social terms such as norms, reputation, trust, tags, institutions; but all of them in an intuitive manner.

Social simulation can be a difficult discipline to encompass fully. There are many methods, models, directions, and theories that can be discussed and applied to various social sciences. Anthropology, sociology, political science, economy, government, and management can all benefit from social simulation. Interdisciplinary Applications of Agent-Based Social Simulation and Modeling aims to bring a different perspective to this interdisciplinary topic. This book presents current discussions and new insights on social simulation as a whole, focusing on its dangers, pitfalls, deceits, and challenges. This book is an essential reference for researchers in this field, professionals using social simulation, and even students studying this discipline.

