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## KEY=AGENT - NATALIE HOUSTON

## AGENT-BASED EVOLUTIONARY SEARCH

Springer Science & Business Media **Agent based evolutionary search is an emerging paradigm in computational int- ligence offering the potential to conceptualize and solve a variety of complex problems such as currency trading, production planning, disaster response m- agement, business process management etc. There has been a significant growth in the number of publications related to the development and applications of agent based systems in recent years which has prompted special issues of journals and dedicated sessions in premier conferences. The notion of an agent with its ability to sense, learn and act autonomously - lows the development of a plethora of efficient algorithms to deal with complex problems. This notion of an agent differs significantly from a restrictive definition of a solution in an evolutionary algorithm and opens up the possibility to model and capture emergent behavior of complex systems through a natural age- oriented decomposition of the problem space. While this flexibility of represen- tion offered by agent based systems is widely acknowledged, they need to be - signed for specific purposes capturing the right level of details and description. This edited volume is aimed to provide the readers with a brief background of agent based evolutionary search, recent developments and studies dealing with various levels of information abstraction and applications of agent based evo- tionary systems. There are 12 peer reviewed chapters in this book authored by d- tinguished researchers who have shared their experience and findings spanning across a wide range of applications.**

## INTELLIGENT AGENTS IN THE EVOLUTION OF WEB AND APPLICATIONS

Springer Science & Business Media **Intelligent agents have revolutionised the way we do business, we teach, we learn, design systems, and so on. Agent applications are increasingly being developed in - mains as diverse as meteorology, manufacturing, war gaming, UAV mission mana- ment and the evolution of Web [1]. The Web has also has the same effect on our daily life as the intelligent agents. We use Web for information search, shopping, news, communication and so on. We wonder how we lived without Web in the past [2]. The book presents a sample of some of the most innovative research on the use of intelligent agents in the evolution of Web. There are thirteen chapters in the book. Chapters are on theoretical foundations as well as practical applications. We are grateful to the contributors and reviewers for their contribution. We believe that the research reported in the book will encourage researchers to develop the robust human-like intelligent machines for the service of humans. We sincerely thank Springer-Verlag for their editorial support during the prepa- tion of the manuscript. The editors appreciate the resources provided by Wroclaw University of Technology and the University of South Australia to edit this volume.**

## EVOLUTIONARY MULTI-AGENT SYSTEMS

## FROM INSPIRATIONS TO APPLICATIONS

Springer **This book addresses agent-based computing, concentrating in particular on evolutionary multi-agent systems (EMAS), which have been developed since 1996 at the AGH University of Science and Technology in Cracow, Poland. It provides the relevant background information on and a detailed description of this computing paradigm, along with key experimental results. Readers will benefit from the insightful discussion, which primarily concerns the efficient implementation of computing frameworks for developing EMAS and similar computing systems, as well as a detailed formal model. Theoretical deliberations demonstrating that computing with EMAS always helps to find the optimal solution are also included, rounding out the coverage.**

## ADVANCES IN THE EVOLUTIONARY SYNTHESIS OF INTELLIGENT AGENTS

MIT Press **This book explores a central issue in artificial intelligence, cognitive science, and artificial life: how to design information structures and processes that create and adapt intelligent agents through evolution and learning. Among the first uses of the computer was the development of programs to model perception, reasoning, learning, and evolution. Further developments resulted in computers and programs that exhibit aspects of intelligent behavior. The field of artificial intelligence is based on the premise that thought processes can be computationally modeled. Computational molecular biology brought a similar approach to the study of living systems. In both cases, hypotheses concerning the structure, function, and evolution of cognitive systems (natural as well as synthetic) take the form of computer programs that store, organize, manipulate, and use information. Systems whose information processing structures are fully programmed are difficult to design for all but the simplest applications. Real-world environments call for systems that are able to modify their behavior by changing their information processing structures. Cognitive and information structures and processes, embodied in living systems, display many effective designs for biological intelligent agents. They are also a source of ideas for designing artificial intelligent agents. This book explores a central issue in artificial intelligence, cognitive science, and artificial life: how to design information structures and processes that create and adapt intelligent agents through evolution and learning. The book is organized around four topics: the power of evolution to determine effective solutions to complex tasks, mechanisms to make evolutionary design scalable, the use of evolutionary search in conjunction with local learning algorithms, and the extension of evolutionary search in novel directions.**

## MULTI-AGENT APPLICATIONS WITH EVOLUTIONARY COMPUTATION AND BIOLOGICALLY INSPIRED TECHNOLOGIES: INTELLIGENT TECHNIQUES FOR UBIQUITY AND OPTIMIZATION

## INTELLIGENT TECHNIQUES FOR UBIQUITY AND OPTIMIZATION

IGI Global **"This book compiles numerous ongoing projects and research efforts in the design of agents in light of recent development in neurocognitive science and quantum physics, providing readers with interdisciplinary applications of multi-agents systems, ranging from economics to engineering"--Provided by publisher.**

## EVOLUTIONARY AGENT-BASED POLICY ANALYSIS IN DYNAMIC ENVIRONMENTS

V. Nannen

## NETWORK-BASED DISTRIBUTED PLANNING USING COEVOLUTIONARY ALGORITHMS

World Scientific **In this book, efficient and scalable coevolutionary algorithms for distributed, network-based decision-making, which utilize objective functions are developed in a networked environment where internode communications are a primary factor in system performance. A theoretical foundation for this class of coevolutionary algorithms is introduced using techniques from stochastic process theory and mathematical analysis. A case study in distributed, network-based decision-making presents an implementation and detailed evaluation of the coevolutionary decision-making framework that incorporates distributed evolutionary agents and mobile agents. The methodology discussed in this book can have a fundamental impact on the principles and practice of engineering in the distributed, network-based environment that is emerging within and among corporate enterprise systems. In addition, the conceptual framework of the approach to distributed decision systems described may have much wider implications for network-based systems and applications. Contents: Background and Related Work; Problem Formulation and Analysis; Theory and Analysis of Evolutionary Optimization; Theory and Analysis of Distributed Coevolutionary Optimization; Performance Evaluation Based on Ideal Objectives; Coevolutionary Virtual Design Environment; Evaluation and Analysis. Readership: Researchers and engineers in artificial intelligence, evolutionary computation and decision sciences.**

## APPLICATIONS OF EVOLUTIONARY COMPUTATION

## 21ST INTERNATIONAL CONFERENCE, EVOAPPLICATIONS 2018, PARMA, ITALY, APRIL 4-6, 2018, PROCEEDINGS

Springer **This book constitutes the refereed conference proceedings of the 21st International Conference on the Applications of Evolutionary Computation, EvoApplications 2018, held in Parma, Italy, in April 2018, collocated with the Evo* 2018 events EuroGP, EvoCOP, and EvoMUSART. The 59 revised full papers presented were carefully reviewed and selected from 84 submissions. EvoApplications 2018 combined research from 14 different domains: business analytics and finance (EvoBAFIN); computational biology (EvoBIO); communication networks and other parallel and distributed systems (EvoCOMNET); complex systems (EvoCOMPLEX); energy-related optimization (EvoENERGY); games and multi-agent systems (EvoGAMES); image analysis, signal processing and pattern recognition (EvoIASP); realworld industrial and commercial environments (EvoINDUSTRY); knowledge incorporation in evolutionary computation (EvoKNOW); continuous parameter optimization (EvoNUM); parallel architectures and distributed infrastructures (EvoPAR); evolutionary robotics (EvoROBOT); nature-inspired algorithms in software engineering and testing (EvoSET); and stochastic and dynamic environments (EvoSTOC).**

## INTELLIGENT AGENT TECHNOLOGY: SYSTEMS, METHODOLOGIES AND TOOLS - PROCEEDINGS OF THE 1ST ASIA-PACIFIC CONFERENCE ON INTELLIGENT AGENT TECHNOLOGY (IAT '99)

World Scientific **This book is a collection of high quality technical papers contributed by active researchers and leading practitioners in intelligent agent technology. It offers a closer look at the state-of-the-art in the development of intelligent agents, and examines in depth the underlying logical, cognitive, physical, and biological foundations as well as the**

**performance characteristics of various approaches in intelligent agent technology. It will stimulate the development of new models, new methodologies, and new tools for building a variety of embodiments of agent-based systems.**

## EVOLUTIONARY PROGRAMMING VII

### 7TH INTERNATIONAL CONFERENCE, EP98, SAN DIEGO, CALIFORNIA, USA, MARCH 25–27, 1998 PROCEEDINGS

Springer **This book constitutes the thoroughly refereed post-conference proceedings of the 7th International Conference on Evolutionary Programming, EP98, held in San Diego, CA, USA, in March 1998. The volume presents 81 revised full papers selected from an overwhelming number of submissions. The papers are organized in topical sections on economics, emergence and complex systems; issues and innovations in evolutionary computation; applications; evolution-based approaches to engineering design; examining representations and operators; evolutionary computation theory; evolutionary computation and biological modeling; particle swarm; and combinations of evolutionary and neural computation.**

## APPLICATIONS OF EVOLUTIONARY COMPUTATION

### 20TH EUROPEAN CONFERENCE, EVOAPPLICATIONS 2017, AMSTERDAM, THE NETHERLANDS, APRIL 19-21, 2017, PROCEEDINGS, PART I

Springer **The two volumes LNCS 10199 and 10200 constitute the refereed conference proceedings of the 20th European Conference on the Applications of Evolutionary Computation, EvoApplications 2017, held in Amsterdam, The Netherlands, in April 2017, collocated with the Evo* 2016 events EuroGP, EvoCOP, and EvoMUSART. The 46 revised full papers presented together with 26 poster papers were carefully reviewed and selected from 108 submissions. EvoApplications 2016 consisted of the following 13 tracks: EvoBAFIN (natural computing methods in business analytics and finance), EvoBIO (evolutionary computation, machine learning and data mining in computational biology), EvoCOMNET (nature-inspired techniques for telecommunication networks and other parallel and distributed systems), EvoCOMPLEX (evolutionary algorithms and complex systems), EvoENERGY (evolutionary computation in energy applications), EvoGAMES (bio-inspired algorithms in games), EvoIASP (evolutionary computation in image analysis, signal processing, and pattern recognition), EvoINDUSTRY (nature-inspired techniques in industrial settings), EvoKNOW (knowledge incorporation in evolutionary computation), EvoNUM (bio-inspired algorithms for continuous parameter optimization), EvoPAR (parallel implementation of evolutionary algorithms), EvoROBOT (evolutionary robotics), EvoSET (nature-inspired algorithms in software engineering and testing), and EvoSTOC (evolutionary algorithms in stochastic and dynamic environments).**

## SUPPORTING VALIDATION OF UAV SENSE-AND-AVOID ALGORITHMS WITH AGENT-BASED SIMULATION AND EVOLUTIONARY SEARCH

## APPLICATIONS OF EVOLUTIONARY COMPUTATION

### 18TH EUROPEAN CONFERENCE, EVOAPPLICATIONS 2015, COPENHAGEN, DENMARK, APRIL 8-10, 2015, PROCEEDINGS

Springer **This book constitutes the refereed conference proceedings of the 18th International Conference on the Applications of Evolutionary Computation, EvoApplications 2015, held in Copenhagen, Spain, in April 2015, colocated with the Evo 2015 events EuroGP, EvoCOP, and EvoMUSART. The 72 revised full papers presented were carefully reviewed and selected from 125 submissions. EvoApplications 2015 consisted of the following 13 tracks: EvoBIO (evolutionary computation, machine learning and data mining in computational biology), EvoCOMNET (nature-inspired techniques for telecommunication networks and other parallel and distributed systems), EvoCOMPLEX (evolutionary algorithms and complex systems), EvoENERGY (evolutionary computation in energy applications), EvoFIN (evolutionary and natural computation in finance and economics), EvoGAMES (bio-inspired algorithms in games), EvoIASP (evolutionary computation in image analysis, signal processing, and pattern recognition), EvoINDUSTRY (nature-inspired techniques in industrial settings), EvoNUM (bio-inspired algorithms for continuous parameter optimization), EvoPAR (parallel implementation of evolutionary algorithms), EvoRISK (computational intelligence for risk management, security and defence applications), EvoROBOT (evolutionary computation in robotics), and EvoSTOC (evolutionary algorithms in stochastic and dynamic environments).**

## KNOWLEDGE PROCESSING AND DECISION MAKING IN AGENT-BASED SYSTEMS

Springer **Knowledge processing and decision making in agent-based systems constitute the key components of intelligent machines. The contributions included in the book are: Innovations in Knowledge Processing and Decision Making in Agent-Based Systems Towards Real-World HTN Planning Agents Mobile Agent-Based System for Distributed Software Maintenance Software Agents in New Generation Networks: Towards the Automation of Telecom Processes Multi-agent Systems and Paraconsistent Knowledge An Agent-based Negotiation Platform for Collaborative Decision-Making in Construction Supply Chain An Event-Driven Algorithm for Agents at the Web A Generic Mobile Agent Framework Toward Ambient Intelligence Developing Actionable Trading Strategies Agent Uncertainty Model and Quantum Mechanics Representation Agent Transportation Layer Adaptation System Software Agents to Enable Service Composition through Negotiation Advanced Technology Towards Developing Decentralized Autonomous Flexible Manufacturing Systems**

## EVOLUTIONARY AND ADAPTIVE COMPUTING IN ENGINEERING DESIGN

Springer Science & Business Media **Following an introduction to the various techniques and examples of their routine application, this potential is explored through the introduction of various strategies that support searches across a far broader set of possible design solutions within time and budget constraints. Generic problem areas investigated include: - design decomposition; - whole-system design; - multi-objective and constraint satisfaction; - human-computer interaction; - computational expense. Appropriate strategies that help overcome problems often encountered when integrating computer-based techniques with complex, real-world design environments are described. A straightforward approach coupled with examples supports a rapid understanding of the manner in which such strategies can best be designed to handle the complexities of a particular problem.**

## NETWORK-BASED DISTRIBUTED PLANNING USING COEVOLUTIONARY ALGORITHMS

World Scientific **In this book, efficient and scalable coevolutionary algorithms for distributed, network-based decision-making, which utilize objective functions are developed in a networked environment where internode communications are a primary factor in system performance. A theoretical foundation for this class of coevolutionary algorithms is introduced using techniques from stochastic process theory and mathematical analysis. A case study in distributed, network-based decision-making presents an implementation and detailed evaluation of the coevolutionary decision-making framework that incorporates distributed evolutionary agents and mobile agents. The methodology discussed in this book can have a fundamental impact on the principles and practice of engineering in the distributed, network-based environment that is emerging within and among corporate enterprise systems. In addition, the conceptual framework of the approach to distributed decision systems described may have much wider implications for network-based systems and applications. Contents: Background and Related WorkProblem Formulation and AnalysisTheory and Analysis of Evolutionary OptimizationTheory and Analysis of Distributed Coevolutionary OptimizationPerformance Evaluation Based on Ideal ObjectivesCoevolutionary Virtual Design EnvironmentEvaluation and Analysis Readership: Researchers and engineers in artificial intelligence, evolutionary computation and decision sciences. Keywords:Distributed Evolutionary Computation;Coevolutionary Algorithms;Distributed Optimization;Distributed Planning;Intelligent Agents;Intelligent Automation;Decision Support Systems**

## PRACTICAL APPLICATIONS OF SOFT COMPUTING IN ENGINEERING

World Scientific **Soft computing has been presented not only with the theoretical developments but also with a large variety of realistic applications to consumer products and industrial systems. Application of soft computing has provided the opportunity to integrate human-like vagueness and real-life uncertainty into an otherwise hard computer program.This book highlights some of the recent developments in practical applications of soft computing in engineering problems. All the chapters have been sophisticatedly designed and revised by international experts to achieve wide but in-depth coverage.**

## MULTI-AGENT-BASED SIMULATION XI

### INTERNATIONAL WORKSHOP, MABS 2010, TORONTO, CANADA, MAY 11, 2010, REVISED SELECTED PAPERS

Springer **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 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.**

## PHILOSOPHY AND SYNERGY OF INFORMATION

## SUSTAINABILITY AND SECURITY

IOS Press **The philosophy of information is one of the most exciting and fruitful areas of current philosophical research. Not only is it affecting the way in which new and old philosophical problems are addressed, but it is also creating a substantial innovation of the philosophical system. This book contains selected papers presented at the 2011 spring conference entitled aePhilosophy and Synergy of Information: Sustainability and SecurityAE, held in Tbilisi, and supported by the NATO Science for Peace and Security Programme. The conference welcomed scientists from different disciplines and different countries, both eastern and western. They met to share their ideas, the results of their research and their experiences related to information science and technology, philosophy, the nature and culture of information and the problems of sustainable development for countries,**

**regions and continents. Subjects covered include the latest innovations in informatics, forecasting, quantum information theory, nano information-communication systems and many more. Since ancient times, philosophers have been preoccupied with investigating life and security in the cosmos (world order).This book will be of interest to all those involved in that endeavor.**

## SIMULATING TAX EVASION USING AGENT BASED MODELLING AND EVOLUTIONARY SEARCH

**We present a design and model for Simulating Co-Evolution of Tax and Evasion (SCOTE). The system performs agent based modeling of the tax ecosystem and searches for tax evasion strategies using a variant of a Genetic Algorithm with a grammar. Current methodologies and tools to detect, discover or recognize tax evasion are not sufficient. In recent years the tax gap, the aggregate sum of the difference between the tax owed in principle and tax paid in practice was calculated to exceed 450 billion dollars. Numerous tax evasion schemes have surfaced that perform seemingly legal transactions but once observed closely their sole purpose is to reduce tax liability. Moreover, these schemes are evolving with time. Whenever a scheme is detected and eliminated by fixing a loop hole in the tax code, others emerge to replace it and currently there is no systematic way to predict the emergence of these schemes. SCOTE allows us to encode tax evasion strategies into a searchable representation. SCOTE has three major components namely the Genetic Algorithm library(GA), the interpreter and the Parser. The GA encodes transaction plans into an integer representation and performs search over the transaction plans to find a scheme that produces the maximum tax gap. The Parser performs grammatical mapping of list of integers to a transaction plan.The interpreter models the tax ecosystem into a graph where the entities such as taxpayer and partnerships are nodes and the transactions between entities are the edges. Each entity has a portfolio of assets and the values of the assets are updated after a transaction. The interpreter runs a transaction plan generated by GA on the graph to produce the tax gap. We ran two experiments using two of the known tax evasion schemes namely "Son of Boss" and "iBOB" and we were able to detect the two schemes using SCOTE.**

## KNOWLEDGE MINING USING INTELLIGENT AGENTS

World Scientific **Knowledge Mining Using Intelligent Agents explores the concept of knowledge discovery processes and enhances decision-making capability through the use of intelligent agents like ants, termites and honey bees. In order to provide readers with an integrated set of concepts and techniques for understanding knowledge discovery and its practical utility, this book blends two distinct disciplines data mining and knowledge discovery process, and intelligent agents-based computing (swarm intelligence and computational intelligence). For the more advanced reader, researchers, and decision/policy-makers are given an insight into emerging technologies and their possible hybridization, which can be used for activities like dredging, capturing, distributions and the utilization of knowledge in their domain of interest (i.e. business, policy-making, etc.). By studying the behavior of swarm intelligence, this book aims to integrate the computational intelligence paradigm and intelligent distributed agents architecture to optimize various engineering problems and efficiently represent knowledge from the large gamut of data.**

## HANDBOOK OF RESEARCH ON NATURE-INSPIRED COMPUTING FOR ECONOMICS AND MANAGEMENT

IGI Global **"This book provides applications of nature inspired computing for economic theory and practice, finance and stock-market, manufacturing systems, marketing, e-commerce, e-auctions, multi-agent systems and bottom-up simulations for social sciences and operations management"--Provided by publisher.**

## AGENT AND MULTI-AGENT SYSTEMS: TECHNOLOGIES AND APPLICATIONS

## 5TH KES INTERNATIONAL CONFERENCE, KES-AMSTA 2011, MANCHESTER, UK, JUNE 29 -- JULY 1, 2011, PROCEEDINGS

Springer **This book constitutes the refereed proceedings of the 5th KES International Conference on Agent and Multi-Agent Systems, KES-AMSTA 2011, held in Manchester, UK, in June/July 2011. The 69 revised papers presented were carefully reviewed and selected for inclusion in the book. In addition the volume contains one abstract and one full paper length keynote speech. The papers are organized in topical sections on conversational agents, dialogue systems and text processing; agents and online social networks; robotics and manufacturing; agent optimisation; negotiation and security; multi-agent systems; mining and profiling; agent-based optimization; doctoral track; computer-supported social intelligence for human interaction; digital economy; and intelligent workflow, cloud computing and systems.**

## AGENT AND MULTI-AGENT SYSTEMS: TECHNOLOGIES AND APPLICATIONS

## 9TH KES INTERNATIONAL CONFERENCE, KES-AMSTA 2015 SORRENTO, ITALY, JUNE 2015, PROCEEDINGS

Springer **Agents and multi-agent systems are related to a modern software paradigm which has long been recognized as a promising technology for constructing autonomous, complex and intelligent systems. The topics covered in this volume include agent-oriented software engineering, agent co-operation, co-ordination, negotiation, organization and communication, distributed problem solving, specification of agent communication languages, agent privacy, safety and security, formalization of ontologies and conversational agents. The volume highlights new trends and challenges in agent and multi-agent research and includes 38 papers classified in the following specific topics: learning paradigms, agent-based modeling and simulation, business model innovation and disruptive technologies, anthropic-oriented computing, serious games and business intelligence, design and implementation of intelligent agents and multi-agent systems, digital economy, and advances in networked virtual enterprises. Published papers have been presented at the 9th KES Conference on Agent and Multi-Agent Systems – Technologies and Applications (KES-AMSTA 2015) held in Sorrento, Italy. Presented results should be of value to the research community working in the fields of artificial intelligence, collective computational intelligence, robotics, dialogue systems and, in particular, agent and multi-agent systems, technologies, tools and applications.**

## DISTRIBUTED INFORMATION SYSTEMS IN BUSINESS

Springer Science & Business Media **This book gives answers to the question how distributed information systems can serve management, especially lean management. The authors develop new theoretical insights for the future of decentralized firms and offer concepts for creating and maintaining distributed information systems. The book contains interesting prototypes in logistics and financial industries and shows designs and applications of workflow systems. It offers a state-of-the-art survey of the subject.**

## ACQUISITION OF SOFTWARE ENGINEERING KNOWLEDGE

## SWEEP, AN AUTOMATIC PROGRAMMING SYSTEM BASED ON GENETIC PROGRAMMING AND CULTURAL ALGORITHMS

World Scientific **This is the first book that attempts to provide a framework in which to embed an automatic programming system based on evolutionary learning (genetic programming) into a traditional software engineering environment. As such, it looks at how traditional software engineering knowledge can be integrated with an evolutionary programming process in a symbiotic way.**

## ARTIFICIAL INTELLIGENCE IN DESIGN ’00

Springer Science & Business Media **Designing is one of the foundations for change in our society. It is a fundamental precursor to manufacturing, fabrication and construction. Design research aims to develop an understanding of designing and to produce models of designing that can be used to aid designing. The papers in this volume are from the Sixth International Conference on Artificial Intelligence in Design (AID'00) held in June 2000, in Worcester, Massachusetts, USA. They represent the state of the art and the cutting edge of research and development in this field, and demonstrate both the depth and breadth of the artificial intelligence paradigm in design. They point the way for the development of advanced computer-based tools to aid designers, and describe advances in both theory and application. This volume will be of particular interest to researchers, developers, and users of advanced computer systems in design.**

## EXPLORING INTELLIGENT DECISION SUPPORT SYSTEMS

## CURRENT STATE AND NEW TRENDS

Springer **This book presents innovative and high-quality research regarding advanced decision support systems (DSSs). It describes the foundations, methods, methodologies, models, tools, and techniques for designing, developing, implementing and evaluating advanced DSSs in different fields, including finance, health, emergency management, industry and pollution control. Decision support systems employ artificial intelligence methods to heuristically address problems that are cannot be solved using formal techniques. In this context, technologies such as the Semantic Web, linked data, big data, and machine learning are being applied to provide integrated support for individuals and organizations to make more rational decisions. The book is organized into two parts. The first part covers decision support systems for industry, while the second part presents case studies related to clinical emergency management and pollution control.**

## ARTIFICIAL WAR

## MULTIAGENT-BASED SIMULATION OF COMBAT

## AGENT AND MULTI-AGENT SYSTEMS IN DISTRIBUTED SYSTEMS - DIGITAL ECONOMY AND E-COMMERCE

Springer **Information and communication technology, in particular artificial intelligence, can be used to support economy and commerce using digital means. This book is about agents and multi-agent distributed systems applied to digital economy and e-commerce to meet, improve, and overcome challenges in the digital economy and e-commerce sphere. Agent and multi-agent solutions are applied in implementing real-life, exciting developments associated with the need to eliminate problems of distributed systems. The book presents solutions for both technology and applications, illustrating the possible uses of agents in the enterprise domain, covering design and analytic methods, needed to provide a**

**solid foundation required for practical systems. More specifically, the book provides solutions for the digital economy, e-sourcing clusters in network economy, and knowledge exchange between agents applicable to online trading agents, and security solutions to both digital economy and e-commerce. Furthermore, it offers solutions for e-commerce, such as, mapping and alignment of ontologies for business, negotiation, automated auctions, recommender systems to support traders in business activities, and game simulations.**

## HYBRID ARTIFICIAL INTELLIGENCE SYSTEMS

## THIRD INTERNATIONAL WORKSHOP, HAIS 2008, BURGOS, SPAIN, SEPTEMBER 24-26, 2008, PROCEEDINGS

Springer **The Third International Workshop on Hybrid Artificial Intelligence Systems (HAIS 2008) presented the most recent developments in the dynamically expanding realm of symbolic and sub-symbolic techniques aimed at the construction of highly robust and reliable problem-solving techniques. Hybrid intelligent systems have become incre- ingly popular given their capabilities to handle a broad spectrum of real-world c- plex problems which come with inherent imprecision, uncertainty and vagueness, high-dimensionality, and non stationarity. These systems provide us with the oppor- nity to exploit existing domain knowledge as well as raw data to come up with prom- ing solutions in an effective manner. Being truly multidisciplinary, the series of HAIS workshops offers a unique research forum to present and discuss the latest theoretical advances and real-world applications in this exciting research field. This volume of Lecture Notes on Artificial Intelligence (LNAI) includes accepted papers presented at HAIS 2008 held in University of Burgos, Burgos, Spain, Sept- ber 2008 The global purpose of HAIS conferences has been to form a broad and interdis- plinary forum for hybrid artificial intelligence systems and associated learning pa- digms, which are playing increasingly important roles in a large number of application areas. Since its first edition in Brazil in 2006, HAIS has become an important forum for researchers working on fundamental and theoretical aspects of hybrid artificial intel- gence systems based on the use of agents and multiagent systems, bioinformatics and bio-inspired models, fuzzy systems, artificial vision, artificial neural networks, opti- zation models and alike.**

## EVOLUTION, COMPLEXITY AND ARTIFICIAL LIFE

Springer Science & Business Media **Evolution and complexity characterize both biological and artificial life – by direct modeling of biological processes and the creation of populations of interacting entities from which complex behaviors can emerge and evolve. This edited book includes invited chapters from leading scientists in the fields of artificial life, complex systems, and evolutionary computing. The contributions identify both fundamental theoretical issues and state-of-the-art real-world applications. The book is intended for researchers and graduate students in the related domains.**

## ARTIFICIAL LIFE MODELS IN SOFTWARE

Springer Science & Business Media **The advent of powerful processing technologies and the advances in software development tools have drastically changed the approach and implementation of computational research in fundamental properties of living systems through simulating and synthesizing biological entities and processes in artificial media. Nowadays realistic physical and physiological simulation of natural and would-be creatures, worlds and societies becomes a low-cost task for ordinary home computers. The progress in technology has dramatically reshaped the structure of the software, the execution of a code, and visualization fundamentals. This has led to the emergence of novel breeds of artificial life software models, including three-dimensional programmable simulation environment, distributed discrete events platforms and multi-agent systems. This second edition reflects the technological and research advancements, and presents the best examples of artificial life software models developed in the World and available for users.**

## INTELLIGENT DECISION SYSTEMS IN LARGE-SCALE DISTRIBUTED ENVIRONMENTS

Springer **One of the most challenging issues for the intelligent decision systems is to effectively manage the large-scale complex distributed environments such as computational clouds, grids, ad hoc and P2P networks, under the different types of users, their relations, and real-world uncertainties. In this context the IT resources and services usually belong to different owners (institutions, enterprises, or individuals) and are managed by different administrators. These administrators conform to different sets of rules and configuration directives, and can impose different usage policies on the system users. Additionally, uncertainties are presented in various types of information that are incomplete, imprecise, fragmentary or overloading, which hinders the full and precise determination of the evaluation criteria, their subsequent and selection, the assignment scores, and eventually the final integrated decision result. This book presents new ideas, analysis, implementations and evaluation of the next generation intelligent techniques for solving complex decision problems in large-scale distributed systems. In 15 chapters several important formulations of the decision problems in heterogeneous environments are identified and a review of the recent approaches, from game theoretical models and computational intelligent techniques, such as genetic, memetic and evolutionary algorithms, to intelligent multi-agent systems and networking are presented. We believe that this volume will serve as a reference for the students, researchers and industry practitioners working in or are interested in joining interdisciplinary works in the areas of intelligent decision systems using emergent distributed computing paradigms. It will also allow newcomers to grasp key concerns and potential solutions on the selected topics.**

## RECENT TRENDS IN MECHATRONICS TOWARDS INDUSTRY 4.0

## SELECTED ARTICLES FROM IM3F 2020, MALAYSIA

Springer Nature **This book presents part of the iM3F 2020 proceedings from the Mechatronics track. It highlights key challenges and recent trends in mechatronics engineering and technology that are non-trivial in the age of Industry 4.0. It discusses traditional as well as modern solutions that are employed in the multitude spectra of mechatronics-based applications. The readers are expected to gain an insightful view on the current trends, issues, mitigating factors as well as solutions from this book.**

## PRINCIPLES IN NOISY OPTIMIZATION

## APPLIED TO MULTI-AGENT COORDINATION

Springer **Noisy optimization is a topic of growing interest for researchers working on mainstream optimization problems. Although several techniques for dealing with stochastic noise in optimization problems are covered in journals and conference proceedings, today there are virtually no books that approach noisy optimization from a layman’s perspective; this book remedies that gap. Beginning with the foundations of evolutionary optimization, the book subsequently explores the principles of noisy optimization in single and multi-objective settings, and presents detailed illustrations of the principles developed for application in real-world multi-agent coordination problems. Special emphasis is given to the design of intelligent algorithms for noisy optimization in real-time applications. The book is unique in terms of its content, writing style and above all its simplicity, which will appeal to readers with a broad range of backgrounds. The book is divided into 7 chapters, the first of which provides an introduction to Swarm and Evolutionary Optimization algorithms. Chapter 2 includes a thorough review of agent architectures for multi-agent coordination. In turn, Chapter 3 provides an extensive review of noisy optimization, while Chapter 4 addresses issues of noise handling in the context of single-objective optimization problems. An illustrative case study on multi-robot path-planning in the presence of measurement noise is also highlighted in this chapter. Chapter 5 deals with noisy multi-objective optimization and includes a case study on noisy multi-robot box-pushing. In Chapter 6, the authors examine the scope of various algorithms in noisy optimization problems. Lastly, Chapter 7 summarizes the main results obtained in the previous chapters and elaborates on the book’s potential with regard to real-world noisy optimization problems.**

## MAN-MACHINE INTERACTIONS 3

Springer Science & Business Media **Man-Machine Interaction is an interdisciplinary field of research that covers many aspects of science focused on a human and machine in conjunction. Basic goal of the study is to improve and invent new ways of communication between users and computers, and many different subjects are involved to reach the long-term research objective of an intuitive, natural and multimodal way of interaction with machines. The rapid evolution of the methods by which humans interact with computers is observed nowadays and new approaches allow using computing technologies to support people on the daily basis, making computers more usable and receptive to the user's needs. This monograph is the third edition in the series and presents important ideas, current trends and innovations in the man-machine interactions area. The aim of this book is to introduce not only hardware and software interfacing concepts, but also to give insights into the related theoretical background. Reader is provided with a compilation of high-quality original papers covering a wide scope of research topics divided into eleven sections, namely: human-computer interactions, robot control, embedded and navigation systems, bio data analysis and mining, biomedical signal processing, image and sound processing, decision support and expert systems, rough and fuzzy systems, pattern recognition, algorithms and optimization, computer networks and mobile technologies and data management systems.**

## HANDBOOK OF OPTIMIZATION

## FROM CLASSICAL TO MODERN APPROACH

Springer Science & Business Media **Optimization problems were and still are the focus of mathematics from antiquity to the present. Since the beginning of our civilization, the human race has had to confront numerous technological challenges, such as finding the optimal solution of various problems including control technologies, power sources construction, applications in economy, mechanical engineering and energy distribution amongst others. These examples encompass both ancient as well as modern technologies like the first electrical energy distribution network in USA etc. Some of the key principles formulated in the middle ages were done by Johannes Kepler (Problem of the wine barrels), Johan Bernoulli (brachystochrone problem), Leonhard Euler (Calculus of Variations), Lagrange (Principle multipliers), that were formulated primarily in the ancient world and are of a geometric nature. In the beginning of the modern era, works of L.V. Kantorovich and G.B. Dantzig (so-called linear programming) can be considered amongst others. This book discusses a wide spectrum of optimization methods from classical to modern, alike heuristics. Novel as well as classical techniques is also discussed in this book, including its mutual intersection. Together with many interesting chapters, a reader will also encounter various methods used for proposed optimization approaches, such as game theory and evolutionary algorithms or modelling of evolutionary algorithm dynamics like complex networks.**

## COMPETITIVE MULTI-AGENT SEARCH

**While evolutionary computation is well suited for automatic discovery in engineering, it can also be used to gain insight into how humans and organizations could perform more effectively. Using a real-world problem of innovation search in organizations as the motivating example, this dissertation formalizes human creative problem solving as competitive multi-agent search. It differs from existing single-agent and team-search problems in that the agents interact through knowledge of other agents' searches and through the dynamic changes in the search landscape caused by these searches. The main hypothesis is that evolutionary computation can be used to discover effective strategies for competitive multi-agent search. This hypothesis is verified in experiments using an abstract domain based on the NK model, i.e. partially correlated and tunably rugged fitness landscapes, and a concrete domain in the form of a social innovation game. In both domains, different specialized strategies are evolved for each different competitive environment, and also strategies that generalize across environments. Strategies evolved in the abstract domain are more effective and more complex than hand-designed strategies and one based on traditional tree search. Using a novel spherical visualization of the fitness landscapes of the abstract domain, insight is gained about how successful strategies work, e.g. by tracking positive changes in the landscape. In the concrete game domain, human players were modeled using backpropagation, and used as opponents to create environments for evolution. Evolved strategies scored significantly higher than the human models by using a different proportion of actions, providing insights into how performance could be improved in social innovation domains. The work thus provides a possible framework for studying various human creative activities as competitive multi-agent search in the future.**

## INFORMATION PROCESSING IN CELLS AND TISSUES

## 10TH INTERNATIONAL CONFERENCE, IPCAT 2015, SAN DIEGO, CA, USA, SEPTEMBER 14-16, 2015, PROCEEDINGS

Springer **This book constitutes the proceedings of the 10th International Conference on Information Processing in Cells and Tissues, IPCAT 2015, held in San Diego, CA, USA, in September 2015. The 19 papers presented in this volume were carefully reviewed and selected from 22 submissions. They were organized in topical sections named: biochemical information processing; collective and distributed behavior; patterning and rhythm generation; biochemical regulatory networks; metabolomics and phenotypes; and neural modelling and neural networks.**