

# Membrane Computing An Introduction Natural Computing Series

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**Combinatorial Image Analysis** **Betra Wiederhold** 2009-11-18 This volume constitutes the refereed proceedings of the 13th International Workshop on Combinatorial Image Analysis, IWCIA 2009, held in Playa del Carmen, Mexico, in November 2009. The 32 revised full papers and one invited paper presented were carefully reviewed and selected from 70 initial submissions. The papers are organized in topical sections on digital geometry: curves, straightness, convexity, geometric transformations, metrics, distance transforms and skeletons, segmentation, thinning, skeletonization, image representation, processing, analysis, reconstruction and recognition, digital tomography, image models based on geometry, combinatorics, arithmetics, algebra, mathematical morphology and grammars, as well as digital topology and its applications to image modeling and analysis.

**Membrane Computing** **David Corne** 2009-01-15 This volume contains a selection of papers presented at the 9th Workshop on Membrane Computing, WMC9, which took place in Edinburgh, during July 28-31, 2008. The first three workshop on membrane computing were organized in Curtea de Argeș, Romania – they took place in August 2000 (with the proceedings published in Lecture Notes in Computer Science, volume 2235), in August 2001 (with a selection of papers published as a special issue of *Fundamenta Informaticae*, volume 49, numbers 1-3, 2002), and in August 2002 (with the proceedings published in *Lecture Notes in Computer Science*, volume 2597). The next three workshops were organized in Tarragona, Spain, in July 2003, in Milan, Italy, in July 2004, in Vienna, Austria, in July 2005, in Leiden, The Netherlands, in July 2006, and in Thessaloniki, Greece, in June 2007, with the proceedings published as volumes 2933, 3365, 3850, 4361, and 5000, respectively, in *Lecture Notes in Computer Science*.

**Membrane Computing** **Gudolf Freund** 2021-06-03 This book constitutes the refereed post-conference proceedings of the 21st International Conference on Membrane Computing, CMC 2021, held in Tarragona, Spain, in September 2020. The 10 full papers presented were selected from 31 submissions. The papers deal with all aspects on membrane computing and related areas.

**Unconventional Computation and Natural Computing** **Anciano Mauri** 2013-06-03 This book constitutes the refereed proceedings of the 12th International Conference on Unconventional Computation and Natural Computing, UCNC 2013, held in Milan, Italy, in July 2013. The 30 papers (28 full papers, 8 poster papers, and 2 invited papers) were carefully reviewed and selected from 46 submissions. The topics of the volume include: quantum, cellular, molecular, neural, DNA, membrane, and evolutionary computing; cellular automata; computation based on chaos and dynamical systems; massive parallel computation; collective intelligence; computation based on physical principles such as relativistic, optical, spatial, collision-based computing; amorphous computing; physarum computing; hypercomputation; fuzzy and rough computing; swarm intelligence; artificial immune systems; physics of computation; chemical computation; evolving hardware; the computational nature of self-assembly, developmental processes, bacterial communication, and brain processes.

**Real-life Applications with Membrane Computing** **Guang Zhang** 2017-04-05 This book thoroughly investigates the underlying theoretical basis of membrane computing models, and reveals the latest applications. In addition, to date there have been no illustrative case studies or complex real-life applications that capitalize on the full potential of the sophisticated membrane computing apparatus: gaps that this book remedies. By studying various complex applications – including engineering optimization, power systems fault diagnosis, mobile robot controller design, and complex biological systems involving data modeling and process interactions – the book also extends the capabilities of membrane systems models with features such as formal verification techniques, evolutionary approaches, and fuzzy reasoning methods. As such, the book offers a comprehensive and up-to-date guide for all researchers, PhDs and undergraduates in the fields of computer science, engineering and the bio-sciences who are interested in the applications of natural computing models.

**Proceedings of the Nineteenth International Conference on Membrane Computing (CMC19)** **inze** 2018-08-02 This volume contains invited and accepted contributions presented at the Nineteenth International Conference on Membrane Computing (CMC19, <http://cmc19.uni-jena.de>) which took place in Dresden (Germany) from 4 to 7 September 2018, organised by the Friedrich Schiller University Jena (Germany) together with the Jena Centre for Bioinformatics (JCB) under the auspices of the International Membrane Computing Society (IMCS). We appreciate the hospitality of the NH Hotel and Conference Centre Dresden-Neustadt. Taking place for the second time in Germany and for the first time in Dresden, CMC19 is pleased to continue the fruitful tradition of 18 previous events of the International Workshop and Conference on Membrane Computing (WMC/CMC) enriched by some new ideas and inspirations emphasising multidisciplinary and innovative capacity and inspired by the idea of bringing together researchers working in membrane computing or related areas in a friendly atmosphere enhancing communication and cooperation.

**Membrane Computing Models: Implementation and Applications** **Guang Zhang** 2021-07-01 The theoretical basis of membrane computing was established in the early 2000s with fundamental research into computational power, complexity aspects and relationships with other (un)conventional computing paradigms. Although this core theoretical research has continued to grow rapidly and vibrant another area of investigation has since been added, focusing on the applications of this model in many areas, most prominently in systems and synthetic biology, engineering optimization, system fault diagnosis and mobile robot controller design. The further development of these applications and their broad adoption by other researchers, as well as the expansion of the membrane computing modelling paradigm to other applications, call for a set of robust, efficient, reliable and easy-to-use tools supporting the most significant membrane computing models. This work provides comprehensive descriptions of such tools, making it a valuable resource for anyone interested in membrane computing models.

**Language and Automata Theory and Applications** **Adrian-Horia Dediu** 2012-02-29 This book constitutes the refereed proceedings of the 6th International Conference on Language and Automata Theory and Applications, LATA 2012, held in A Coruña, Spain in March 2012. The 41 revised full papers presented together with 3 invited talks and 2 invited tutorials were carefully reviewed and selected from 114 initial submissions. The volume features contributions from both classical theory fields and application areas; e.g. informatics, systems biology, language technology, artificial intelligence, etc. Among the topics covered are algebraic language theory, automata and logic, systems analysis, systems verifications, computational complexity, decidability, unification, grammars, transformations, language-based cryptography, and applications in data mining, computational learning, and pattern recognition.

**Membrane Computing** **George Paun** 2003-07-01 This book constitutes the thoroughly refereed post-proceedings of the International Workshop on Membrane Computing, WMC-CdeA 2003, held in Curtea de Argeș, Romania, in August 2002. The 29 revised full papers presented were carefully selected during two rounds of reviewing and revision; some were especially solicited for inclusion in the book after the workshop. Most papers address membrane systems and membrane computing from the point of view of theoretical computer science; some papers solve open problems and present new approaches, and others provide mathematical and biological background. All in all, the book presents the state of the art in membrane computing.

**Membrane Computing** **Anciano Mauri** 2008-01-04 This book constitutes the thoroughly refereed extended postproceedings of the 5th International Workshop on Membrane Computing, WMC 2004, held in Milan, Italy in June 2004. The 20 revised full papers presented together with 6 invited papers went through two rounds of reviewing and improvement. All current topics in membrane computing are addressed, ranging from mathematics and theoretical computer science to applications in biology, linguistics, and computer graphics. Issues related to computational power and complexity classes, new classes of P systems, fuzzy approaches, and reversibility and energy consumption are dealt with as well.

**Applications of Membrane Computing** **Gabriel Ciobanu** 2010-02-12 Membrane computing is a branch of natural computing which investigates computing models abstracted from the structure and functioning of living cells and from their interactions in tissues or higher-order biological structures. The models considered, called membrane systems (P systems), are parallel, distributed computing models, processing multisets of symbols in cell-like compartmental architectures. In many applications membrane systems have considerable advantages – among these are the inherently discrete nature, parallelism, transparency, scalability and nondeterminism. In dedicated chapters, leading experts explain most of the applications of membrane computing reported so far, in biology, computer science, computer graphics and linguistics. The book also contains detailed reviews of the software tools used to simulate P systems.

**Membrane Computing** **George Eleftherakis** 2007-11-25 For anyone needing to keep up to date with all the latest research in the field of membrane computing, this book will come as a breath of fresh air. It is the extended post-proceedings of the 8th International Workshop on Membrane Computing, held in June 2007. A total of 27 revised papers are presented. All of them have passed through two rounds of reviewing. Special attention has been paid to the interaction of membrane computing with biology and computer science.

**Membrane Computing** **Hendrik Jan Hoogeboom** 2007-01-25 This book constitutes the thoroughly refereed extended post-proceedings of the 7th International Workshop on Membrane Computing, WMC 2006, held in Leiden, Netherlands in July 2006. The papers in this volume cover all the main directions of research in membrane computing, ranging from theoretical topics in mathematics and computer science, to application issues. Special attention was paid to the interaction of membrane computing with biology.

**Membrane Computing** **Romania) Wmc-Cdea 200** (2002 Curtea-De-Argeș 2003-02-25 This book constitutes the thoroughly refereed post-proceedings of the International Workshop on Membrane Computing, WMC-CdeA 2002, held in Curtea de Argeș, Romania, in August 2002. The 29 revised full papers presented were carefully selected during two rounds of reviewing and revision; some were especially solicited for inclusion in the book after the workshop. Most papers address membrane systems and membrane computing from the point of view of theoretical computer science; some papers solve open problems and present new approaches, and others provide mathematical and biological background. All in all, the book presents the state of the art in membrane computing.

**Membrane Computing** **Artiom Alhazov** 2014-01-20 This book constitutes the thoroughly refereed post-conference proceedings of the 14th International Conference on Membrane Computing, CMC 2013, held in Chișinău, Republic of Moldova, in August 2013. The 16 revised selected papers presented together with 6 invited lectures were carefully reviewed and selected from 26 papers presented at the conference. Membrane computing is an area of computer science aiming to abstract computing ideas and models from the structure and the functioning of living cells, and from the way the cells are organized in tissues or higher order structures. It deals with membrane systems, also called P systems, which are distributed and parallel algebraic models processing multi sets of objects in a localized manner (evolution rules and evolving objects are encapsulated into compartments delimited by membranes), with an essential role played by the communication among compartments and with the environment.

**Membrane Computing** **Spain) Wmc 200** (2003 Tarragona 2004-01-28 This book constitutes the thoroughly refereed post-proceedings of the International Workshop on Membrane Computing, WMC 2003, held in Tarragona, Spain, in July 2003. The 26 revised full papers presented were carefully selected during two rounds of reviewing and improvement. All current topics in the emerging area of membrane computing are addressed, ranging from issues in mathematics and theoretical computer science to (potential) applications in biology, bioinformatics, sorting, robotics, linguistics, and computer graphics: several implementations and simulations on computers, computer networks, and reconfigurable hardware are presented too.

**Enjoying Natural Computing** **armen Graciani** 2018-11-16 This Festschrift is in honor of Mario de Jesús Pérez-Jiménez, Professor in the Department of Computer Science of University of Seville, Spain, on the occasion of his 70th birthday. The title of this volume reflects both his main research area, viz., Natural Computing, and the guiding principle of his functioning: “once you choose to do something, enjoy doing it”. The respect that Professor Mario de Jesús Pérez-Jiménez enjoys in the scientific community was well demonstrated by the enthusiastic response received to his request to contribute to this book. The contributions by more than 70 authors from 15 countries cover a wide spectrum of research areas and reflect well the broad range of research in

Professor Mario de Jesús Pérez-Jiménez. The research areas presented in this Festschrift include membrane computing, spiking neural networks, phylogenetic networks, ant colonies optimization, reaction systems, entropy of computation, rewriting systems, and insertion-deletion systems.

Rough Sets **Mihálydeák** 2019-06-10 This LNAI 11499 constitutes the proceedings of the International Joint Conference on Rough Sets, IJCRS 2019, held in Debrecen, Hungary, in June 2019. The 41 full papers were carefully reviewed and selected from 71 submissions. The IJCRS conferences aim at bringing together experts from universities and research centers as well as the representing fields of research in which theoretical and applicational aspects of rough set theory already find or may potentially find usage. The papers are grouped in topical sections on set models and methods; related methods and hybridization; areas of application.

Swarm Intelligence **Christian Blum** 2008-09-24 The book's contributing authors are among the top researchers in swarm intelligence. The book is intended to provide an overview of the state of the art, to inform novices, and to offer researchers an update on interesting recent developments. Introductory chapters deal with the biological foundations, optimization, swarm robotics, and applications in generation telecommunication networks, while the second part contains chapters on more specific topics of swarm intelligence research.

Proceedings of the 2005 Workshop on Unconventional Computation **Christian Blum** 2005-01 THE BOOK BRINGS TOGETHER WORK FROM A MULTIDISCIPLINARY CORE OF SCIENTISTS WHO ARE WORKING IN THE FIELD OF UNCONVENTIONAL COMPUTING. THE GOAL WAS TO PROVIDE A COMMON GROUND FOR DIALOG AND INTERACTION, TO HIGHLIGHT THE LATEST ADVANCES, AND TO DISCUSS THE MAIN DIRECTIONS FOR THE FUTURE. TOPICS INCLUDE PROGRAMMING OF CHEMICAL SYSTEMS, EVOLVING LOGICAL GATES IN LIQUID CRYSTAL, IMAGE PROCESSING IN CHEMICAL MEDIA, REACTION-DIFFUSION ELECTRONIC CIRCUITS FOR COMPUTATION AND PATTERN GENERATION, RULE MIGRATION IN CELLULAR AUTOMATA, MULTI-STATE QUANTUM AUTOMATA, DNA COMPUTING OF SHORTEST PATH PROBLEMS, AND ARTIFICIAL CHEMISTRIES. THE PAPERS COLLECTED IN THIS BOOK PROVIDE A GOOD OVERVIEW OF HOT RESEARCH TOPICS IN THE VIBRANT FIELD OF UNCONVENTIONAL COMPUTING.

Membrane Computing **Carlos Martín-Vide** 2004-02-02 This volume is based on papers presented at the Workshop on Membrane Computing, WMC 2003, which took place in Tarragona, Spain, on the 17-19 July 2003. This was the Fourth Annual Membrane Computing Workshop, and the first one held outside Romania. The first three meetings were organized in Curtea de Argeș, Romania - they took place in August 2000 (with the proceedings published in Lecture Notes in Computer Science, Vol. 2235), in August 2001 (with a selection of papers published as a special issue of *Fundamenta Informaticae*, Vol. 49, Nos. 1-3, 2002), and in August 2002 (with the proceedings published in Lecture Notes in Computer Science, Vol. 2597). The 2003 workshop was the second workshop of the Molecular Computing Network (MolCoNet) funded by the EU Commission in the Fifth Framework Program Information Science Technologies (project number IST-2001-32001). The preproceedings of WMC 2003 were published as Technical Report 28/03 of the Research Group on Mathematical Linguistics from Rovira i Virgili University, Tarragona, and they were available during the workshop.

Multiojective Problem Solving from Nature **Noshua Knowles** 2007-11-15 This text examines how multiojective evolutionary algorithms and related techniques can be used to solve problems, particularly in the disciplines of science and engineering. Contributions by leading researchers show how the concept of multiojective optimization can be used to reformulate and resolve problems in areas such as constrained optimization, co-evolution, classification, inverse modeling, and design.

Unconventional Computation and Natural Computation **Christian Quillan** 2019-05-27 This book constitutes the proceedings of the 18th International Conference on Unconventional Computation and Natural Computation, UCNC 2019, held in Tokyo, Japan, in June 2019. The 19 full papers presented were carefully reviewed and selected from 32 submissions. The papers cover topics such as hypercomputation; chaos and dynamical systems based computing; granular, fuzzy and rough computing; mechanical computing; cellular, evolutionary, molecular, neural, and quantum computing; membrane computing; amorphous computing, swarm intelligence; artificial immune systems; physics of computation; chemical computation; evolving hardware; the computational nature of self-assembly, developmental processes, bacterial communication, and brain processes.

Formal and Natural Computation **Gilfried Brauer** 2002-02-06 This book presents state of the art research in theoretical computer science and related fields. In particular, the following areas are discussed: automata theory, formal languages and combinatorics of words, graph transformations, Petri nets, concurrency, as well as natural and molecular computing. The articles are written by leading researchers in these areas. The writers were originally invited to contribute to this book but then the normal refereeing procedure was applied as well. All of the articles deal with topics that has been under vigorous study during recent years. Still, the topics range from very classical ones to issues raised only two or three years ago. Both survey articles and papers attacking research problems are included. The book highlights some key issues of theoretical computer science, as they seem to us now at the beginning of the new millennium. Being a comprehensive overview of some of the most active current research in theoretical computer science, it should be of definite interest for all researchers in the areas covered. The topics range from basic and the notion of information to graph grammars and graph transformations, and from trees and traces to aqueous algorithms, DNA encoding and self-assembly. Special effort has been given to the lucid presentation. Therefore, the book should be of interest also for advanced students.

Membrane Computing **Gheorghe Paun** 2002-08-01 Membrane computing is an unconventional model of computation associated with a new computing paradigm. The field of membrane computing was initiated in 1998 by the author of this book: it is a branch of natural computing inspired by the structure and functioning of the living cell and devises distributed parallel computing models for the form of membrane systems. This book is the first monograph surveying the new field in a systematic and coherent way. It presents the central notions and results: the main classes of membrane systems, the main results about their computational power and efficiency, a complete bibliography, and a series of open problems and research topics.

Unconventional Computation **Christian S. Calude** 2010-06-26 The 9th International Conference on Unconventional Computation, UC 2010, was organized under the auspices of EATCS and the Academia Europaea, by the University of Tokyo (Tokyo, Japan), and the Center for Discrete Mathematics and Theoretical Computer Science (Auckland, New Zealand). It was held in Tokyo from June 21-25, 2010 (see <http://arn.local.frs.riken.jp/UC10/>). The venue was the Sanjo (Hilltop) Conference Hall at Hongo Campus of the University of Tokyo. Hongo Campus was formerly the residence of the Maeda family, one of the richest feudal lords in the Edo period of Japan. The Japanese garden in the residence is partially preserved, including the pond and the hill on which the conference hall is located. Within walking distance from Hongo Campus are Ueno park with many museums, the Akihabara area, which is now the center of Japanese pop culture, and the Korakuen stadium/park/baseball stadium. The International Conference on Unconventional Computation (UC) series (see <http://www.cs.auckland.ac.nz/CDMTCS/conferences/uc/>) is devoted to all aspects of unconventional computation — theory as well as experiments and applications. Typical, but not exclusive, topics are: natural computing including quantum, cellular, molecular, membrane, neural, and evolutionary computing, as well as chaos and dynamical system-based computing, and various proposals for computational mechanisms that go beyond the Turing model.

Membrane Computing **Alberto Leporati** 2017-02-21 This book contains revised selected papers from the 17th International Conference on Membrane Computing, CMC 2017, held in Milan, Italy, in July 2016. The 19 full papers presented in this volume were carefully reviewed and selected from 28 submissions. They deal with membrane computing (P systems theory), an area of computer science aiming to abstract computing ideas and models from the structure and the functioning of living cells, as well as from the way the cells are organized in tissues or higher order structures. This volume also contains 3 invited talks in full-paper length.

Models of Computation in Complexity **Benedikt Löwe** 2011-06-22 This book constitutes the refereed proceedings of the 7th Conference on Computability in Europe, CIE 2011, held in Sofia, Bulgaria, in June/July 2011. The 22 revised papers presented together with 11 invited lectures were carefully reviewed and selected with an acceptance rate of under 40%. The papers cover the topics of computability in analysis, algebra, and geometry; classical computability theory; natural computing; relations between the physical world and formal models of computability; theory of transfinite computations; and computational linguistics.

Relations and Kleene Algebra in Computer Science **Renate A. Schmidt** 2006-08-17 The book constitutes the joint refereed proceedings of the 9th International Conference on Relational Methods in Computer Science, ReLMICS 2006, and the 4th International Workshop on Applications of Kleene Algebras, AKA 2006, held in Manchester, UK in August/September 2006. The 25 revised full papers presented together with two invited papers and the abstract of an invited talk were carefully reviewed and selected from 44 submissions.

Unconventional Computation **Christian S. Calude** 2011-05-27 This book constitutes the refereed proceedings of the 10th International Conference on Unconventional Computation, UC 2011, held in Turku, Finland, in June 2011. The 17 revised full papers presented together with 6 extended abstracts of invited talks, and 3 extended abstracts of tutorials were carefully reviewed and selected from 33 initial submissions. The papers are devoted to all aspects of unconventional computation theory as well as experiments and applications. Typical topics are: natural computing including quantum, cellular, molecular, membrane, neural, and evolutionary computing, as well as chaos and dynamical system-based computing, and various proposals for computational mechanisms that go beyond the Turing model.

Applications of Membrane Computing **Gabriel Ciobanu** 2007-08-06 Membrane computing is a branch of natural computing which investigates computing models abstracted from the structure and functioning of living cells and from their interactions in tissues or higher-order biological structures. The models considered, called membrane systems (P systems), are parallel, distributed computing models, processing multisets of symbols in cell-like compartmental architectures. In many applications membrane systems have considerable advantages – among these are their inherently discrete nature, parallelism, transparency, scalability and nondeterminism. In dedicated chapters, leading experts explain most of the applications of membrane computing reported so far, in biology, computer science, computer graphics and linguistics. The book also contains detailed reviews of the software tools used to simulate P systems.

Membrane Computing **Marian Gheorghe** 2014-12-16 This book constitutes the thoroughly refereed post-conference proceedings of the 15th International Conference on Membrane Computing, CMC 2014, held in Prague, Czech Republic, in August 2014. The 19 revised selected papers presented together with 5 invited lectures were carefully reviewed and selected from 24 papers submitted at the conference. In addition, two papers selected from the 22 papers presented at the regional version of CMC, the Asian Conference on Membrane Computing, ACMC 2014, held in Coimbatore, India, are included. The papers cover a wide range of topics in the area of membrane computing, which is an area of computer science aiming to abstract computing ideas and models from the structure and the functioning of living cells, as well as from the way the cells are organized in tissues or higher order structures.

Membrane Computing **Thomas Hinze** 2019-01-31 This book constitutes revised selected papers from the 19th International Conference on Membrane Computing (CMC19), CMC 2018, which was held in Dresden, Germany, in September 2018. The 15 papers presented in this volume were carefully reviewed and selected from 20 submissions. The contributions aim to abstract computing ideas and models from the structure and the functioning of living cells, as well as from the way the cells are organized in tissues or higher order structures.

Natural Computing and Beyond **Nasuhiko Suzuki** 2013-04-01 This book contains the joint proceedings of the Winter School of Hakodate (WSH) 2011 held in Hakodate, Japan, March 15–16, 2012, and the 6th International Workshop on Natural Computing (6th IWNC) held in Tokyo, Japan, March 28–30, 2012, organized by the Special Interest Group of Natural Computing (SIG-NAC), the Japanese Society for Artificial Intelligence (JSAI). This volume compiles refereed contributions to various aspects of natural computing, ranging from computing with slime mold, artificial neural networks, chemistry, eco-physics, and synthetic biology, to computational aesthetics.

Large-Scale Scientific Computation **Vagif Lirkov** 2010-05-10 This book constitutes the thoroughly refereed post-conference proceedings of the 7th International Conference on Large-Scale Scientific Computations, LSSC 2009, held in Sozopol, Bulgaria, in June 2009. The 93 revised full papers presented together with 5 plenary and invited papers were carefully reviewed and selected from numerous submissions for inclusion in the book. The papers are organized in topical sections on multilevel and multiscale preconditioning methods multilevel and multiscale methods for linear systems applications, environmental modeling, control and uncertain systems, application of metaheuristics to large scale problems, monte carlo: methods, applications, distributed computing, grid computing, scientific and engineering applications, reliable numerical methods for differential equations, novel applications of optimization ideas to the numerical Solution of PDEs, and contributed talks.

Evolvable Components **Sukana Sekanina** 2012-12-06 At the beginning of the 1990s research started in how to combine soft computing with reconfigurable hardware in a quite unique way. The methods that was developed has been called evolvable hardware. Thanks to evolution ary algorithms researchers have started to evolve electronic circuits routinely. A number of interesting circuits - with features unreachable by means of conventional techniques - have been developed. Evolvable hardware is quite popular right now; more than fifty research groups are presently

over the world. Evolvable hardware has become a part of the curriculum at some universities. Evolvable hardware is being commercialized and there are specialized conferences devoted to evolvable hardware. On the other hand, surprisingly, we can feel the lack of a theoretical background and consistent design methodology in the area. Furthermore, it is quite difficult to implement really innovative and practically successful evolvable systems using contemporary digital reconfigurable technology.

Computing with New Resources Cristian S. Calude 2014-12-09 Professor Jozef Gruska is a well known computer scientist for his many and broad results. He was the father of theoretical computer science research in Czechoslovakia and among the first Slovak programmers in the early 1960s. Jozef Gruska introduced the descriptive complexity of grammars, automata, and languages, and was one of the pioneers of parallel (systolic) automata. His other main research interests include parallel systems and automata, as well as quantum information processing, transmission, and cryptography. He is co-founder of four regular series of conferences in informatics and two in quantum information processing and the Founding Chair (1989-96) of the IFIP Specialist Group on Foundations of Computer Science.

Membrane Computing Gheorghe Paun 2014-03-12 Membrane computing is an unconventional model of computation associated with a new computing paradigm. The field of membrane computing was initiated in 1998 by the author of this book: it is a branch of natural computing inspired by the structure and functioning of the living cell and devises distributed parallel computing in the form of membrane systems. This book is the first monograph surveying the new field in a systematic and coherent way. It presents the central notions and results: the main classes of membrane systems, the main results about their computational power and efficiency, a complete bibliography, and a series of open problems and research topics.

Computation, Cooperation, and Life Zoltan Kelemen 2011-06-21 Gheorghe Păun has played an important role within a wide range of disciplines, from the foundations of traditional computational theory and formal language theory to research gaining its inspiration from living nature. He has significantly contributed to the development of these diverse fields, initiating and pioneering them with remarkable imaginativeness and enthusiasm. Gheorghe Păun's research focusses on systems inspired by structures and processes found in living systems, with the field of membrane computing or P systems being the most important of his initiatives. This Festschrift volume, published to honor Gheorghe Păun on the occasion of his 60th birthday, includes 16 contributions by his students and collaborators. The research presented aims to gain a better understanding of what computation is, to find better models of computation, and to look for new computing devices inspired by the structure and/or functioning of natural or societal systems. The papers are preceded by an introduction by Solomon Marcus, Gheorghe Păun's lifelong teacher and mentor, and are organized in topical sections on general computing, grammar systems, membrane systems, and inspirations from natural computing.

Developments in Language Theory Masami Ito 2003-06-20 The refereed proceedings of the 6th International Conference on Developments in Language Theory, DLT 2002, held in Kyoto, Japan, in September 2002. The 28 revised full papers presented together with 8 invited papers were carefully reviewed and selected from 63 submissions. Among the topics addressed are grammars, automata, acceptors for strings, graphs, arrays, etc; efficient algorithms for languages; combinatorial and algebraic properties of languages; decision problems; relations to complexity theory, logic programming, description and analysis, DNA computing, cryptography, concurrency, quantum computing, and algebraic systems.

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