

Preface

This volume contains invited and accepted contributions presented at the **Eleventh International Conference on Membrane Computing (CMC11, <http://cmc11.uni-jena.de>)** which took place from 24 to 27 August 2010. We appreciate the hospitality of the Friedrich Schiller University Jena, Germany, in hosting CMC11 together with the Jena Centre for Bioinformatics (JCB) under the auspices of the European Molecular Computing Consortium (EMCC) and the Molecular Computing Task Force of the Emergent Technologies Technical Committee at IEEE Computational Intelligence Society. Having now for the first time the status of a conference, CMC11 is pleased to continue the fruitful tradition of 10 previous events of the International Workshop on Membrane Computing (WMC) 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 is an area of computer science aiming to abstract computational ideas and models from the structure and the functioning of living cells, as well as from the way the cells are organised in tissues or higher order structures. It deals with membrane systems, also called P systems, which are distributed and parallel computing models processing multisets of objects in a localised 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.

From a systems biology point of view, membrane computing provides a discrete modelling approach to describe biological reaction systems composed of interconnected membranes. Each membrane delimits a spatial region in which chemical reactions can occur. Within a membrane, a multiset of objects represents molecular particles while dedicated term-rewriting mechanisms simultaneously execute reaction rules associated to each membrane. Supplementary rules can control the exchange of objects among membranes or even modify the membrane structure. Hence, capturing descriptive aspects of structural dynamics is considered as an advantageous feature of membrane systems. Further information about membrane computing can be found at the P systems web page (<http://ppage.psystems.eu>).

The “evolution” of membrane computing towards a substantiated field of research which attracts a growing community of scientists can nowadays look back over a short but eventful history of 12 years flanked by annual international meetings. The first three workshops were organised in Curtea de Arges, Romania. They took place in August 2000 (with proceedings published in *Lecture Notes in Computer Science (LNCS)*, volume 2235), in August 2001 (with a selection of papers published as a special issue of *Fundamenta Informaticae*, volume 49(1-3), 2002), and in August 2002 (with the proceedings published in *LNCS*, volume 2597). The next six workshops were organised in Tarragona (Spain, July 2003),

in Milan (Italy, June 2004), in Vienna (Austria, July 2005), in Leiden (The Netherlands, July 2006), in Thessaloniki (Greece, June 2007), and in Edinburgh (UK, July 2008) with the proceedings published as *LNCS* volumes 2933, 3365, 3850, 4361, 4860, and 5391, respectively. For the tenth anniversary, the workshop returned to Curtea de Arges, Romania in August 2009. The proceedings finally appeared as volume 5957 of *LNCS*, Springer Verlag.

Six experts having an established reputation in the research field of membrane computing or related areas were invited to give keynotes and talks covering important directions and findings. These invited speakers were: Gabriel Ciobanu (Iasi, Romania), Peter Dittrich (Jena, Germany), Marian Gheorghe (Sheffield, UK), Martin Kutrib (Gießen, Germany), Maurice Margenstern (Metz, France), and Gheorghe Păun (Bucharest, Romania and Sevilla, Spain). Extended abstracts of these talks are included in this volume. Moreover, the CMC11 and Jena Life Science Forum 2010 (JLSF2010) audiences enjoyed the opportunity to listen to two joint keynote presentations made by Gheorghe Păun (Bucharest, Romania and Sevilla, Spain), from CMC11, and Peter Stadler (Leipzig, Germany), from JLSF2010.

This volume also incorporates the 26 accepted papers and 6 contributions accepted as extended abstracts. Each of them was subject of at least three referee reports. The program committee consisted of 21 members: Artiom Alhazov (Hiroshima, Japan), Gabriel Ciobanu (Iasi, Romania), Erzsebet Csuhaj-Varju (Budapest, Hungary), Gabi Escuela (Jena, Germany), Rudolf Freund (Vienna, Austria), Pierluigi Frisco (Edinburgh, UK), Marian Gheorghe (Sheffield, UK) – Chair, Thomas Hinze (Jena, Germany) – Co-chair, Oscar H. Ibarra (Santa Barbara, USA), Vincenzo Manca (Verona, Italy), Maurice Margenstern (Metz, France), Giancarlo Mauri (Milan, Italy), Van Nguyen (Adelaide, Australia), Marion Oswald (Budapest, Hungary), Linqiang Pan (Wuhan, China), Gheorghe Păun (Bucharest, Romania and Sevilla, Spain), Mario J. Perez-Jimenez (Sevilla, Spain), Dario Pescini (Milan, Italy), Francisco J. Romero-Campero (Nottingham, UK), Monika Sturm (Dresden, Germany), and Sergey Verlan (Paris, France) assisted by 7 additional reviewers: Oana Agrigoroaiei (Iasi, Romania), Christian Bodenstern (Jena, Germany), Paolo Cazzaniga (Milan, Italy), Alberto Leporati (Milan, Italy), Antonio E. Porreca (Milan, Italy), Sara Woodworth (Amgen in Thousand Oaks, USA), and Claudio Zandron (Milan, Italy).

The organising committee was constituted by Jörn Behre, Gabi Escuela, Thomas Hinze – Chair, Thorsten Lenser, and Kathrin Schowtka (secretary).

The invited contributions together with a selection of regular papers and extended abstracts, improved according to the discussions held in Jena and additionally refereed, will be published after the conference in a special issue of the series *Lecture Notes in Computer Science* by Springer Verlag.

CMC11 was held in conjunction with three international satellite workshops that take place simultaneously to encourage further collaboration and synergy effects: The Fourth Workshop on Membrane Computing and Biologically Inspired Process Calculi (MeCBIC), the Second Workshop on Non-Classical Models of Automata and Applications (NCMA), and the debut of the Workshop on Ap-

plications of Membrane computing, Concurrency and Agent-based modelling in POPulation biology (AMCA-POP).

To emphasise the new status of a conference, CMC11 comes with some additional novelties. Firstly, we introduced a software demo session which is intended to be a platform that allows to share computer programs and tools applicable and useful in the field of membrane computing. Typical examples are membrane system simulators, membrane system designers, visualisation tools, format converters, statistical tools, and new versions of existing membrane computing tools with extended or revised features. We believe that the software demo session will also in future contribute to focus on applications of membrane computing by refining modelling and simulation techniques to answer questions of life sciences. Secondly, the new poster session as integrative component of CMC11 can be seen as an opportunity of attracting presentations of late-breaking results and self-dependent contributions from young researchers and students new in the field. Last but not least, we mention the Best Contribution Award comprising a travel grant. The winner of this prize had been identified by the vote of all CMC11 participants.

We gratefully acknowledge funding for CMC11 from the German Research Foundation (grant HI801/3-1) and additional financial support provided by the Jena Centre for Bioinformatics (JCB). Furthermore, we thank the administration of the Friedrich Schiller University Jena for the perfect infrastructure made available to CMC11 and for the extensive assistance in many issues related to CMC11. Finally, we express our gratitude to the “UniverCity” of Jena for taking care of special rates for accomodation dedicated to CMC11 participants.

The editors cordially thank the program committee, the invited speakers, the authors of the contributions, the reviewers, all further organisers, all participants, and all people who contributed to turn CMC11 into a major success.

Welcome to CMC11 in Jena.

Marian Gheorghe
Thomas Hinze
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Editors

July 6, 2010