Foreword

SPECIAL ISSUE ON MEMBRANE COMPUTING

Eighth brainstorming week on membrane computing

The present volume contains a selection of papers resulting from the Eighth Brainstorming Week on Membrane Computing (BWMC8), held in Sevilla, from February 1 to February 5, 2010, in the organization of the Research Group on Natural Computing from the Department of Computer Science and Artificial Intelligence of Sevilla University.

The previous editions of this series of meetings were organized in Tarragona (2003), and Sevilla (2004 – 2009), and on those occasions special issues of *Natural Computing* (volume 2, number 3, 2003), *New Generation Computing* (volume 22, number 4, 2004), *Journal of Universal Computer Science* (volume 10, number 5, 2004), *Soft Computing* (volume 9, number 9, 2005), *International Journal of Foundations of Computer Science* (volume 17, number 1, 2006), *Theoretical Computer Science* (volume 372, numbers 2-3, 2007), *Fundamenta Informaticae* (volume 87, number 1, 2008), *International Journal of Unconventional Computing* (volume 5, number 5, 2009), and *International Journal of Computers, Control and Communication* (volume 4, number 3, 2009) were published.

A volume containing most of the papers elaborated or only started during the eighth BWMC and completed later was published by Fenix Editora, Sevilla, 2010. The reader interested in consulting this volume is advised to visit the domain website `http://ppage.psystems.eu`.

Membrane computing is a branch of natural computing which studies models of computation inspired by the structure and functioning of living cells, and organization of cells in tissues and other structures. The resulting models (called P systems) are distributed parallel computing devices, processing multisets in compartments defined by membranes. Many bio-inspired ingredients and features of P systems were considered. For instance, the multisets of objects can evolve by multiset rewriting rules similar to bio-chemical reactions, by symport/antiport rules, or by other types of rules, the membranes themselves can change in time, by division, creation, endocytosis, exo-cytosis, and so on. Most classes of P systems are computationally universal and, if an exponential working space can be produced in polynomial time (e.g., by membrane division), then they are able to solve computationally hard problems in a feasible time. A series of applications were recently reported, especially in biology and medicine, but also in computer graphics, cryptography, linguistics, economics, approximate optimization, etc. Several simulation programs (useful in applications) are available by now. A comprehensive information about this research area (considered in 2003 by ISI as "fast emerging research front in computer science") can be found at the above mentioned website.

For the present volume we have selected only a few of the BWMC8 papers; they went through the standard refereeing procedure of the journal, each of them getting two or three referee reports, according to which the final versions were produced. The topics covered by these papers range from basic theoretic issues (such as examining the power of P systems with only one catalyst and looking for complete problems for complexity classes related to P systems with active membranes), new ideas (such as the proposed GPR machines and the communication complexity approaches), extensions to P systems with 2D objects and other applications in handling images, to more practical computer science issues (model checking, modeling firewalls). In the spirit of the brainstorming, besides providing results, most of the papers also raise interesting research problems.

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