Preface

Membrane computing is a relatively new research area of natural computing, with a high development pace, very solid theoretical investigations and interesting and broad spectrum applications. This computational model has been introduced by Gheorghe Păun in the seminal paper "Computing with membranes" (J. Comput. Syst. Sci. 61(1), 108–143, 2000). Now, after more than 15 years of research and substantial progress, membrane computing has reached a level of maturity illustrated by a rich and solid corpus of knowledge and results. There are regular events associated with the field, like conferences (International Conference on Membrane Computing - CMC, 16 editions so far) and brainstorming workshops (Brainstorming Week on Membrane Computing - BWMC, 14 editions). Since 2012 an Asian version of CMC, called ACMC, has started and in 2015 there was the 4th edition. Several monographs and applications textbooks have been published, and a handbook presenting the key developments of the field appeared in 2010. A thorough account of the many developments of the field are reported on the membrane computing research website (`http://ppage.psystems.eu`).

The current volume contains a selection of six papers presented at a special session on Membrane Computing of the 14th edition of the International Conference on Unconventional Computation and Natural Computation (UCNC), Auckland, New Zealand, 2015, that have been expanded and additionally reviewed. These papers illustrate both theoretical developments in the field as well as applications.

Three of the papers deal with theoretical investigations. "Recognizer P systems with antimatter", by D. Díaz-Pernil, A. Alhazov, R. Freund, M.A. Gutiérrez-Naranjo and A. Leporati, presents recognizer P systems with antimatter and the influence of the matter/antimatter annihilation rules having (or not) weak priority over all the other rules. "Using membrane systems to solve the bounded fanout bradcast problem", by M.J. Dinneen and Y.-B. Kim, introduces a non-deterministic solution to a problem of broadcasting to all the nodes of a network, a message originating from a subset of nodes. The paper "On string languages generated by numerical P systems", by Z. Zhang, T. Wu, L. Pan and Gh. Păun, investigates the generative power of the language generators numerical P systems, a model inspired by both the structure of the living cells and economic phenomena.

Applications of membrane computing are investigated in three of the papers of this volume. "Decision tree models induced by membrane systems", by J. Wang, J. Hu, H. Peng, M.J. Pérez-Jiménez and A. Riscos-Núñez, focuses on the developement of a novel membrane computing decision tree induction algorithm which is then successfully applied to some existing test benchmark data sets for finding global optimal decision trees. Applications of spiking neural P systems with probabilities are investigated by T. Wang, S. Zeng, G. Zhang, M.J. Pérez-Jiménez and J. Wang in two papers; "Fault section estimation of power systems with optimization spiking neural

P systems" investigates the usage of the model to solve the power system fault section estimation, whereas "Fault diagnosis of metro traction power systems based on probabilistic fuzzy reasoning SN P systems with real number" looks into the diagnosis of metro power system fault.

Finally, we would like to thank all the reviewers for their help in improving the quality of the papers and the UCNC organisers for providing the reviews of the papers submitted to the special session on Membrane Computing.

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Michael J. Dinneen
Marian Gheorghe
Linqiang Pan
Gexiang Zhang

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