Int. Journ. of Unconventional Computing, Vol. 15, pp. 1–3
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Editorial: Membrane Computing

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This special issue contains a selection of papers from the Seventh Asian Conference on Membrane Computing (ACMC 2018). ACMC 2018 was successfully held at the University of Auckland, New Zealand, December 10–14, 2018, which was organized by the International Membrane Computing Society (IMCS) and the Department of Computer Science at the University of Auckland, New Zealand. The Centre for Discrete Mathematics and Theoretical Computer Science sponsored ACMC 2018, which published the pre-proceedings of the conference.

Membrane computing is a computational paradigm motivated by the structure and functioning of the living cells. The computational models are called either membrane systems or P systems. In the last 20 years, membrane computing community has succeeded to achieve a set of landmarking successes: the establishment of International Membrane Computing Society (IMCS), the organization of four regular conference/workshop events, namely ECMC, ACMC, BWMC, and CWMC, and the gestation and birth of two periodic publications, Journal of Membrane Computing (JMC) and IMCS Bulletin.

ACMC is one of the flagship conferences on membrane computing, aiming to provide a high-level international forum for researchers working in membrane computing and related areas, especially for those from the Asia-Pacific region. The six previous editions had successfully been held in Wuhan (China, 2012), Chengdu (China, 2013), Coimbatore (India, 2014), Anhui (China, 2015), Bangi (Malaysia, 2016) and Chengdu (China, 2017), respectively. Accordingly, special issues were edited in International Journal of Unconventional Computing (Vol. 9(5-6), 2013), Romanian Journal of

Information Science and Technology (Vol. 17(1), 2014), Journal of Computational and Theoretical Nanoscience (Vol. 12(7), 2015), Natural Computing (Vol. 15(4), 2016), Journal of Computational and Theoretical Nanoscience (Vol. 13(6), 2016), Romanian Journal of Information Science and Technology (Vol. 20(1), 2017), Journal of Optimization (Vol. 2017, 2017), Theoretical Computer Science (Vol. 736, 2018), and Fundamenta Informaticae (Vol. 164(2-3), 2019).

The five papers in this issue represent a broad range of topics on membrane computing, covering cell-like, tissue-like, and spiking neural P systems and their applications in a variety of fields.

The first paper, by Duan, *et al.*, introduced a tissue-like P system with four cells based on particle swarm optimization algorithms to solve traffic network transportation optimization problems. In this system, the modified prim algorithm and the position updated mechanism are used to generate and update all particle individuals, velocity-updated mechanism; an exchange tree strategy is employed to balance exploration and exploitation processes.

The second paper, by Wang, *et al.*, provided a solution for breaking RSA encryption by using weighted spiking neural P systems with rules on synapses. The parallelism of weighted spiking neural P systems with rules on synapses allows the system to perform a space-time trade-off and helps the system to factorize large integers in linear time.

The third paper, by Ishdorj, *et al.*, presented a preliminary microfluidic computing system design for spiking neural P systems aiming to solve the computational hard problem of Boolean satisfiability SAT by implementing the model studied in the authors' previous work. The authors also developed a simulation model for the proposed system and have been doing in silico experiments.

The fourth paper, by Guo, *et al.*, proposed an optimal thresholding by a cell-like membrane algorithm with enhanced particle swarm optimization (PSO) with hyperparameter. According to the special membrane structure, a modification of PSO is employed to find the best multi-level thresholding for image segmentation problem effectively.

The final paper, by Jiang, *et al.*, discussed a variant of SNQ P systems, called spiking neural P systems with communication on request and polarizations (in short, PSNQ P systems). The spikes of a neuron are requested from neighboring neurons, depending on both the contents and polarization of the neuron and the polarization of all requesting neurons (not checked by means of a regular expression). The polarizations related to the requesting neurons can be changed. PSNQ P systems are proved to be computationally universal as long as one type of spike is considered, and a small universal PSNQ P system using 209 neurons is constructed.

We would like to thank the Editor-in-Chief, Andy Adamatzky, for the opportunity to publish the special issue, the anonymous reviewers for their timely and insightful comments/suggestions to enhance the quality, and the authors' contributions.