

EDITORIAL

The present issue of *Journal of Automata, Languages and Combinatorics* is devoted to membrane computing, one of the most active areas of natural computing, whose goal is to learn computing models, ideas, paradigms from the structure and the functioning of living cells and from their interaction in tissues, organs, or other constructions.

The proposed models, currently called P systems, can be shortly described as distributed and parallel computing devices, with multisets of objects being processed in compartments defined by membranes by means of various types of evolution rules; the membranes themselves can also evolve by means of biologically inspired rules. Both cell-like and tissue-like (neural-like included) P systems were investigated. In the basic version, these systems are synchronized (the rules are applied in each compartment in a maximally parallel manner), but also sequential systems, with partial parallelism, with minimal parallelism, or even asynchronous systems were considered.

Most classes of P systems were proved to be computationally complete, able to compute all Turing computable sets of numbers (or of vectors of numbers), both in the generative and the accepting case. When an enhanced parallelism is possible, e.g., by means of membrane division, computationally hard (typically, NP-complete, but also PSPACE-complete) problems can be solved in this framework in a feasible time (typically, linear), by means of a space-time trade-off.

An important direction of research in membrane computing concerns the use of P systems as models of processes taking place in the cell. Although this was not among the initial goals of this area, such applications in biology/medicine are now most promising, making use of the attractive features of this approach: discrete, algorithmic, easily scalable and understandable, able to deal with small populations of agents/reactants, modular, directly inspired from cell biology.

The papers included in the present volume illustrate several of these issues, with emphasis on the mathematical and theoretical computer science aspects.

For the reader interested in further details in membrane computing we mention here the web site of the domain, <http://psystems.disco.unimib.it>, maintained at the University of Milano-Bicocca, Italy (with a mirror in China), under the auspices of European Molecular Computing Consortium (EMCC), and where one can find many downloadable papers and collective volumes – for instance, from the Workshop on Membrane Computing (the seventh edition took place in July 2006 in Leiden, The Netherlands), or the Brainstorming Week on Membrane Computing (the fourth edition was held in Sevilla, Spain, at the beginning of February 2006).

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