Simulating Parallel Architectures with P Systems (extended abstract)

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We are concerned with modelling several types of parallel architectures within the framework offered by the new computing devices, P systems with communication. We thus continue in this paper research started in [1], [2], [3].

A simulation with P systems of the parallel architecture known as *shuffle–exchange networks* has been proposed in [2], and used also in [3] to solve a class of problems known as reduction problems.

The problem of sorting with P systems in [1] can be also considered an attempt to model a classical parallel algorithm with P systems with communication.

We have been led to make a passage, from the known P systems, in which communication occurs only between adjacent membranes, to a new version of P systems with communication, for which the communication graphs are not fixed, but have a dynamic evolution, and for which different communication rules are associated to different communication graphs. The simulation of the shuffle–exchange network provided a first, simple example of such a system, called *P system with periodic dynamic communication of S–E type*.

For a general parallel architecture, denoted say by *PA*, we can similarly consider *P systems with periodic dynamic communication of PA type*, and analyze the corresponding algorithms in terms of P systems, for *PA*=Mesh networks, Binary tree, Pyramid, Butterfly, Hypercube, SIMD CREW, SIMD CRCW, and so on.

The P systems with periodic dynamic communication patterns, used for modelling parallel architectures, are but a first step towards considering P systems with more elaborate communication patterns, able to model also biological phenomena, in which the communication patterns develop from "internal conditions/computations" inside each membrane. This opens up the perspective of "computing with mobile membranes".

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