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 \textit{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 \textit{P system with periodic dynamic communication of S-E type}.

For a general parallel architecture, denoted say by \textit{PA}, we can similarly consider \textit{P systems with periodic dynamic communication of PA type}, and analyze the corresponding algorithms in terms of P systems, for \textit{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”.

184
References


