Some Quick Research Topics for 13th BWMC

Gheorghe Păun
Romanian Academy, Bucharest,
RGNC, Sevilla University, Spain

gpaun@us.es, curteadelaarges@gmail.com

Many problems in the previous brainstorming volumes, the handbook, the website, the mega-paper

Proposals:

- "negative" (numbers) extensions
- hypercomputing
- extensions of SN P systems
- numerical P systems

"Negative" extensions

In many cases (multiplicity, decay time, time associated with rules, weights, etc.) we have functions

$$f : X \longrightarrow \mathbf{N}$$

Natural (mathematical) extension

$$f : X \longrightarrow \mathbf{Z}$$

Problems:

- connection with anti-matter (by the way: remove priority of annihilation)?
- moving back and forth in time?
- further extension to **Q** or even **R**, or EVEN **C**
- what else?

Hypercomputing

Many ideas in the literature, only two extended to MC

Problems:

1. extend other ideas

2. especially to SN P systems (brain $>$ Turing...)

3. hyper-ideas used as fyper-tools

References

1. http://en.wikipedia.org/wiki/Hypercomputation (14 ideas)

2. C. Calude, Gh. Păun: Bio-steps beyond Turing. *BioSystems*, 77 (2004), 175–194.

3. T. Ord: *Hypercomputation: Computing More Than the Turing Machine*. Honours Thesis, Department of Computer Science, University of Melbourne, 2003.

4. P. Sosík, O. Valik: On evolutionary lineages of membrane systems. *Membrane Computing, International Workshop, WMC6, Vienna, Austria, 2005, Selected and Invited Papers*, LNCS 3850, Springer, Berlin, 2006, 67–78.

5. A. Syropoulos: *Hypercomputation: Computing Beyond the Church-Turing Barrier*. Springer, Berlin, 2008.

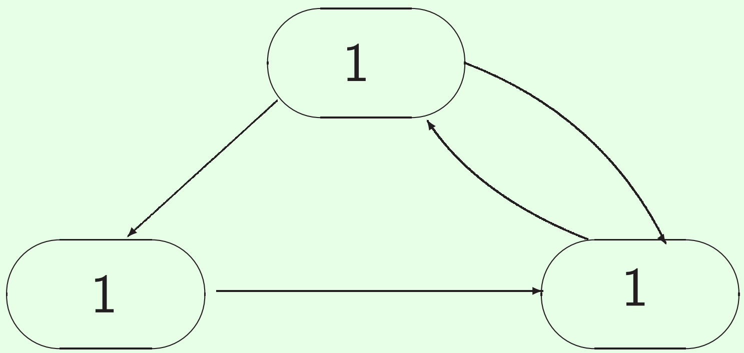
Extensions of SN P systems

1. astrocytes with $(E_i, action_i)$
2. compute functions $f : \mathbf{N}^n \longrightarrow \mathbf{N}^m$; efficiency? applications?
3. "brain" with a nondeterministic part and a deterministic one (dP SN P)
4. "white" holes: rules $a^n \to a^n,\ n \geq 1$

Reference:

E. Csuhaj-Varjú, M. Gheorghe, Gy. Vaszil, M. Oswald: P systems for social networks. *Ninth Brainstorming Week on Membrane Computing*, Sevilla, 2011, 113–124

A simple example



The same sequence in all neurons:

$$1, 2, 2, 3, 4, 5, 7, 9, 12, 16, 21, 28, 37, 49, 65, 86, 114, \ldots$$

with

$$\delta = 0, 1, 1, 1, 2, 2, 3, 4, 5, 7, 9, 12, 16, 21, 28, \ldots$$

Generate interesting sequence (Fibonacci?)

Numerical P systems

1. use as decision devices; which is the efficiency? membrane division needed?

2. pass from 2D robot control to 3D robot control (drones)

Thank you!

...and please do not forget: CMC 16 – Valencia, Spain, August
ACMC 4 – China (more help!)