PACE Workshop

The IT Potential of Programmable Artificial Cells

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ECLT, Venice, Italy

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Goals The goal of this workshop is to investigate and discuss the potential of Protocells as a new approach to information technology. The idea is to integrate views and coordinate effort between all groups within PACE for this area in general. Specifically, we will also work towards the first one year deliverable, i.e., the "Position paper on the capabilities of artificial cells in the complex systems approach to information technology".

The workshop is scheduled immediately following the Chemistry/Experimental workshop and the General Council meeting which should allow most groups in PACE to participate.

Integrated Themes The format of the workshop is a mixture of presentations and discussion groups. In the presentations PACE partners will present their individual views on the potential of Protocells as a new approach to information technology. In a series of discussion workgroups these different ideas and opinions will be structured and integrated towards a "Position paper on IT potential" (1-year deliverable). We will build on a paper skeleton produced by Richard Walker, John McCaskill and the Zurich group using earlier contributions from all PACE partners. This skeleton will be mailed to participants well ahead of the workshop. Potential topics for discussions and contributions include:

- Limitations of current computing paradigms (with regard to, e.g., scalability, adaptability, robustness, programmability, real world interaction capability)
- Embodied computing (with special focus on the implications of scale and nature of the "computational substrate", as well as the potential of autonomously adaptive computational units; the role of "hybrid" electronic-chemical computers like the Omega-Machine)
- Evolutionary computing, evolutionary robotics and evolutionary morphology (e.g., how to find an "optimal" computational substrate)
- Bottom-up (self-organizational) programming vs. top-down (conventional) methods, and the complex systems approach to IT
- Differences to other computational approaches (e.g., molecular computing, quantum computing, classical computing)
- Key PACE competencies, tools and contributions required for Protocell computation (e.g. computerized control of spatially organized, nano-scale, chemical reaction processes (Omega-Machine); single and multi-level simulation of complex bio-chemical systems; semi-automated design (via a co-evolutionary process) of hybrid electronic/biochemical systems)
- New computing technologies as "by-product" of Protocell development (e.g., technologies for large-scale simulation, methods for data mining, etc)
- (Future) application domains of Protocells, e.g., programmable (self-)repairing systems, programmable (self-organizing) production systems, autonomously adaptive monitoring and actuator systems, etc