PACE IT Potential: (Artificial) Chemistry meets Software Agents?

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Context: Network Software Agents

- Loosely coupled network of processing nodes.
- Paradigm case: the Internet.
- Software agents execute on the nodes.
- Agents can communicate by message passing.

Replicating Agents: Intra-node

- In*tra*-node Agent replication commonly used to dynamically adapt to service demands.
- Examples:
  - Apache httpd pool
  - PSQL postmaster pool
  - firefox threads (tabs, windows)
  - etc.
- Replication is intrinsically "dangerous"
- Tightly constrained (obviously!?)

Replicating Agents: Inter-node

- Any good/benign examples?
- Embedded java/javascript etc.? (*sometimes* benign at least)
- Usually only one step propagation(?)
- SETI at home? Bittorrent? etc. (do these qualify?)
- Best known examples of *autonomously propagating* agents are generally *malicious*:
  - Worms/viruses
  - Adware
  - Spyware
  - Trojans

- etc.

Two complementary challenges

- Combat malicious propagating agents
- Exploit autonomous propagating agents for constructive purposes

What has this to do with PACE?

A suggested level of analogy (possible influences in both directions?):

- (bio-)molecule — software agent
- Somatic time cell co-ordination and regulation — agent ensemble co-ordination and regulation
- Cellular closure(s) — agent ensemble closure(s)
- ... and evolutionary time? major transitions?

Model systems

Very high level; computationally efficient; but tenuous biological relationships:

- Holland α-Universes
- Coreworld
- Tierra
- Avida
- Alchemy

but not (?):

- Genetic Algorithms
- Genetic Programming
- ANN

Some Current Directions...

- Tierra:
  - Optimisation (execution speed)
  - Specialisation/diversification
- Beyond Tierra:
  - Compartmentation?
  - Regulation?
  - Evolution?

Related Online Resources

- Presentation slides:
  - `http://www.eeng.dcu.ie/~alife/talks/bmcm-pace-it-potent`
- DCU Alife Laboratory:
  - `http://www.eeng.dcu.ie/~alife/`
- Research Institute for Networks and Communications Engineering (RINCE):
  - `http://www.rince.ie/`

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