

Cooperative Computing in Dynamic Environments

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In the year July 1, 2001 to June 30, 2002, I would like to continue our current work on IOA and on building blocks for distributed systems.

The IOA language and underlying model has already proved to be useful as a foundation for agent system modeling and verification, in collaborative projects between our group and NTT. We would like to continue developing the IOA toolset so that it can provide better support for this and related efforts. In particular, we would like to add composition features to the front end; improve the quality and usability of the IOA simulator; instrument the simulator for use with Prof. Ernst's Daikon invariant discovery tool; improve the quality and usability of the connection with the theorem-prover LP; and perhaps connect IOA to other interactive theorem-proving tools and other automatic validation tools.

The mathematical foundations behind IOA require more work. The DIOA extension to the I/O automaton model, which provides support for dynamic process creation and destruction and for dynamic changes of process capabilities, is not quite as simple and elegant as we would like; we would like to improve it. Extensions of the underlying model and the IOA language itself for timing, hybrid (continuous/discrete), and probabilistic behavior are also interesting and important to pursue. Such extensions would expand the applicability of the model, language to domains such as robotics and embedded systems.

Finally, in our work on distributed systems building blocks, we plan to focus on performance and fault-tolerance analysis for group-communication-based system designs.

Collaboration

One visit from us to NTT. Paul Attie and myself spent a week last summer working with Drs. Kiyoshi Kogure, Ken Mano, Tadashi Araragi, and Yoshinobu Kawabe, at the Kyoto labs.

NTT folks made several visits to our group, though I'm not sure I can recall the number or dates.

Partial information:

Kiyoshi Kogure, Ken Mano, and Tadashi Araragi visited our group for a few days early in the project

Ken Mano spent a week or so visiting our group

Yoshinobu Kawabe visited our group for about a week in April, 2000.

An NTT researcher, Yoshinobu Kawabe, Paul Attie, and myself all attended a workshop on formal methods for agent systems, at NASA Goddard, in April, 2000.

Papers published jointly with NTT

A paper on modeling agent systems using I/O automata (DIOA, to be precise). Appeared in NASA Goddard Workshop on formal methods for agent systems. Co-authored by Araragi, Attie, Keidar, Kogure, Luchangco, Lynch, and Mano (4 MIT authors and 3 NTT authors)

A paper on the DIOA model. To appear in PODC 2001 (short version); submitted to Concur (long version). This is co-authored just by me and Paul Attie, but the work is tightly coupled to the NTT project.

Press mentions

No press mentions.

Most significant progress:

1. IOA and agents: Adding structure to IOA to support dynamic systems of the sort that arise in agent-based computing.
2. Building blocks: Development of group communication service that runs efficiently in WANs