

DARPA Agent Based Computing (ABC) Program, Taskable Agent Software Kit (TASK)

PI: Lee Spector, Hampshire College

Project: Multi-type, Self-Adaptive Genetic Programming for Complex Applications

Accomplishments This Quarter

- Wrote and revised (with Alan Robinson) an article, “Multi-type, Self-adaptive Genetic Programming as an Agent Creation Tool,” for publication in the proceedings of the Workshop on Evolutionary Computation for Multi-Agent Systems, ECOMAS-2002. This paper describes some of the CAHDE work on the evolution of transport network control agents, exploring the ways in which agents evolved under various environmental conditions respond to sudden changes in their environments. This paper also describes some new work on modularity and on-line evolution in dynamic environments, building on work presented by David Ackley at the January P.I. meeting in D.C. The paper will be presented orally at the ECOMAS workshop in New York City in July. A copy is available at <http://hampshire.edu/lspector/pubs/ecomas2002-spector-toappear.pdf>.
- Revised (with Raphael Crawford-Marks) accepted article, “Size Control via Size Fair Genetic Operators in the PushGP Genetic Programming System,” for publication in the proceedings of the Genetic and Evolutionary Computation Conference (GECCO-2002). This article will be orally presented at the GECCO conference in New York City in July. It is available on-line at <http://hampshire.edu/lspector/pubs/size-control-toappear.pdf>.
- Produced materials for a tutorial on “Quantum Computing for Genetic Programmers” that will be presented at the Genetic and Evolutionary Computation Conference (GECCO-2002) in New York City in July.
- Prepared (with physicist Herb Bernstein) a submission to the Sixth International Conference on Quantum Communication, Measurement and Computing, called “Communication through certain quantum gates of interest, discovered in part by genetic programming.” The submission was accepted for poster presentation at the conference in July at MIT, and a paper will be prepared for the proceedings that will be published following the conference.
- Completed the final production stage of the journal article “Hierarchy Helps it Work That Way,” which will appear in the journal *Philosophical Psychology* in June. This article is concerned with the role of hierarchical representation schemes in the implementation of robust, broadly context-sensitive reasoning services.
- Prepared a submission to Artificial Life VIII, The 8th International Conference on the Simulation

and Synthesis of Living Systems. The title of the submission is “Adaptive populations of endogenously diversifying *Pushpop* organisms are reliably diverse.” This submission addresses the evolution of reliably diversifying reproductive systems, an important requirement for self-adaptive evolutionary computation systems with strong problem-solving capabilities.

- Worked with Tiffany Frazier and other members of the CAHDE REF group to refine the group’s understanding of “Taskable Agent Software Kit” and to flesh out specific goals for the May P.I. meeting and beyond.

Current Plans

- Continue to work with the CAHDE REF group to refine and then to meet near-term goals for development of the Taskable Agent Software Kit. In particular, work to provide an evolutionary computing component, providing semi-automated agent programming services, for the kit.
- Hire Jon Klein, a former student who is completing a Master’s program on the basis of his “breve” system which simulates 3D environments with realistic physics. This is an excellent testbed environment for many TASK/CAHDE problems and agent architectures. I expect to use breve, in conjunction with our already-developed evolutionary computing systems (PushGP and Pushpop) to achieve several of this project’s objectives.
- Work with the MIT and BBN groups to write up a more complete account of our results on network traffic control agents. The description of this work in the ECOMAS-2002 paper (see above) is brief and a longer format article should situate this work in the larger context of agent architectures as discussed by Selfridge and Feurzeig.
- Work more closely with the University of New Mexico group on the utility of modular architectures for agents evolving in dynamic environments, following up on the work reported in the ECOMAS-2002 paper described above.
- Work with another colleague to re-implement the Push programming language in C to facilitate its application in more diverse environments.
- Meet with the Dartmouth group to extend collaboration on evolved agent-controllers in continuous 3D environments.