

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

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

Recent Accomplishments

- Ported the PushGP and Pushpop genetic programming systems (as documented in the Genetic and Evolutionary Computation (GECCO-2001) paper "Autoconstructive Evolution: Push, PushGP, and Pushpop) to the 16-node Beowulf-style cluster. Results in at least 16x speedup (possibly more by allowing for runs that use the entire cluster with sub-populations).
- Obtained preliminary data confirming the general utility of PushGP on standard genetic programming test problems. Began systematic benchmarking and application to previously unsolved problems.
- Developed, in conjunction with the MIT/BBN group, detailed plans for applying PushGP/Pushpop to MIT/BBN traffic agent simulators and airlift scenario simulators currently under development. Plans also specify incorporation of MIT/BBN Elementary Adaptive Modules into PushGP/Pushpop. Initial steps of these plans are now being taken.
- Developed a new and particularly challenging test environment for automatically programmed agents, documented in the GECCO-2001 "late-breaking" paper "Virtual Quidditch: A Challenge Problem for Automatically Programmed Software Agents."
- Presented the Autoconstructive Evolution work and the Virtual Quidditch work to audiences at GECCO-2001.
- Served as the Editor-in-Chief of the GECCO-2001 proceedings.
- Created a web site for this project (<http://helios.hampshire.edu/lspector/darpa-selfadapt.html>) which includes links to publications and to source code for Push and PushGP.
- Visited Cambridge for two days of meetings with the MIT/BBN groups. They are visiting Hampshire (in Amherst) next week.
- Documented the project for the PSUM on-line report. Will also upload the quadchart that was produced for this to the JIFFY site.

- Continued discussions with other CAHDE REF members on scenario details and issues of common interest. Considering plans to meet also with the Dartmouth group.

Current Plans

- Apply PushGP/Pushpop genetic programming systems to several new problems including CAHDE problems and problems related to quantum computation (as described in the proposal).
- Integrate PushGP/Pushpop genetic programming systems with MIT/BBN agent simulators and/or additional agent simulators.
- Produce initial evolved agents and compare evolved and hand-crafted agent designs and performance.
- Integrate MIT/BBN Elementary Adaptive Modules (EAMs) into the PushGP/Pushpop genetic programming systems.
- Assess utility of components made available to evolution, including EAMs and other components.
- Continue to disseminate research products—two journal articles are in preparation.
- Attend DARPA QUIST meeting to connect this project to other DARPA quantum computation work.