Control Structures for Software Agents

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Abstract

Control Structure is one of the most important issues which has to be addressed while designing and developing a software agent system. Based on the research and development of several agent systems, this thesis describes new agent architectures and a number of general principles.

1. The Problems Being Addressed

Software agents have shown considerable promise in many fields. Thus, control structures for such software agents raise important research issues. This thesis goals are (1) to design control structures for software agents, (2) to solve real world problems with these models, and by doing this, (3) to discover some principles of control mechanisms of software agents.

Therefore, the major question being addressed throughout the thesis research is: What are fundamental principles of control structures for software agent systems?

The following questions are emphasized:

1.1 Control Structure

What sort of control structure will allow software agents to pursue multiple goals with multiple perception-action channels and limited communication? A control structure for an agent, SUMPY, has been built for this perspective.

1.2 Fuzzy Control

How is the fuzzy control theory applied to the software agent field so that agents are able to handle fuzzy information in the environment where they live and to achieve their goals in a real-world manner?

1.3 Collaboration

What kind of control structure will empower an agent to collaborate with humans in the process of autonomously carrying out an everyday clerical task? How can such an architecture handle the coordination of several different activities, including the understanding of incoming messages and the composition of simple documents? An intelligent agent, VMattie, is being built for this purpose.

2. A Table of the Proposed Work Plan

The following time table is the proposed work plan.

Time	Completion Task
June, 1996	The major research and prototype of SUMPY
Dec., 1996	VMattie architecture design and programming specification
May, 1997	The coding and debugging of VMattie.
June, 1997	Submission and defense of the thesis

3. A Description of the Progress to Date

The first software agent, SUMPY, has been designed and implemented (in Perl). SUMPY "lives" in and helps to maintain a UNIX file system for better disk space utilization by compressing and backing up the files. Built using subsumption architecture, SUMPY displays multiple parallel goals, multiple perception-action channels, fuzzy control, limited communication, and "plug and play" properties. An experiment in agent architecture and in the use of agents for such maintenance tasks, SUMPY promises to prove useful and has added no significant problems to the test file systems.

The second agent system, Virtual Mattie, has been designed and is under coding and testing (in Java). The initial version is expected to be completed by May 1997. Its architecture enables Virtual Mattie to actively gather information from humans, compose announcements of next week's seminars, and mail them each week to a list that she keeps updated, all without the supervision of a human. VMattie's architecture combines Maes' behavior net architecture and Hofstadter and Mitchell's Copycat architecture and significantly extends them.