

tool, for instance, the user might observe the agent sending out job request messages – refuting hypothesis (A); and using the micro tool the user might observe that in the coordination trace for the job, the agent progresses past the wait-acceptance node before replies to its job request messages are received –  
5 confirming hypothesis (B).

A browser window for the control tool might for instance allow a user to remotely browse, add, delete and/or modify the task specifications of agents in a society. Such a window might show list boxes for the agents in the society, the set of tasks of the current selected agent, and the status of the selected task. A  
10 text area might show the specification of the current selected task. “Modify” and “Add” buttons might launch a task specification editor through which an existing task specification may be modified or a new task defined. The status of the tasks are set to OK when, as far as the tool is aware, the task definition in the tool is the same as that in the relevant agent’s task database. A status value of UNKNOWN  
15 indicates that the user has modified the task specification but, so far, the agent has not yet returned acknowledgement of receipt of the new specification.

The control tool is useful in debugging and/or analysing the behaviour of a society of agents by allowing a user to dynamically reconfigure the society and analyse its subsequent behaviour. That is, it allows the agent system to be  
20 redefined at runtime.

The strength in the control tool lies in the use of high level messages in communication, perhaps KQML and its related languages. With high-level messages, new specifications of whatever behaviour can be sent to an agent and it is the agent’s function to interpret the specification into the relevant  
25 functionality. If one were to use object-level messaging such dynamism is immediately lost. An analogy is the relationship between interpreted languages such as Prolog and Lisp that provide dynamic redefinition of program behaviour and compiled languages such as C++ and Fortran that do not.

Because different multi-agent system applications may use different  
30 ontologies or data dictionaries to specify data items, this tool allows user to load an ontology database defining the ontology of their specific application.

## 5.5 The Statistics Tool