Learning Agents with Bayesian Nets to Model Relationship

Ioan Alfred Letia
Technical University
Department of Computer Science
Cluj-Napoca, Romania
http://cs-gw.utcluj.ro/˜letia

Florin Craciun
Technical University
Department of Computer Science
Cluj-Napoca, Romania
http://cs-gw.utcluj.ro/˜florin

We are studying methods for adaptation in a multi-agent system where agents have to cooperate without communication in performing service consisting of tasks variable in time. The world of the warehouse scenario we are using [2] is shown in figure 1. Agents have to carry out a task T_k^v, where

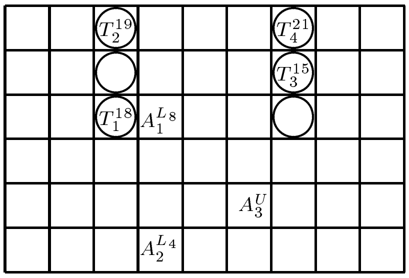

Figure 1: Scenario world for service agents.

k is its identifier and v is the utility value associated to the task, decreasing in time. The task is considered to start being serviced after it is downloaded on the South bank outside the grid. Bayesian networks are used to capture inter-agent relationships that can be learned [1]. The Bayesian network

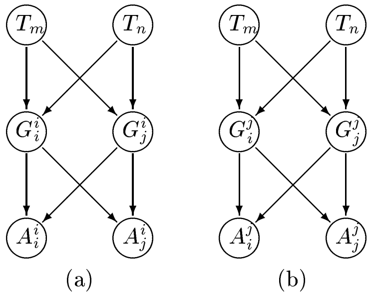

Figure 2: Bayesian nets of agents A_i (a) and A_j (b).

of agent A_i, shown partly in the figure 2a, describes the world as seen by the agent A_i. Various tasks, like T_m and T_n, have influence on the selection of goals, for example G_i^i of agent A_i and G_j^i of agent A_j. The Bayesian network of agent A_j is similarly partly shown in the figure 2b.

Our study on avoiding conflicts by imposing social norms on agent behavior revealed some of the drawbacks of such an approach [2] towards attaining an acceptable and robust collective behavior. We have turned therefore to learning agents by considering the behavior of other agents [3], all using reinforcement learning. Some of the issues that we are tackling at the moment for achieving adaptation are:

- learning the Bayesian nets representing inter-agent relationships in the case of incomplete data;
- improving learning when changes in the decision functions of some agents might cause changes in the other agents' target functions;
- exploiting the situation calculus to improve convergence of learning;
- using a first-order representation to reduce the search space.

While the scenario used in [1] consists of a few exchanges between agents, ours imposes a much deeper and sustained collaboration between agents. We are interested in obtaining a behavior that can lead to a quick adaptation when the environment changes. By properly instrumenting the environment of our scenario we generate various environmental changes and evaluate the behavior of the overall agent system. Another line of interest to us is the generation of policies execution monitoring.

1. REFERENCES

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