Negotiation to Improve Role Adoption in Organizations

Asad Rahman and Henry Hexmoor
University of Arkansas
Engineering Hall, Room 340A, Fayetteville, AR 72701
{rahman, hexmoor}@uark.edu

Abstract

We present negotiation schemes for efficient role adoption that enhance utility in organizations. In one scheme, local utility computations determine role adoption. In the second scheme, utility of the entire system is considered by the negotiating agents. These strategies are compared to the optimal outcome. Our results show that when agents negotiate using the second strategy, the system performance converges to its pareto optimal utility level.

1. Role Adoption

We consider organizations with fixed number of individuals in fixed roles and individuals at varying fitness levels to roles. Self-organization of individuals of an organization allows for them to change roles in the organization. Efficient role adoption increases performance of the organization [6]. The adaptation depends on many factors, which include consideration of institutional norms and autonomy [5]. Since agents are independent, centralized schemes for role assignment do not apply. Instead, an agent can freely choose to suggest a role swap with any other agent in the system. In our model, agents use negotiation to adopt new roles. Negotiation is the process during which participants communicate with one another to come to a mutually acceptable agreement on any matter [1]. The motivation for negotiation is supported by the ideas presented in [6] where managers of a group of agents in a coalition use negotiation to efficiently allocate agents to other coalitions. This notion of negotiation can be further extended to allow all members of an organization to actively negotiate.

Negotiation between agents can be described in a variety of ways. We use the state diagram model in [5] and the conversational scheme in [6] to describe negotiation between agents. The main premise behind the state diagram model in [5] is to describe negotiation in terms of state transitions. A negotiation state denotes whether or not there are any pending or new proposals in the system. The conversations that take place between the agents are described by using the conversational scheme, as in [6]. The state diagram model shows how the system reacts to negotiation between agents. The conversational scheme, on the other hand, captures the way every agent reacts to negotiation.

2. Negotiation Strategies

Two negotiation strategies are explored in this paper. The first strategy is called the local strategy and is based on the idea of an agents’ local maximization of its utility as presented in [4]. The second strategy, called the rational strategy, is a cooperative strategy where the agent negotiates with all other agents in the system, and may choose to adopt a new role even though it might not maximize its own utility by doing so. The two strategies are compared to the optimal solution.

In the local negotiation strategy, an agent proposes to adopt a specific role based on its own comprehension of where it will maximize its contribution to the organization. It is a greedy approach where agents are trying to maximize their own utility and are therefore selfish. This proposal is analyzed by all agents currently performing in that role and if any agent’s utility is going to increase due to a swap, a concession is sent back to the initiating agent, with the agent’s corresponding change in utility. The initiating agent sends a message back to the agent whose utility change is the highest amongst this group and swaps roles with that agent.

In the rational strategy, an agent does not broadcast a message to agents performing in just one role but to the entire system, of its willingness to leave its current role and adopt any other role in the organization. All concessions sent by the other agents are analyzed by the initiating agent and it chooses to swap its role with that agent, which will bring about the most positive change in utility for the initiating agent. Outcomes of this strategy are Pareto Optimal. An outcome is Pareto optimal if and only if there are no other outcomes available which guarantee a higher utility for the system without making any single agent have lower utility [3]. In this strategy, an agent begins by not being selfish and after hearing all the concessions, continues to negotiate only with those agents that will increase its utility if it chooses to swap roles with them. The initiating agent, however, is not trying to maximize its utility and considers adopting any role that will increase its utility, however small that increment might be.
3. Experiments and Results

When the system is first initiated, the agents are randomly assigned roles. It is then left to self-organize itself using the negotiation strategies mentioned above. The change in utility of the organization is used as a metric for comparing the local and rational strategies with the globally optimal solution. The Java programming language was used to code the algorithm.

Figure 1 indicates the results. As we can see from the figure, the local strategy does not yield an optimal level of system utility, and the change in system utility is not much. This happens because in this strategy, negotiation is carried on locally based on the local perspective of the initiating agent. The agent tries to maximize its own utility by choosing to adopt a new role, but since that role might not have agents that will positively benefit from the swap, no agreement is reached and the negotiation is unsuccessful. Therefore, the system utility does not change much.

The results for the rational strategy indicate a sharp increase in system utility in the beginning which flattens out as more and more agents successfully negotiate to adopt roles. The negotiation makes the different roles stable as time passes. This happens because, with time, more and more agents end up in their pareto optimal role. The system does not reach the optimal level in this strategy also but the increase in utility is higher than exhibited in the local strategy.

The globally optimal solution for system utility is also depicted in figure 1. The rational strategy is more desirable than the globally optimal solution because none of the agents, once assigned a role in the beginning adopt a role that might decrease their utility while negotiating using the rational strategy. In the optimal solution, however, agents are made to adopt a role that might decrease their utility which is not desirable.

4. Conclusion and Future Work

In this paper, we have shown that efficient role adoption by agents in an organization is achieved through negotiation, and that during this process the system performance converges to its pareto optimal level. The agents in the system selflessly adopt roles which maximize change in system utility for that time period. Eventually, the system converges to its pareto optimal level. This paper suggests a desirable negotiation scheme.

We will further investigate the rational negotiation scheme to include changes in the organizational structure like, for instance, layoffs, turnovers etc, or changes to agents’ perceptions or their capabilities. The main contribution of this paper is to outline a strategy simulating an automated negotiation between agents for role adoption. This, in turn, can decrease cost and time for efficiently distributing talent within an organization.

Another place where a strategy like this can be used is to allocate resources to a task.

5. References


