Implementing an Agent Negotiation Protocol based on Persuasion

Takayuki Ito and **Toramatsu Shintani**
Department of Intelligence and Computer Science
Nagoya Institute of Technology
Gokiso, Showa-ku, Nagoya, 466, JAPAN
E-mail:{itota tora}@ics.nitech.ac.jp

Abstract

In this paper, we present methods for improving problems in group decision-making and implement a meeting scheduling system. This system automatically schedules meetings based on users' calendars. In the system, agents negotiate on behalf of the users. The problem is that the agent must clarify the trade-off between "reaching a consensus" and "reflecting the users' preferences." We improve the trade-off by using the persuasion protocol and by controlling negotiation among agents by means of the effective characteristic function.

Meeting scheduling system

In our meeting scheduling system(Ito & Shintani 1996), an agent is assigned to a user. Each user manages a private calendar. To schedule a meeting, agents negotiate using the users' private calendars. Users input information on private events into their calendars and also can attach a weight to an event. This weight is represented by a numerical value.

Agent negotiation

At the beginning of negotiation, a host agent inputs attributes of a meeting and its candidate times into a circulation board. This board then is circulated among agents in a designated order. When an invitee agent receives the circulation board, that agent declares his preferences as follows: (1) The invitee agent calculates his expected utility of each candidate time with the characteristic function by using available information. (2) The invitee agent inputs his preferences into the circulation board. (3) The invitee agent sends the circulation board to the next agent. We define the characteristic function as follows:

$$V(S_I) = \sqrt{(p|S_I|)^2 + \sum_{a_i \in S_I} (W_{a_i}(I))^2} \qquad (1)$$

In equation (1), $V(S_I)$ denotes the coalition value of the coalition S_I in which $|S_I|$ and $W_{a_i}(I)$ are the size of a coalition and the weight of an event, respectively.

Persuasion protocol

To improve the trade-off, we propose the persuasion protocol described below. We give the persuasion coefficient p a small value. Thereby, the value of the $V(S_I)$ is affected by the weight of an event $W_{a_i}(I)$ more than by the size of a coalition $|S_I|$. In this condition, agents participate in coalitions according to the weight of an event rather than according to the size of the coalitions. In other words, we can reflect users' individual preferences in group decision, because the weight of an event associates with each user's preference. To facilitate reaching a consensus, we increase the value of the persuasion coefficient p by degrees. The higher $|S_I|$ value becomes, the more it affects the coalition value $V(S_I)$. The higher the value of the p becomes, the more agents whose weight of an event is low move into the majority coalition. If an agent does not move into a majority coalition for a candidate time, we can understand that the user who owns the agent does not strongly prefer the majority candidate time.

Conclusions

In social decisions, we must clarify the trade-off between "reaching a consensus" and "reflecting users' preferences in a social decision." To improve the trade-off, we have proposed in this paper an effective characteristic function and persuasion protocol. We implemented a meeting scheduling system to see how effectively the protocol is used. Our agent negotiation protocol can facilitate reaching a consensus among agents, reflect a group's preference and reflect users' individual preferences.

References

Ito, T., and Shintani, T. 1996. An approach to a multi-agent based scheduling system using a coalition formation. In *Ninth International Conference on Industrial & Engineering Applications of Artificial Intelligence and Expart Systems (IEA/AIE-96)*, 780. Gordon and Breach Science Publishers.