

CCAgent

Shota Kimata and Yuko Sakurai
Nagoya Institute of Technology

May 2, 2023

1 Introduction

CCAgent is an agent that takes into account "cooperation" and "compromise". In this year's competition, the focus shifted from "price" to "quantity" in the rules, which was a change from previous competitions. Preliminary experiments demonstrated that SimpleAgent, which only considers quantity, is the most effective base agent. Thus, we improve upon SimpleAgent by introducing cooperative and compromising elements.

In the proposal strategy, we adopt a "cooperative strategy" that takes into account the proposal quantity from the negotiation partner. By using this cooperative strategy, it is possible to propose a quantity that the other party is more likely to accept, thus increasing the chances of a successful negotiation. In the acceptance strategy, we employ a "compromising strategy". Specifically, we use the required quantity plus one unit as the criterion for acceptance. This compromising strategy increases the likelihood of successful negotiation by accepting the penalty of product shortages.

2 CCAgent

2.1 Symbol Definitions

The definitions of the symbols are as follows :

i : opponent number

q_{offer} : offer quantity to the negotiating opponent

q_{need} : current required quantity

q_{opp} : offer quantity from the negotiating opponent

$q_{opp}[i]$: the latest offer quantity of opponent i (Update throughout the day)

2.2 Agent Behavior (Offer Strategy)

In the offer strategy, CCAgent determines the quantity to propose to the the negotiating opponent by comparing the $q_{opp}[i]$ and q_{need} according to the following formula:

$$q_{offer} = \min(q_{opp}[i], q_{need})$$

By proposing q_{offer} to the opponent, it is always possible to propose a quantity less than the quantity needed by the opponent, thus facilitating the negotiate agreement.

2.3 Agent Behavior (Acceptance Strategy)

In the acceptance strategy, CCAgent decides whether to accept or reject according to the following formula :

$$\begin{cases} \text{Accept} & \text{if } q_{opp} \leq q_{need} + 1 \\ \text{Reject} & \text{if } q_{opp} > q_{need} + 1 \\ \text{End Negotiation} & \text{if } q_{need} \leq 0 \end{cases}$$

By setting a range for the quantity to be accepted, it is easier to accept the opponent’s proposal, and thus, it is easier to conclude a negotiation. We found that CCAgent gets lower utility when sets a range of 2 or more by the preliminary experiment.

3 Evaluation

We compare between our proposed CCAgent and SimpleAgent by varying the number of days. Table1 show the average obtained utility of each agent. CCAgent outperformed SimpleAgent in all cases.

Table 1: Experimental Results

Agent \ Num of days	50days	125days	200days
CCAgent	1.083	1.102	1.119
SimpleAgent	1.079	1.101	1.118

4 Conclusions

We proposed CCAgent by incorporating ”cooperation” and ”compromise” concepts to SimpleAgent which obtained the best result among the base agents in this year’s problem setting. In our experiments, we showed that CCAgent performed better than SimpleAgent. Future work will focus on developing more sophisticated agents capable of predicting an opponent’s acceptance strategy and adjusting the quantity of their proposals based on these predictions.