Academic report

Bidding Strategy And Opponent Modelling

On agent initialization (getting settings on “notifyChange”), the agent will construct all the possible bids associated with the given domain and all the utilities of the bids by the profile’s weights.

The agent has 2 bidding strategies:

1. Exploration
2. Exploitation

Based on the bidding state, the agent will bid differently.

Exploration

At the exploration stage, the agent will try to gather information on the opponent agent by tracking the number of offered issues and issue values. This information will be stored in memory and will be updated at each turn.

While at this state, the agent will offer random options from the top 5% of utilities, in case the opponent agent accepts the offer, the offer has a reasonable utility.

The agent will switch from the exploration stage to the exploitation state once 800 turns are reached.

Exploitation

The agent will use the explored data (number of issues and issue values that the opponent agent offered).

Leveraging the explored data, the agent will add to each possible bid a pre-determined weight in direct correlation with the number of times the opponent’s agent offered the issue value.

In the case that the number of times offered by the opponent agent is more than half of the offers, we assume that the specific utility and utility value has more weight for the opponent, so, we'll update the bid according to the following function:

$$updated\_bid = utility + \Sigma(issue1 = n_1 \wedge issue2 = n_2 \wedge \ldots \wedge issueT = n_T) * 0.02$$

Otherwise, we'll assume the weight is lower and we'll update the bid according to the following function:

$$updated\_bid = utility + \Sigma(issue1 = n_1 \wedge issue2 = n_2 \wedge \ldots \wedge issueT = n_T) * 0.005$$

Before each bid is made, the agent will update the explored data in order to keep the data relevant and use the opponent agent's response in the calculation of the possible bid.

Visualitation

In the graph above, we can see the offers and acceptance moves according to the number of rounds.

Acceptance Strategy

The agent will accept the offers matching a strict (time-based) criteria.
Based on the time left until the deadline is hit, the agent will accept the top N offers based on the following logic:

1. If there is more than $\frac{1}{12}$ of the time left, the agent will accept only the top 5%
2. If there is more than $\frac{1}{3}$ of the time left, the agent will accept only the top 8%

3. If there is more than $\frac{1}{2}$ of the time left, the agent will accept only the top 5%
4. If there is more than $\frac{2}{3}$ of the time left, the agent will accept only the top 3%
5. Otherwise: the agent will accept only the top 1%