Practical assignment 2
Group 9

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Bidding strategy

The idea of our bidding strategy is to not start at our optimal bid where our utility would be U = 1.0. Instead, we would like to start at a lower utility, increase our utility with bids gradually until we reach our optimal bid, and only then do we start conceding. We can call the part where we increase our bids as Phase 1 and the part where we concede as Phase 2. Also, we can call the utility that we start as a threshold.

The advantages of this strategy are to deceive our opponent during Phase 1. If the opponent should think we start at our optimal bid then it would seem that we are conceding during this Phase. Therefore the opponent may be more inclined to accept a bid although our utility is still close to our optimal utility. Also, we guarantee that if a bid is accepted during this Phase then we should have a utility between 1.0 and our threshold. Another advantage is that we can use Phase 1 to learn about the opponent's bids and create an opponent model.

There are a few disadvantages to this strategy. If we reach an agreement very early then we have eliminated the chance of our agent having an optimal utility. Also, since we are trying to deceive the opponent then we could be lowering the chances of reaching a good agreement for both parties. Another disadvantage is that if the results in Phase 1 are not satisfying then we continue into Phase 2, which is a simple conceding strategy where our utility always decreases.

Because our acceptance strategy also contains a threshold where we accept any bids over that threshold by default, it would make sense to have the same threshold in our bidding strategy. The threshold there was chosen as 0.8 so we have done that here as well.

We define Phase 1 as the first third of the time. During that time we increase our bids gradually up to utility U = 1.0. This can be described as the function $U = f(t) = 0.6 * t + 0.8$. After Phase 1 we move onto Phase 2 where we start conceding, which can be described as $U = f(t) = 1 - 0.2 * t^2$.

$$U = \begin{cases} Pmin + (1 - Pmin)nt, & \text{t} \leq \frac{1}{n} \\ Pmax - (Pmax - Pmin)t^e, & \text{t} > \frac{1}{n} \end{cases}$$

If we have $Pmin = 0.8, Pmax = 1, n = 3, e = 2$:

$$U = \begin{cases} 0.8 + 0.6t, & \text{t} \leq \frac{1}{3} \\ 1 - 0.2t^2, & \text{t} > \frac{1}{3} \end{cases}$$