KanbeAgent for SCML 2023 OneShot Track

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Concept

- Aim to contract with multiple agents
- Set **quantity range**
- Concessions according to s and n^{rm}

Offering Strategy

- Price

$$p^{best} = \begin{cases} p^{max} & if\ selling \\ p^{min} & if\ buying \end{cases}, p^{worst} = \begin{cases} p^{min} & if\ selling \\ p^{max} & if\ buying \end{cases}$$

  - Consider surroundings

$$p_{s,a}^{offer} = \begin{cases} p^{best} & TF = 0\ or\ p_{s-1}^{a} = p^{best} \\ p^{worst} & TF = 1 \end{cases}$$

$$TF = \begin{cases} 1 & \frac{1}{4}n^{ap} \le n_s^{fo}\ or\ \frac{3}{4}n^{ap} \le n_s^{c}\ or\ s \ge TT \\ 0 & otherwise \end{cases}$$

- Quantity
  - Propose within the quantity range
  - Change our strategy depending on the round
    - Propose the bids with high quantity ($s < 5$)
    - Reduce the quantity with rounds elapsed ($5 \le s < TT$)
    - Propose the bids with low quantity ($TT \le 18$)
  - Consider the opponent last offer
    - $q_{s,a}^{offer} = \min(quantity, q_{s-1}^{a})$

Acceptance Strategy

- q^a is the criterion of the agreement

  if $p^a = p^{best}$
  - if $q_{trade_s}^{min} \le q^a \le q_{trade_s}^{max}$ when $s \le 17$
  - elif $q^a \le q_{trade_s}^{max}$ when $18 \le s$

  if $p^a = p^{worst}$
  - if $q_{trade_s}^{min} \le q^a \le q^{need}\ and\ (p_{last}^{offer}\ or\ p_{next}^{offer} = p^{worst})$ when $s < TT$
  - elif $q_{trade_s}^{min} \le q^a \le q^{need}$ when $\mathrm{TT} \le s < 18$
  - elif $q^a \le q^{need}$ when $18 \le s < TT$

Setting Quantity Range

- The range of the target number of the contracting partners

$$n_s^{mxto} = \begin{cases} \frac{3}{4}n^{ap} - n_s^{c} & n_s^{fo} < \frac{1}{4}n^{ap} \\ n_s^{rm} & otherwise \end{cases}$$

$$n_s^{mnto} = \begin{cases} \frac{1}{2}n^{ap} - n_s^{c} & n_s^{fo} < \frac{1}{2}n^{ap} \\ \max\left(1, \frac{1}{4}\left(\frac{1}{2}n^{ap} - n_s^{c} + n_s^{mxto}\right)\right) & \frac{1}{2}n^{ap} < n_s^{c} \\ n_s^{rm} & otherwise \end{cases}$$

- The range of quantities

$$q_{trade_s}^{max} = \min\left(q^{max}, \frac{q^{need}}{n_s^{mxto}}\right)$$

$$q_{trade_s}^{min} = \max\left(q^{min}, \frac{q^{need}}{n_s^{mnto}}\right)$$

s : negotiation step
n^{rm} : the number of partners we can negotiate
n^{ap} : the number of all negotiation partners
n_s^c : the number of all agreements by step s
n_s^{fo} : the number of all finished partners by step s
q^{max} : the maximum quantity of the negotiation issues
q^{min} : the minimum quantity of the negotiation issues
q^{need} : the quantity of its needs
p^{max} : the maximum unit price of the negotiation
p^{min}: the minimum unit price of the negotiation
$\mathrm{TT} = 20 - \mathrm{q}^{\mathrm{need}}$

Evaluation

- Simulate against SyncAgent, AdaptiveAgent, and BetterAgent
- KanbeAgent outperforms those