Quantity Oriented Agent

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1 Introduction

For the SCML 2023 competition, specifically, it is established that the maximum trading price and the minimum trading price are consecutive values. Thus, it is reasonable to assume that the *price* should not be the main factor in a negotiation. In fact, the *quantity* to be negotiated in the contracts should be the single most important aspect to be considered [**1**].

QuantityOrientedAgent's skeleton is loosely based on "Simple Agent" [**2**], and was developed to *efficiently* match the amount determined in the exogenous contract to the amount of products negotiated in the contracts.

2 Strategy

2.1 Proposal Strategy

The offers made by QuantityOrientedAgent are sensible to the agent's needs and the current simulation step (between 0 and 19), as well as its layer (L0 or L1).

2.1.1 Quantity

Considering that most agents immediately turn down contracts when the quantity offered exceeds its demands [**3**], adjusting the amount of products is one of the central aspects of QuantityOrientedAgent's proposals. This is the reason why it is important to adapt the quantity offered based on the agent's needs.

Knowing that the exogenous contracts never exceed $q_{max} = 10$ products:

If $q_{needs} > 5$, it divides its needs by 2, so that $q_{offer} = \lceil \frac{q_{needs}}{2} \rceil$. Otherwise, it simply offers the exact amount it needs: $q_{offer} = q_{needs}$.

This is done to minimize the risks of a negotiation being terminated based on the amount of products.

Splitting the values in the offer by the amount of partners had a negative impact on QuantityOrientedAgent's performance.

2.1.2 Price

QuantityOrientedAgent insists on offering the best price *for itself* for a given number of steps σ:

$p_{offer} = p_{max}$ if the agent is selling, or $p_{offer} = p_{min}$ if the agent is buying.

The agent eventually concedes its prices, proposing $p_{offer} = p_{min}$ if it is selling, or $p_{offer} = p_{max}$, if it is buying. This was done to minimize the risks of not matching the exogenous contract's amount.

Notably, the agent presented a much inferior performance when it conceded on the price on sooner steps, as it leveraged the gains of its partners.

2.2 Response Strategy

The agent accepts *any* proposals, *regardless of price*, as long as the established quantity in the contract is lower or equal to the agent's needs.

During the last proposal it receives, however, QuantityOrientedAgent will try to minimize the difference between the quantity determined by the exogenous contract and the amount of products negotiated. As such, it will accept offers, if and only if:

$$|q_{offer} - q_{needs}| < q_{needs} \tag{1}$$

Note that the response strategy remains the same, regardless of the agent's layer in the supply chain.

3 Evaluation

QuantityOrientedAgent performed significantly better than the standard SCML agents (e.g,*BetterAgent*, *GreedyOneShotAgent*). As of April 30 of of 2023, QuantityOrientedAgent is in the 1st place of the Live Tournament, with higher median and mean scores than the other competitors, as well as a lower standard deviation. This indicates that the agent is overall more *consistent* than its peers across the multiple configurations and settings.

References

[1] Y. Mohammad, "Developing an agent for SCML2023 (OneShot)-Effect Of Price" www.yasserm.com. `http://www.yasserm.com/scml/scml2020docs/tutorials/02.develop_agent_scml2020_oneshot.html#effect-of-price-new-in-2023` (accessed May 1, 2023).

[2] Y. Mohammad, "Developing an agent for SCML2023 (OneShot)-OneShotAgent" www.yasserm.com. http://www.yasserm.com/scml/scml2020docs/tutorials/02.develop_agent_scml2020_oneshot.html#oneshotagent (accessed May 1, 2023).

[3] Y. Mohammad, "Developing an agent for SCML2023 (OneShot)" www.yasserm.com. http://www.yasserm.com/scml/scml2020docs/tutorials/02.develop_agent_scml2020_oneshot.html (accessed May 1, 2023).