AX: An agent submitted to the ANAC 2024 SCM league

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Abstract

AX is an agent that changes its strategy depending on the level at which it is deployed.When it is at the first or last level, it is forced to enter into an exogenous contract.Therefore, it acts on exogenous contracts to reduce losses.When placed at any other level, it makes flexible trades and profits.

1 Introduction

SCML is a competition to see which agent can make the most profit under certain conditions, and our goal is to develop an agent that automatically trades that generate greater profits.Examples of the conditions are as follows.

- Agents sign contracts with other agents, and according to the content of the contract, they make products using their own factories.
- Agents are free to decide how much they want to buy or sell a product for.Quantities and delivery times are also negotiated.
- The production of the product requires other products bought from other agents and some expenses.
- If agents fail to prepare a product that must be sold by the delivery date, they will be fined.
- The product does not spoil over time. However, if agents continue to put products in their inventory, they will incur storage costs.
- In addition to agents, there are BUYER and SELLER which enter into exogenous contracts with some agents.

Based on these conditions, AX is the agent we have developed in order to make more profits.

2 The Design of AX

Agents are placed at different levels. Among them, agents placed at the first and last levels are forced to do business with BUYER and SELLER, respectively.Therefore, AX needs to adopt a strategy for each of the three types of cases: when it is placed in the first level, when it is placed in the last level, and when it is placed in another level.

2.1 When placed on the first level

AX placed on the first level will continue to be forced to buy products by exogenous contracts.This means that it needs to continue to sell its products, even if the selling price is low.The amount of products that it sells at one time is the amount of products that can be produced by the delivery date, minus the amount of products that have already been decided to be sold, divided by the number of counterparties.This reduces the risk of paying fines for not being able to produce products in time, even if it signs a contract with all the agents it can trade with.However, it is predicted that the number of agents accepting trades will decrease as the days go by.Therefore, it increases the amount of products sold at one time when the current number of days exceeds half of the total number of days. However, only if the other agent makes a proposal to it. This is because there is a possibility that the other agent will reject a proposal from AX because the quantity is too large.

2.2 When placed on the last level

AX placed at the last level is always required to sell products by exogenous contracts.If it fails to sell the product by the delivery date, it will be fined.In order to avoid fines, it must make products, and in order to make products, it is necessary to secure products as materials.Therefore, it tries to buy as many products as it wants, even if the price is high.The number required for it is the same as the amount of products that it can produce in a day. If it already has many products, it will not ask for them.The number of products that it requests at one time in a transaction is half of the amount it needs.

2.3 When placed on another level

AX placed at a level that is neither the first nor the last does not have exogenous contracts.Therefore, even if it does nothing, it will not lead to a deficit.However, if it can make a profit from trading, it should do so.Based on this idea, it buys a small amount of products cheaply and continues to sell them little by little.The price at which the product is bought and sold is flexibly determined by negotiating with the other agent.It's important to buy at a lower price and sell at a higher price, but it's a top priority to close as many viable deals as possible.This is because the biggest loss is to go into the last day without selling almost any products in the pursuit of a better contract.

3 Evaluation

AX was executed with the pre-given agents GreedyStdAgent and SingleAgreementAspirationAgent. The parameters determined at the time of execution are as follows.

- `n_configs = 5`
- `n_runs_per_world = 1`
- `n_steps = 50`

The results of each of the five executions are as follows.

Table 1: Agent Scores

agent_type	**AX**	**GreedyStdAgent**	**SingleAgreementAspirationAgent**
score1	1.02	0.62	0.58
score2	1.09	0.82	0.79
score3	1.09	0.81	0.80
score4	0.98	0.83	0.74
score5	1.05	0.89	0.81
average	1.05	0.79	0.74

AX outperformed the other two agents.In addition to that, it scored more than 1 on 4 out of 5 attempts. This means that it was ultimately profitable.

Conclusions

AX is an agent that focuses on closing contracts, and thanks to that idea, we were able to reduce our losses.However, there are still challenges that have not been achieved.For example, despite continuing to sell products, it placed on the first level often has a large amount of inventory and significant losses.We should have found a way to get other agents to buy more products other than lowering the selling price.Also, unless it is placed on the last level, it largely depends on whether other agents will buy its product.It may lack the ability to sign contracts faster than other agents.Rather than the content of the negotiations, the issue remained as to whom and how AX would propose the negotiations.