

AgentGC

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1 Introduction

The agent introduced here will be representing a factory in a supply chain environment, in the ANAC2020 Supply Chain Management League. The objective of a factory agent is to buy / sell products from / to other agents, create a production schedule, and obtain the highest profit among the other agents during a predefined simulation time. The agent needs not only decide *how* to negotiate in a predefined single negotiation session, but *when* to join negotiations, and *how* to coordinate the behavior of its negotiators across multiple concurrent negotiations [1]. Therefore, we need to define several strategies to optimize our agent's profit with a given cost.

2 Agent Design

2.1 Negotiation Choices

Our negotiation strategy is used for evaluating the agent to engage and decide on what offers to accept. We designed this strategy that includes a risk assessment for each negotiating party at each step. If we sign a contract with a seller for a large amount of inputs, or a buyer that offers high revenue, and if that agent bankrupts, we will not be able to obtain our goods or money. To avoid these situations, it is necessary to add this risk assessment that evaluates the performance of this agent from the bulletin board. If it does not pass a risk level our agent will continue negotiating with them.

Given the information of total time steps at the beginning of the tournament, we define our main strategy time dependent. In order to start producing faster, the focus during the initial steps is signing contracts that have less delivery time, so that agent can start producing faster. After a certain point, the focus is shifted to profit oriented contracts.

The tournament setup allows agents to get paid at the contract due. Until that point our agent cannot earn money. Investing on raw materials and producing final products faster is the initial goal. To invest more in raw materials, the delivery time for both inputs and outputs always has a big role. For the first part of the strategy, having less delivery time is the priority, and when keeping the delivery time small our agent will try to have agreements with maximum price as it sells and minimum cost as it buys.

After several steps, our agent focuses on selling contracts that have longer delivery times, more products, and higher profits. Signing contracts with longer duration has a risk in terms of obtaining the necessary raw materials in time and planning their production schedule by considering costs. After reaching a predefined level, it is intended for agent to start playing more risky by signing contracts with longer periods.

2.2 Utility Function

We have defined a utility function that changes according to the role of our agent. After setting a critical point for changing the prioritization of delivery time and revenue, we also defined some coefficients for their importance. If the current step of simulation is smaller than that critical point, the agent uses a higher coefficient for delivery time than revenue. Otherwise it prioritizes the revenue the most. Also, since the utilities differ when the agent is a buyer or a seller, a penalty is added to the multiplication of price and quantity when the agent is buyer to prevent high costs.

2.3 Risk Management

In order to prevent bad contract decisions, we added a risk analysis by defining a breach probability threshold. If the agents that request negotiation pass that elimination, the negotiation starts.

3 Evaluation

We evaluated the performance of our agent by having it compete against other agents provided with the SCML library and in the online tournament system in the SCML home page.

4 Lessons and Suggestions

The SCML environment offers lots of resources and trainings to build an agent. By following these resources, it is possible to have a good performing agent.

5 Conclusion

Since each component of the strategy has a tremendous impact on the result, it should be reminded that each of them needs a core idea and fine adjustments. To have an aggregate solution that performs as wanted, this agent needs some improvements which we intend to add in the upcoming competition.

References

- [1] Home Page SCML 2020 League. <https://scml.cs.brown.edu/>
- [2] Mohammed Y. et al. (2020, March 3). Supply Chain Management League. Page 2. <http://www.yasserm.com/scml/scml2020.pdf>
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