# Agent Merchant

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# Outline

# Strategy Outline

Overall agent strategy can be categorized into three sub-strategies:

- Production Strategy: Strategy to decide what to produce at every time-step.
- Negotiation control strategy: Responsible for requesting negotiation, responding negotiation and conducting concurrent negotiation. Trading strategy is also included in this.
- Signing strategy: Strategy to decide what agreements to sign as contracts.

# Outline

# Production and Negotiation Control strategy

- Production Strategy: Produce whenever input products are available.
- Negotiation control strategy:
  - ▶ Agent Merchant uses a linear utility function and negotiation strategy is a meta strategy consisting of Boulware and Hardheaded strategies.
  - ▶ The agent requests multiple negotiations with all its customers and suppliers for each time step.
  - ▶ Rejects all negotiation request from other agents.
  - ▶ The ranges for each issue is dynamically changed depending on the outcome of previous negotiations.
  - ▶ Certain abnormal offers are sent to customers and suppliers to check if those agents are exploitable.

# Outline

# Signing Strategy

This can be broken down into 5 components:

- A Greedy signing component signs pairs of contract that ensures profit, if available, at each time step.
- A risk management component comprising of overselling balance algorithm and an overbuying balance algorithm.
- A dead lock breaker component signs a few buy and sell contract to avoid deadlocks.
- A profit pruning component that makes the agent stop all negotiations when estimated profit is above a threshold.

# Outline

# Collusion Track

Goal: To improve the median score of all agents

- Final score is the median of the profits accrued by all the factories across all simulations.
- Note: A factory at a higher level has more starting balance than a factory at a lower level.
- Depending on configurations, three colluding algorithms are used by Agent Merchant.

# Collusion Track: Strategy-I
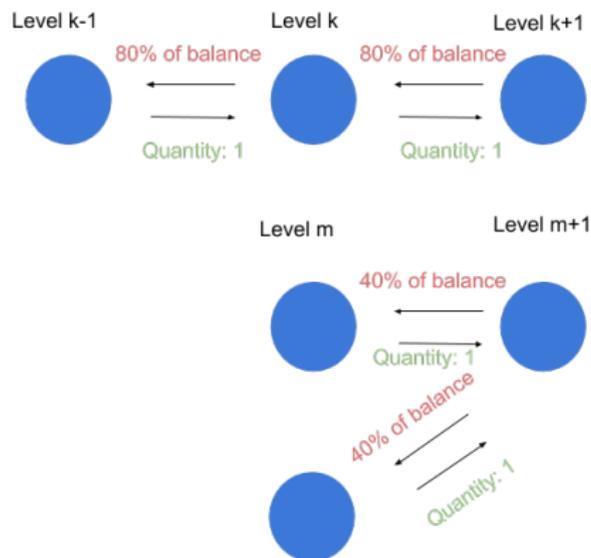


Figure: Top: Collusion strategy for two or more instances of same agent in consecutive levels namely $k-1$, $k$ and $k+1$. Bottom: Collusion strategy for two or more agents in a lower level $m$ and one agent in the next higher level $m+1$
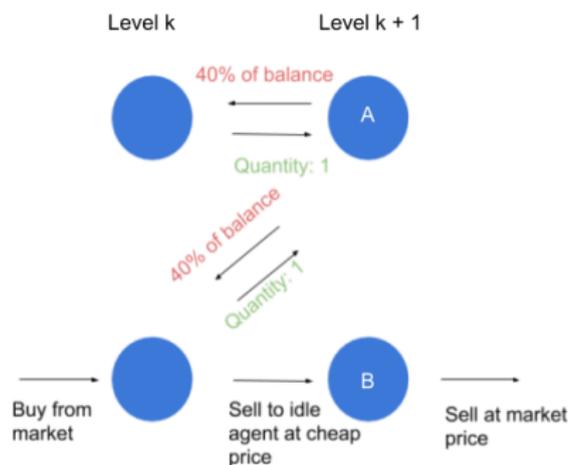
Figure: Collusion strategy when there are more than one instance of agent in each of two consecutive levels k and $k + 1$. In the initial step B is the idle agent.

# Collusion Track: Strategy-III
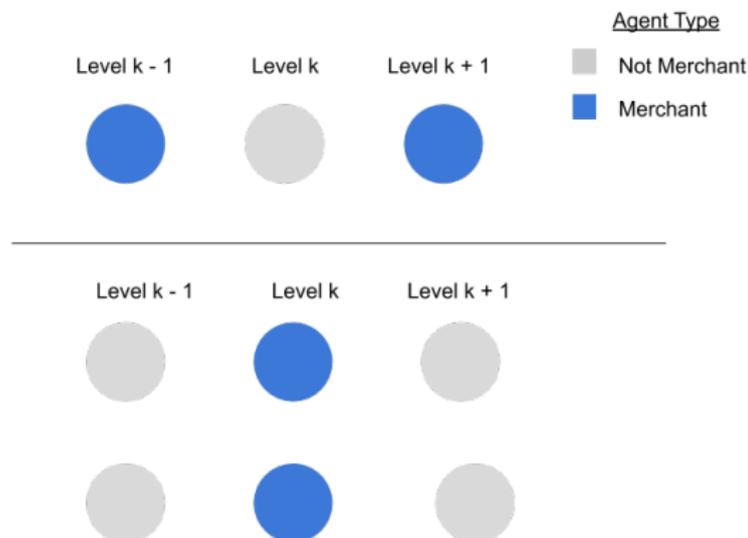


Figure: Top and Bottom: Not considered in collusion strategy. Each agent independently will behave according to standard track.

# Experimental Result