TAC

Trading Agent Competition

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Agenda

- TAC SCM
- The MicroCredit Approach
- The Sorter’95 Approach
- Demo
Introduction

• TAC – Trading Agent Competition
• International forum, created in 2002 (Michael Wellman)
• Goal: Promote and encourage high quality research into the trading agent problem

• Two scenarios:
  – TAC Classic – Travel Agent Scenario
  – Since 2003, also the Supply Chain Management (SCM) scenario (CMU and SICS)
  – New scenarios since 2007 (Procurement and Prediction)

Introduction

– Six agents (in a client-server architecture) compete for the highest bank balance (score points)
– Agents sell assembled computers
  • Negotiation with suppliers (buy components)
  • Factory and delivery scheduling (assembly)
  • Negotiation with clients
– A game lasts 219 simulator days (~1 work year)
– Simulation considers:
  • Penalties (late deliveries)
  • Interests (positive and negative bank interests)
  • Storage Costs (almost irrelevant)
  • Agent Reputation
**Tips & Tricks**

- **Goal: Highest Bank Balance**
  - Why deliver assembled computers ASAP?
  - Why limit the initial loan?
  - Why maintain a big client portfolio?

- **Tricks**
  - Try to buy a significant amount of components early
  - Maintain a high occupation level on the factory (careful!)

- **Alerts**
  - Component stock shortage
  - Late delivery penalties
  - Supplier agent reputation
  - Market offer/demand relation
Tips & Tricks

- How to get started?
  - Tools:
    - http://www.sics.se/tac/page.php?id=16
    - TAC SCM Server
    - AgentWare (Java) (Simple base agent implementation)
    - Statistical and Visualizer kits
    - https://www.sics.se/tac/showagents.php
      - Some agent binaries available for download
    - Register agent and alter configuration file (aw.conf)

The MicroCredit Approach

Goal: Prove that the MicroCredit could be a good strategy in SCM Environment
Introduction

- World War II, Mohammad Yunus, GrameenBank
- Bolivia and Bangladesh
- Successful Microcredit Cases
  - Many Bolivian Families now run legitimate businesses
  - European carpenter requested 40,000 € and now has shop that is worth 200,000 €

Implementation Limits

- Loan Limit
  - The agent is limited to an average estimated loan of 100,000 score points
- Production Limits
  - The agent loads the factory to a maximum of 70% of its capacity
    - In microcredit environment there are no storage facilities
    - 30% of margin for scheduling problems
    - Overloading equipments leads to damages – costs not admissible
Request Evaluation

- Analyze client requests according to a evaluation function

\[
\text{MaxClientPrice} = \left( \frac{\text{MaxPrice} - \text{MinPrice}}{2} \right) + \text{MinPrice}
\]

- Evaluation Parameters
  - (A) – Factory Load
  - (B) – Profit Margin

Proposals

- Sort Client Request

- Offer Price

- Suppliers
Results – 2007 Qualifying Rounds

<table>
<thead>
<tr>
<th>Position</th>
<th>Agent</th>
<th>Average Score</th>
<th>Zero Games Played</th>
<th>Zero Games Played</th>
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<tbody>
<tr>
<td>1</td>
<td>DeepMaison (a1, 1e0)</td>
<td>19.56 M</td>
<td>20.96 M</td>
<td>120</td>
</tr>
<tr>
<td>2</td>
<td>TacTex (a2, 1e0)</td>
<td>19.09 M</td>
<td>19.26 M</td>
<td>120</td>
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<tr>
<td>3</td>
<td>PlanetAgent (a3, 1e0)</td>
<td>18.93 M</td>
<td>20.28 M</td>
<td>120</td>
</tr>
<tr>
<td>4</td>
<td>Messen (a4, 1e0)</td>
<td>17.17 M</td>
<td>17.17 M</td>
<td>120</td>
</tr>
<tr>
<td>13</td>
<td>Nett44 (a5, 1e0)</td>
<td>9.096 M</td>
<td>9.096 M</td>
<td>120</td>
</tr>
<tr>
<td>14</td>
<td>CAM TAC (a6, 1e0)</td>
<td>7.429 M</td>
<td>8.030 M</td>
<td>120</td>
</tr>
<tr>
<td>15</td>
<td>Banta (a7, 1e0)</td>
<td>5.202 M</td>
<td>5.202 M</td>
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<tr>
<td>16</td>
<td>Societas (a8, 1e0)</td>
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<tr>
<td>17</td>
<td>MicroT4 (a9, 1e0)</td>
<td>1.920 M</td>
<td>1.920 M</td>
<td>120</td>
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<tr>
<td>18</td>
<td>AnteFer (a10, 1e0)</td>
<td>0</td>
<td>0</td>
<td>120</td>
</tr>
<tr>
<td>19</td>
<td>TimeOff (a11, 1e0)</td>
<td>-3.570 M</td>
<td>-3.756 M</td>
<td>120</td>
</tr>
</tbody>
</table>

Conclusion

• The Hypothesis is confirmed
• Outstanding Paper Award E-Commerce 2007
• The agent was able to achieve a steady growth in most games
• Same profit margin as Tac Tex
The Sorter’95 Approach

Goal: Design and implement an agent to compete in the TAC SCM Challenge

a priori Decisions

- Maximum Factory Occupation
- Initial Profit Margin
- Initial & Final Inactivity
- Component Order-to-Stock
Agent Architecture

Suppliers
- Communication Protocol
- Unit Price Policy
- Component Acquisition Policy
- Production Price Update

Production
- Factory Schedule
- Delivery Schedule
- Capacity Monitoring

Costumers
- Communication Protocol
- Demand Request Management
- Product Price Policy

The Sorter'95 Approach

Demand Management

$$\text{MPC} = \sum_{i=1}^{n} \text{acceptedRequests} \cdot i$$

$$\text{PPC} = \sum_{i=1}^{n} \text{proposedRequests} \cdot i$$

Price, Volume, Which

Volume

Price

Which

Percentage of Capacity × Percentage of Utilization × PPC ÷ MPC
Demand Management

\[ APM = \sum_{i=0}^{n} \frac{Accepted\,Profit\,i + Error\,i}{Proposed\,Profit\,i + Error\,i} \]

\[ P\,M = \begin{cases} P\,M = 2, APM = 0 \\ P\,M = 0.9, APM < \text{Threshold for} \% N\,\text{Participants} \\ P\,M = 0.1, APM > \text{Threshold for} \% N\,\text{Participants} \end{cases} \]

Market Tendencies - Order Analysis

Results

Profit Distribution

Profit Histogram

The Sorter’95 Approach
The Sorter’95 Approach

Results

Classification

Outlier Influence

Demonstration

- Server
- Sorter’95
- MicroCredit
- Log Analysis
Questions