DYNAMIC REASONING MODELS IN E-NEGOTIATIONS

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Questions?

- How to improve efficiency of agents?
- How to make agents intelligent enough to be adaptable to changing market mechanisms?
- How to automate negotiation?
- What is the desired agent features for flexible negotiation?
- How to benefit from negotiation in several application domains?
- How to decide which negotiation mechanism is the best for an agent?
What is an Agent?

A Software entity that:
- Carries out some set of operations on behalf of a user or another program
- With some degree of independence or autonomy
- And in doing so, employs some knowledge or representation of user's goals and desires.

Types of Agents

- Autonomous Agents
  - Biological Agents
  - Robotic Agents
  - Computation Agents
- Software Agents
  - Task Specific Agents
  - Artificial Life Agents
  - Entertainment Agents
  - Viruses
What is the role of Agents in Supercomputing?

- Scientific problem solving environments
- High performance agent systems
- Coordination in large scale systems
- Distributed scheduling
- Task distribution
- Load balancing
- Resource and service discovery
- Data mining and data warehousing
- Air traffic control
- The Distributed Vehicle Monitoring Task (DVMT)
What is the role of Agents in E-Commerce?

Buyer-Seller Agents
Auction Agents
Brokers and Mediators
Negotiating agents

Challenges in Automating E-Commerce?

Automation support
Decision support
Efficient market mechanism support
What is e-Negotiation?

Facilitate and automate business interactions for mutual and efficient agreements on terms of transaction relationships involving complex needs, trade-offs, and options in dynamic e-commerce

Some of the many advantages:

- Increased efficiency (more automation) by shortening the negotiation cycles
- Increased speed and volume of transactions
- Reduced manual effort
- Enhanced profitability (better decisions)
- Improved user satisfaction (better decisions)
Negotiation Mechanisms

**Negotiation protocols:** rules that govern the interaction among agents.

**Negotiation objects:** the ranges of issues over which agreement must be reached.

**Negotiation reasoning models:** apparatus that participants employ to act in line with the negotiation protocol in order to achieve their negotiation objectives.

\[ \text{REASONING MODEL} = \text{PROTOCOL} + \text{OBJECT} \]
What are the current challenges in Supercomputing?

- sCalAbility
- efficiency
- adaptability
- flexibility

*On-demand allocation of resources based on user's preferences*
Existing Systems

- **GRAIL** - Grid Research And Innovation Laboratory (GRAIL) Focuses on scheduling and the deployment of distributed scientific applications.
- **Apples** - Application level scheduling
- **Ubero** - Universal binding and execution of redundant objects
- **CoABS** - DARPA Control of Agent Based Systems
Proposed Solution

Flexible Distributed Systems

- Software mobility
- Intelligent Negotiating Agents
- Modularity
Initial Design

- use light-weight mobile agents
- use a default reasoning model at start-up
- use on-demand loading of complex algorithms
- use a modular approach and componentware technology
- use standard communication protocols like FIPA

<table>
<thead>
<tr>
<th>SELLER</th>
<th>PRODUCT</th>
<th>PROTOCOL</th>
<th>STRATEGY</th>
<th>SUCCES RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seller 1</td>
<td>Used Cars</td>
<td>Offer-Counter Offer</td>
<td>Tit-For-Tat</td>
<td>0</td>
</tr>
<tr>
<td>Seller 2</td>
<td>Used Cars</td>
<td>Offer-Counter Offer</td>
<td>Tit-For-Tat</td>
<td>60</td>
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<tr>
<td>Seller 3</td>
<td>Used Appliances</td>
<td>Argumentation</td>
<td>Persuade/Critique</td>
<td>90</td>
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<tr>
<td>Seller 4</td>
<td>Used Appliances</td>
<td>Auction</td>
<td>Heuristics</td>
<td>70</td>
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<tr>
<td>Seller 5</td>
<td>Travel package</td>
<td>Offer-Counter offer</td>
<td>Boulware + dependent</td>
<td>40</td>
</tr>
<tr>
<td>Seller 6</td>
<td>Travel package</td>
<td>Bidding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seller 7</td>
<td>Air tickets</td>
<td>Auction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sample matchmaking table for negotiation initialization
Proposed Agent architecture
## MODULE DESCRIPTIONS

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Module</td>
<td>Facilitate &quot;talking&quot; between the agents in a common, understandable way.</td>
</tr>
<tr>
<td>Protocol Module</td>
<td>Enable automated negotiation keeping the rules of the negotiation in mind.</td>
</tr>
<tr>
<td>Strategy Module</td>
<td>Apply the proper reasoning module so that the negotiation ends in a success.</td>
</tr>
</tbody>
</table>

### Technology

- **Java** is used for coding all modules.
- **JADE** Agent platform is used for creating and deploying agents
- **JESS** is used for implementing the Rule-Based logic.
Dynamic Agents in our system

- wireless device
- light-weight agent
- agent migrating to remote server
- remote server
- agent transformation
- negotiations
- local machine
- on-the-fly loading of strategy module
CONCLUSION

• Happy end-users
• Higher efficiency
• Feasibility
• Mobility
Agents on the web
Buyer and Seller Agents in an E-Marketplace

Electronic Market available on the WEB:
Bidding in an E-Marketplace

Four useful coalitions:
- C & D (cost=70)
- B & C (cost=60)
- A & C (cost=90)
- A & B (cost=80)