A Model of an Agent Supporting Multi-Issue Negotiations in an E-marketplace

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E-Negotiation

• Key requirements for customer-oriented e-marketplaces:
  - Personalization
  - Customization

• e-Negotiation:
  - Auction (eBay, Priceline and Amazonauctions)
  - Automated negotiation (Kasbah and Tete-a-Tete)
  - Agent supported negotiation systems (Aspire)
eAgora

- E-marketplace that allows buyers and sellers to conduct multi-issue negotiations.

- Agent support market participants in the negotiation process.

- Usability test of the system.
Negotiation Phase Model

- **Agenda setting**
  - Host
  - Review
  - Join
  - Evaluate issues

- **Exploring the field**
  - Add issues
  - Add options
  - Evaluate issues
  - Evaluate options
  - Construct utility (value function)

- **Narrowing differences. Integration**
  - Construct offer
  - Request offer
  - Evaluate offer
  - Submit offer
  - Receive offer
  - Accept offer
  - Terminate

- **Agreement's assessment**
  - Assess agreement
  - Revise agreement
  - Terminate

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Negotiation Protocols

Diagram:

Start

Buyer: sets up negotiation
- Buyer_host: name, product
- Add_issue: name, description
- Add_option: value
- Wait
- Receive
- Construct 1st offer
- Submit
- End

Seller: joins negotiation
- Review buyer’s product/service
- Accept issues
- Evaluate issues and options. (Construct value/utility function)
- Request for quotation
- Compute 1st offer
- Submit
- Evaluate offer
- Wait
- Receive
- Assess agreement
- Construct counter-offer
- Accept offer
- Evaluate offer
- Construct counter-offer

Log out
Agent Functions

**Offer Generation**

- Construct Value Function:
  \[ v(a_i) = \sum w_i v_{ij}(a_{ij}), \quad (i = 1, \ldots, n) \]

- Determine Concession:
  - strategy
  - previous offers
  - opponent’s offers

- Generate 5 different offer packages:
  - same concession value
  - minimal drop in value

**Offer Critiquing**

- Determine value of counter-offer:
  - value function
  - strategy
  - opponent’s concession

- Provide Critique:
  - comments on the counter-offer
  - suggestion on possible actions
Methodology

- **Web-based system** (distributed and database driven).
- **Agent system** (independent and intelligent).
eAgora Architecture

[Diagram showing the architecture of eAgora, including the client tier, web server, application server, applications, and database server.]
eAgora: A simple example

Host negotiation

Make offer
Receive offer
Accept offer

Join negotiation

Propose new issue
Accept new issue
Reject new issue
Evaluation

Usability Testing:
1. Convenient sample of twelve individuals
2. Pairs (buyer and seller)
3. Pre-test questionnaire (experience with Internet usage and negotiation)
4. Demonstrate eAgora
5. Test eAgora without agent
6. Post-test questionnaire
7. Test eAgora with agent
8. Post-test questionnaire
9. All questions and comments were noted
Discussion

• Results of eAgora not using agent
  • 92% of respondents are in favor of employing eAgora to buy and sell products over the Web.
  • Easy to use & Add issues during negotiation.

• Results of eAgora using agent
  • 83% of participants said that the agent provided helpful advice and suggestions during negotiation.

Pre-negotiations setting could be adjusted during talks.
Agent could adopt an entity.
Choice of several protocols.
Conclusion

• Limitation:
  - Only one protocol for buyer and seller.
  - Limited knowledge-base
  - No actual laboratory or field experiment conducted to verify the performance of eAgora.

• Future Research:
  • Conduct a laboratory experiment
  • Expand the agent
Thank you!

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Fusebox Methodology

• Fuse Engine:
  - Fuses: components of a Web page (dsp, lay, qry or act).
  - Fuseaction: connection of fuses to form a Web page.
Agent-Oriented Methodology

• Agent Model:
  • Agent's role in the system

• Service Model:
  • Knowledge-base (fuzzy logic)

• Acquaintance model:
  • Communication in MAS (not in the scope of this project)
Host negotiation

Host Form

This form allows you to host your own negotiation. Just provide all the information required and you are on your way!

What is your product?  
Car

Describe the product:  
2000 Toyota, Corolla

What is your role?  
Seller □ or Buyer □

Would you like the agent to help you?  
yes □ or no □
Pre-negotiation setting

Seller Issue Rating

Please enter your importance rating of between 0 to 100 for these issues indicated by sliders below.
("0" represents an issue with no value whereas "100" represents an issue with the utmost value).

Price
Rating: 20
0 little some much very much most 100

warranty
Rating: 20
0 little some much very much most 100

winter tires
Rating: 20
0 little some much very much most 100

http://interneg.org
Join negotiation

http://interneg.org
Offer formation

Your negotiation partner last offered this:

<table>
<thead>
<tr>
<th>Price</th>
<th>warranty</th>
<th>winter tires</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10,000</td>
<td>3 months</td>
<td>included</td>
<td>-100</td>
</tr>
</tbody>
</table>

Agent thinks the following are possible good offers:

<table>
<thead>
<tr>
<th>Price</th>
<th>winter tires</th>
<th>warranty</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$18,400</td>
<td>excluded</td>
<td>no coverage</td>
<td>75.</td>
</tr>
<tr>
<td>$18,600</td>
<td>excluded</td>
<td>1 month</td>
<td>75.</td>
</tr>
<tr>
<td>$18,650</td>
<td>excluded</td>
<td>3 months</td>
<td>75.</td>
</tr>
<tr>
<td>$19,550</td>
<td>included</td>
<td>no coverage</td>
<td>75.</td>
</tr>
<tr>
<td>$19,700</td>
<td>included</td>
<td>1 month</td>
<td>75.</td>
</tr>
</tbody>
</table>

Please enter your offer.

Price: $\text{__________}00

(Please round off to nearest dollar without using a comma or space, eg. ten thousand is entered as 10000)

warranty: 3 months, winter tires: included

Message for negotiation partner:

Submit
Offer reception

**Buyer Offer Reception**

Your negotiation partner has proposed the following:

Offer price is: **$18,000**

Bid option for each issue:

<table>
<thead>
<tr>
<th>Issue Name</th>
<th>Bid option</th>
<th>Issue Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>warranty</td>
<td>no coverage</td>
<td>warranty concerns coverage period with these options: 3 months, 1 month, no coverage</td>
</tr>
<tr>
<td>winter tires</td>
<td>excluded</td>
<td>winter tires concerns as part of settlement with these options: included, excluded</td>
</tr>
</tbody>
</table>

You should reject this offer, because it is valued at 0.0 (any value below 0 is outside of your pre-negotiation settings). This offer is better than the last one, which was -18. You may want to make a new offer and acknowledge your counter-part for having made a better deal.

Would you like to?

- Propose counter offer
- Propose New Issue
- Accept Offer
- Terminate Negotiation

[http://interneg.org](http://interneg.org)
Propose new issue

[Image of an eAgora interface for adding or editing an issue form. The form includes fields for issue name, issue description, and options A to E with choices for whether the buyer or seller pays and the time required for delivery. Options include: A) Buyer pays 2 days, B) Seller pays 5 days, C) 1 week, D) blank, E) blank. The form also includes a submit button.]
Offer acceptance

Seller Offer Acceptance

You want to sell car bearing this description: 2000 Toyota, Corolla.

Under the following conditions:

<table>
<thead>
<tr>
<th>Price</th>
<th>warranty</th>
<th>winter tires</th>
<th>Inspection</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$14,000</td>
<td>3 months</td>
<td>included</td>
<td>buyer pay</td>
<td>-20.0</td>
</tr>
</tbody>
</table>

You should not accept this offer because it is valued at -20. (any value below 0 is outside of your preference level).

- accept this offer
- exit