Electronic Auctioning

Overview of Auctioning
Auction Terms and Mechanisms
Auction Protocols
Comparison of protocols
AutoBot server
Security Threats
Today’s auctioning systems
Conclusion
References
Overview of Auctioning

Electronic auctioning is revolutionizing the c-c, b-c, b-b commerce.

New business opportunities
– search engines now auctioning top positions of their search list!
– online auctioning is reaching much more broader customer base

Challenges: fairness, privacy, security, speculation, manipulation, price-wars, convergence

Software agents replacing human agents!
Auction Terms

Auctioneer
– One who is auctioning on behalf of the seller

Bidder
– potential buyer in the marketplace

Agents
– connects potential buyers and sellers
– software agents facilitate personalized, continuously running, auction systems.
– Negotiating agents takes auctioning one step further by bidding and setting terms and conditions thus acts on behalf of its user
Auction Mechanisms

Single-sided auction
- bidders are uniformly of type buyer or seller

Double-sided auction
- admits multiple buyers and sellers at once

English auction
- First-Price, Open-Cry auction
- Progressively higher bids until no bid exceeds current bid making the highest bidder winner.

Dutch auction
- Auctioneer begins at high price and decrements until some bidder accepts to buy at current price
Auction Mechanisms

First-Price Sealed Bid auction
– In this type of auction, each buyer submits only one bid in a sealed envelope and the highest bid wins the auction.

Vickrey Auction
– Here simultaneous sealed bids are made. The winner is the buyer with the highest bid, but only pays the second highest bid.
Auction Mechanisms

Contract Net Protocol [Smith80]

Manager

Contractor

Select Contractor

Judge Management Possibility

Bid

Award

Execute Sub Task

Single-Bidding Auction

Multi-Bidding Auction Protocol

Auctioneer

Buyer

Determine Price

Hope

Determine Number

Yes

Judge Compete

No

Knockdown

Get Distribute Information

Multi-Bidding Auction
Auction Protocols

Negotiation Scenarios

- Single-dimension Auctions, where in one preference for both sellers and buyers. That is, best price is preferred by all.

- Multi-dimension Auctions where in there is different preference weightings for sellers and buyers. This means that the service provider who offers best price does not necessarily match the buyer’s needs.

Choice of negotiation protocol relates to security, anonymity, privacy, atomicity, cost. Negotiation-key 2 multi-agent system!
Auction Protocols

ADEPT project auction protocol

– A first-price open-cry protocol for multi-dimensional auctions.

– 1. Initiation: The process begins with an announcement from the SS agent consisting of the list \{ FPOC, \( u_B(s) \), \( p_0 \), \( m_i \), \( T \), \( X \) \}

  – Where FPOC: type of auction, \( u_B(s) \): buyer’s declared utility function; \( p_0 \): maximum amount the buyer is willing to pay; \( m_i \): minimal acceptance level of offers; \( T \): maximal time buyer will wait for a new offer before accepting existing one; \( X \): percentage figure by which a new offer has to exceed the last offer in order to be considered.
Auction Protocols

ADEPT project auction protocol continued

• 2. Auction: SP-agents submit offers $s$ wherein $s > m_i$ for consideration by SS-agent. An offer will be accepted by SS-agent if it exceeds the last offer by $X$ percentage and $T$ is not elapsed. The acceptable offer is made public by the SS-agent with the identity of SP-agent.

• 3. Termination: The auction terminates $T$ seconds after the last acceptable offer was made.

ADEPT project pre-auction protocol

• If an SS-agent cannot initiate FPOC or appropriately starts one-to-one negotiation, pre-auction protocol can be used to remove inefficiencies.
Auction Protocols

• I. Initiation: An SP-agent approached by an SS-agent announces a “pre-auction protocol” to the other sp-agents.

• II. Pre-Auction: SP-agents compete using an English auction, with the difference that the maximum price is taken as \((1 - A).P_0\) where \(A\) is small and the winning bid is \(S\) and the winning SP-agent has index \(i\).

• III. Negotiations: Here “\(i\)” makes a take-it-or-leave-it offer to SS-agent of service \(S\) for a price of \(P_0\). All other SP-agent do not negotiate with the SS-agent.

• IV. Insurance: “\(i\)” then pays the other sp-agents, \(A. P_0/n\) for their cooperation
Auction Protocols

CPO protocol
– buyer-driven protocol
– Steps include:
  • get arbiter’s approval by buyer
  • posting the CPOs to the server
  • browsing the CPOs by potential sellers
  • binding the CPOs
  • delivery of the CPOs
– a secure protocol
Auction Protocols

Other protocols discussed in my survey report are:

– Secure auction protocol
– Double Auction Protocol
– Multi-agent contracting negotiating protocol

Above protocols are compared in next slide.
### Comparison of protocols

**Table 1: Comparison of Negotiation Protocols**

<table>
<thead>
<tr>
<th></th>
<th>ADEPT Protocol</th>
<th>ADEPT Pre-Auction Protocol</th>
<th>CPO Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auction Mechanism</strong></td>
<td>FOPC (buyer initiated)</td>
<td>FOPC (seller initiated)</td>
<td>Sealed bidding</td>
</tr>
<tr>
<td><strong>Response time and convergence</strong></td>
<td>Quick because there is time limit in the cost function</td>
<td>Quick as it involves Take-it-or-leave-it offer</td>
<td>Slow because it involves parties and checks</td>
</tr>
<tr>
<td><strong>Applicability to large set of services</strong></td>
<td>Yes, because it is a multi-dimensional system</td>
<td>Yes, it is efficient especially in one-to-one negotiation or when fine details are being finalized with one seller and buyer.</td>
<td>No, system doesn’t support multi-variable utility function. However, a variation would make it broader to services.</td>
</tr>
<tr>
<td><strong>Robustness</strong></td>
<td>Yes, it is based on modified English auction</td>
<td>Yes, it is based on modified English auction</td>
<td>Negotiation mechanism is discussed. More general protocol</td>
</tr>
<tr>
<td><strong>Auction Type</strong></td>
<td>Buyer-driven</td>
<td>Seller-driven</td>
<td>Buyer-Driven</td>
</tr>
<tr>
<td><strong>Fulfilling contract</strong></td>
<td>No mechanism</td>
<td>No mechanism</td>
<td>Yes, bond certificates</td>
</tr>
<tr>
<td><strong>Security Attacks</strong></td>
<td>No mechanism</td>
<td>No mechanism</td>
<td>Encryption and digital signatures are part of the negotiation process</td>
</tr>
<tr>
<td><strong>Anonymity</strong></td>
<td>No</td>
<td>No</td>
<td>Yes, involve server and a</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td>Delays sometimes play significant role in bargaining especially one-to-one but there is no incentive to wait in this protocol. Very useful if deadlines are set to complete transactions.</td>
<td>Slightly costly because of Insurance “A” for all SP-agents. But it is a trade-off against the inefficiencies of long direct negotiation.</td>
<td>Costly because of involving arbiter and server. Also, complex process to set up CPO because involves interactions among multiple agents in an order. Buyer of picks up the advertiser cost by posting the CPO.</td>
</tr>
</tbody>
</table>
## Comparison of protocols

### Table 1: Comparison of Auction Protocols

<table>
<thead>
<tr>
<th></th>
<th>Double Auction Protocol</th>
<th>Secure Auction Protocol</th>
<th>Multi-Agent Contracting Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mechanism</strong></td>
<td>English Auction</td>
<td>FPSB</td>
<td>Sealed bid</td>
</tr>
<tr>
<td><strong>Auction type</strong></td>
<td>Many-to-many</td>
<td>Customer-to-customer</td>
<td>Buyer driven one-to-many</td>
</tr>
<tr>
<td><strong>Anonymity</strong></td>
<td>No such mechanism</td>
<td>Yes, uses encrypted messages</td>
<td>Yes, system itself ensures</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>security and java/corba implemented</td>
</tr>
<tr>
<td></td>
<td>Yes, automated agents can mask private data</td>
<td>Yes, uses cryptography</td>
<td>Yes, involves proxy which maintains privacy</td>
</tr>
<tr>
<td><strong>Transaction Cost</strong></td>
<td>No, delivery involves no mediator</td>
<td>Yes, uses merchant as third party</td>
<td>Yes, session involves dealing with exchange delivery mechanism contract service leaving anonymity!</td>
</tr>
<tr>
<td></td>
<td>Less as there is no third party involved</td>
<td>Must pay merchant cost.</td>
<td>Overhead session cost</td>
</tr>
</tbody>
</table>


AutoBot Auction Server
Security Threats

Types of attacks

– black-box attacks
  • seller collusion, jurisdiction problems, delivery failure

– End-Run attacks
  • false certificates, hard-to-interpret conditions, key companies, repudiation

– Direct attacks
  • forged bonding certificates, forged arbiter certificates, forged post or binding a CPO in CPO protocol
  • Learning CPO in advance by attacking the arbiter
## Today’s Auctioning Systems

<table>
<thead>
<tr>
<th></th>
<th>Persona</th>
<th>Logic</th>
<th>Firefly</th>
<th>Bargain Finder</th>
<th>Jango</th>
<th>Kasbah</th>
<th>Auto Bot</th>
<th>Tete-a-Tete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product brokering</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
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<tr>
<td>Merchant Brokering</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>Negotiation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Conclusion
Electronic auctioning offers wide variety of services to consumers. Consumers can now balance factors like price, QOS, delivery time, availability etc. before agreeing!
Agent-Mediated negotiation empowers buyers to form coalition for better bargaining power (can bid for retail prices on the custom products?)
Standards required on agent communication
Agent-driven electronic auction will make internet commerce ubiquitous!
References

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      » http://www.acm.org/pubs/journal/ton

      » http://www.ieee.org
References


  » http://www.acm.org

– and few more ……….