The Unique-Bid Auction

TJHS Computer Systems Lab

2006-2007

To create an auction environment that allows human and robotic bidders to compete for a fictitious auction item

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The Auction

Seller's Perspective:

- Seller sets a bidding range below value of item
- Seller determines a set number of bidders
- Bidders pay a bidding fee to the seller and submit their bids
- Winning bidder pays his/her bid and receives the item

Example:

- $60,000 Cadillac for a maximum bid of $120
- 6 000 bidders
- $10 fee ($60,000 to the auctioneer)
- Winning bidder gets a Cadillac for at most $130
- Losing bidders lose $10
- Seller gets at most $120 profit

The Auction

Bidders' Perspective:

- Bidders submit bid within the bidding range
- Item goes to the bidder
- who picks the highest value that no other bidder chooses.
- In event of tie, item goes to first bidder who picks correctly

Example:

- In Cadillac auction, bidding distribution is:

  $120, 120, 120,

  119, 119, 119, 119,

  118, 118,

  117,

  116,

  115, 115,

  ...

  Highest unique bid is $117

Important Classes

- Auctioneer
- GUI
- Player
- Strategy
- Analyzer

Important Classes

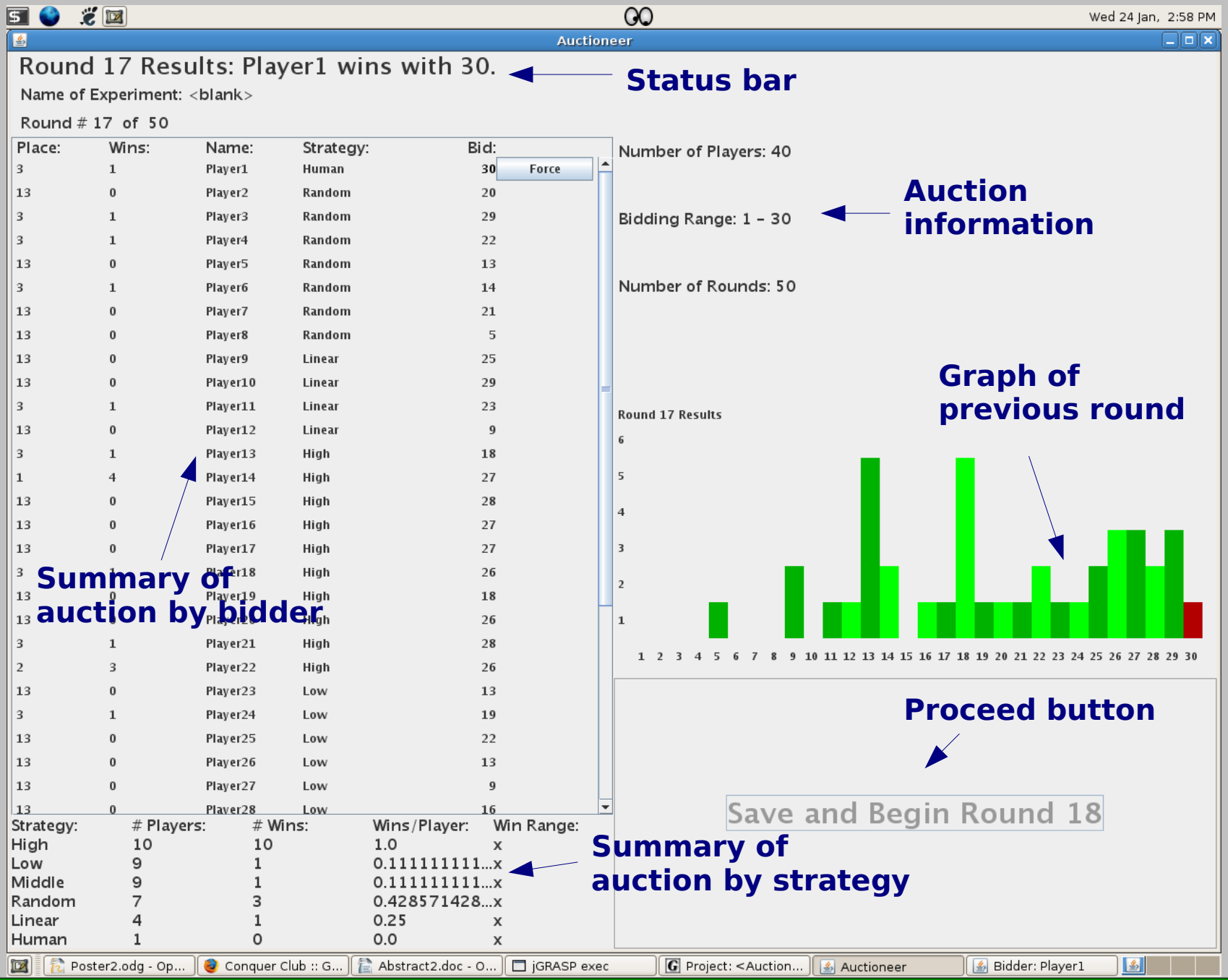
Auctioneer

- Prompts the Bidders for information
- Controls the auction
  - Sets parameters
  - Controls the tempo of the experiment
  - Determines the winners
- Manages the robotic bidders
- Runs the Auctioneer interface

Auctioneer

- GUI
- Player
- Strategy
- Analyzer

Auctioneer Interface



Important Classes

GUI

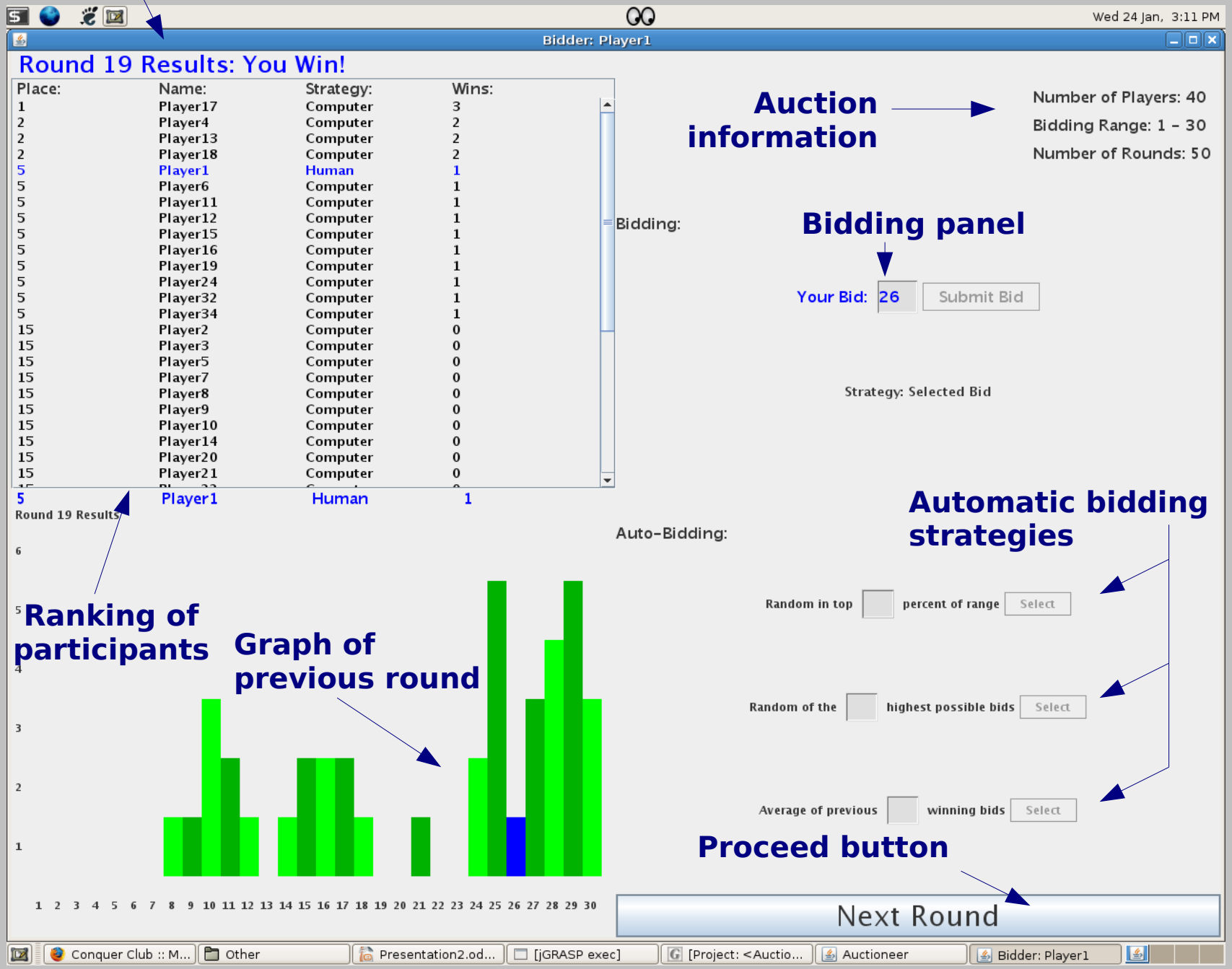
- Controls the actions of one Bidder
  - Does not hold any of the auction information
- Runs the Bidder interface

- Auctioneer

GUI

- Player
- Strategy
- Analyzer

Bidder Interface



Important Classes

Player

- Holds the information of one bidder
  - Robotic bidders and human Bidders
  - “Name”
  - Strategy
  - Number of wins
  - Value of last bid

- Auctioneer
- GUI

Player

- Strategy
- Analyzer

Important Classes

Strategy

- Holds the bidding distribution for the robotic players
- Selects a bid according to the distribution
- Updates the distribution based on the previous round's results

- Auctioneer
- GUI
- Player

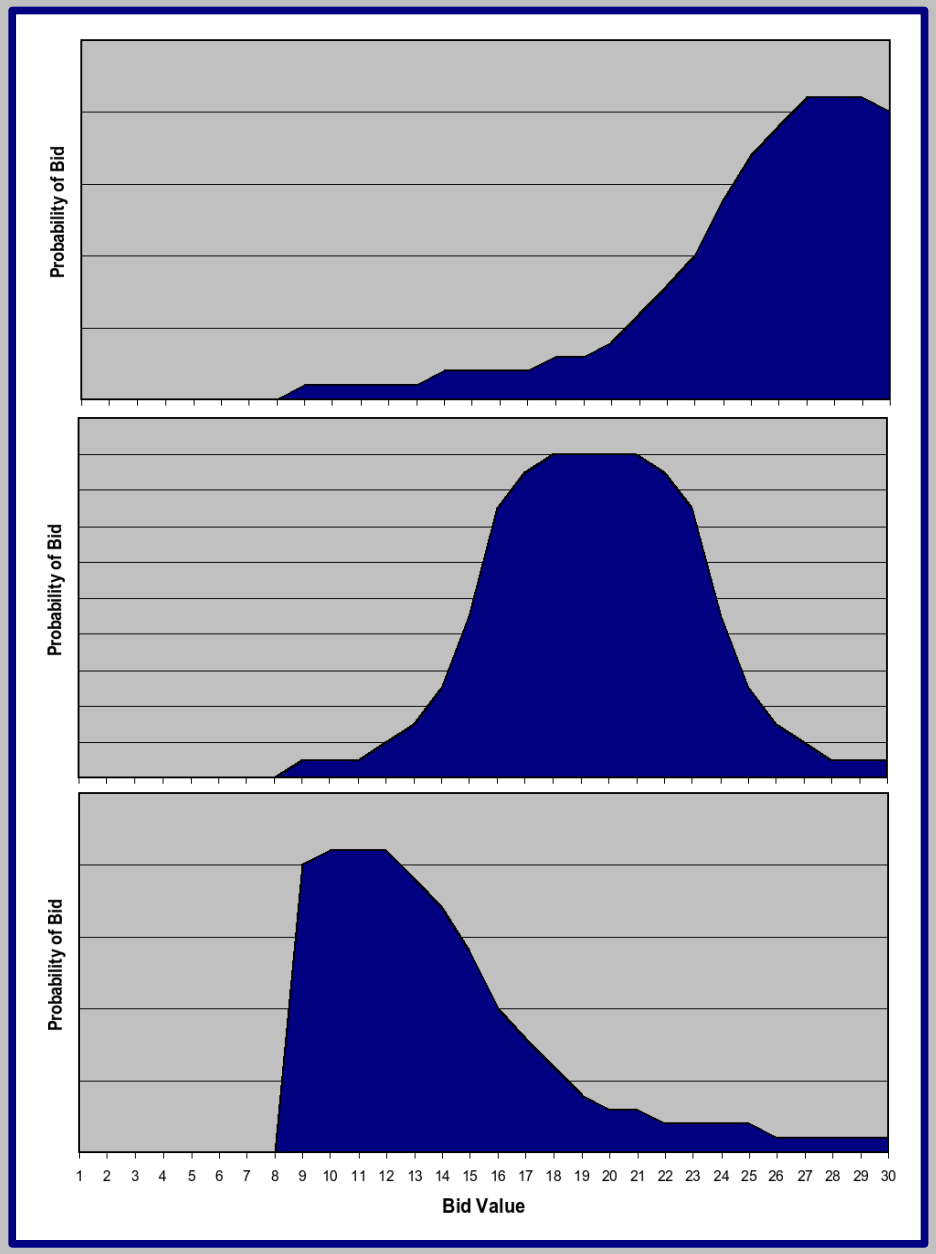
Strategy

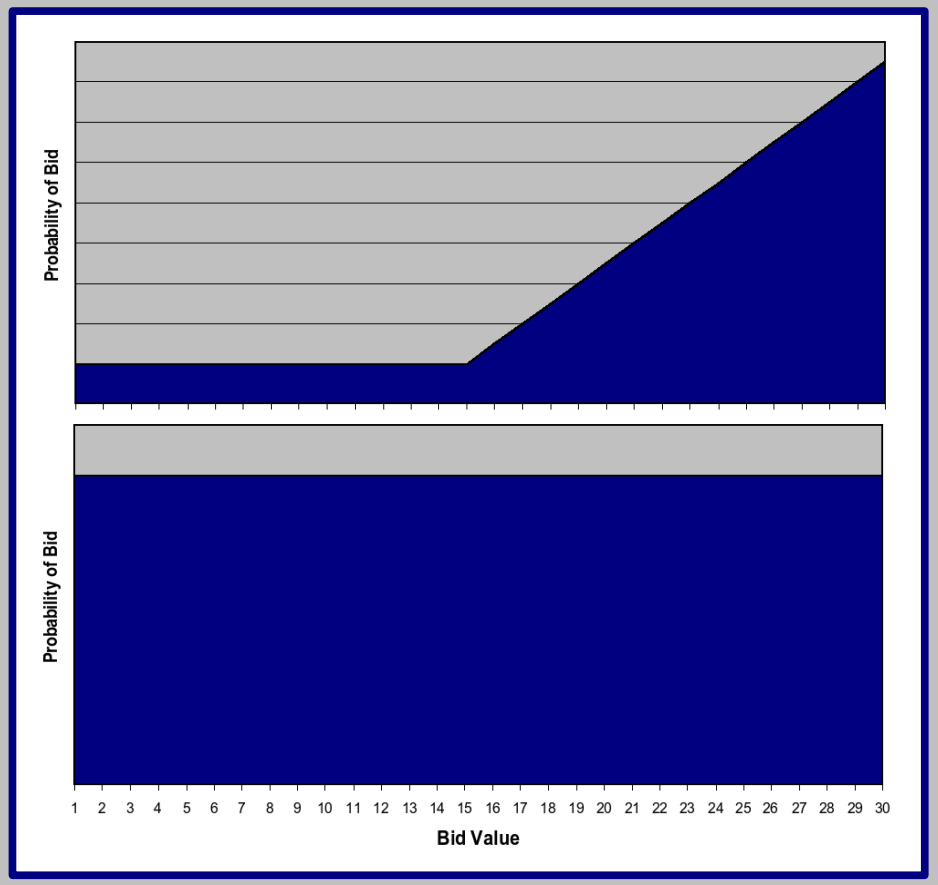
- Analyzer

Robotic Bidders

- Robotic bidding strategy involves picking randomly from a probability distribution
- When bid does not win, the chance of bidding that value decreases
- For each round, the chance of bidding the winning value value increases

Original Bidding Distributions





Important Classes

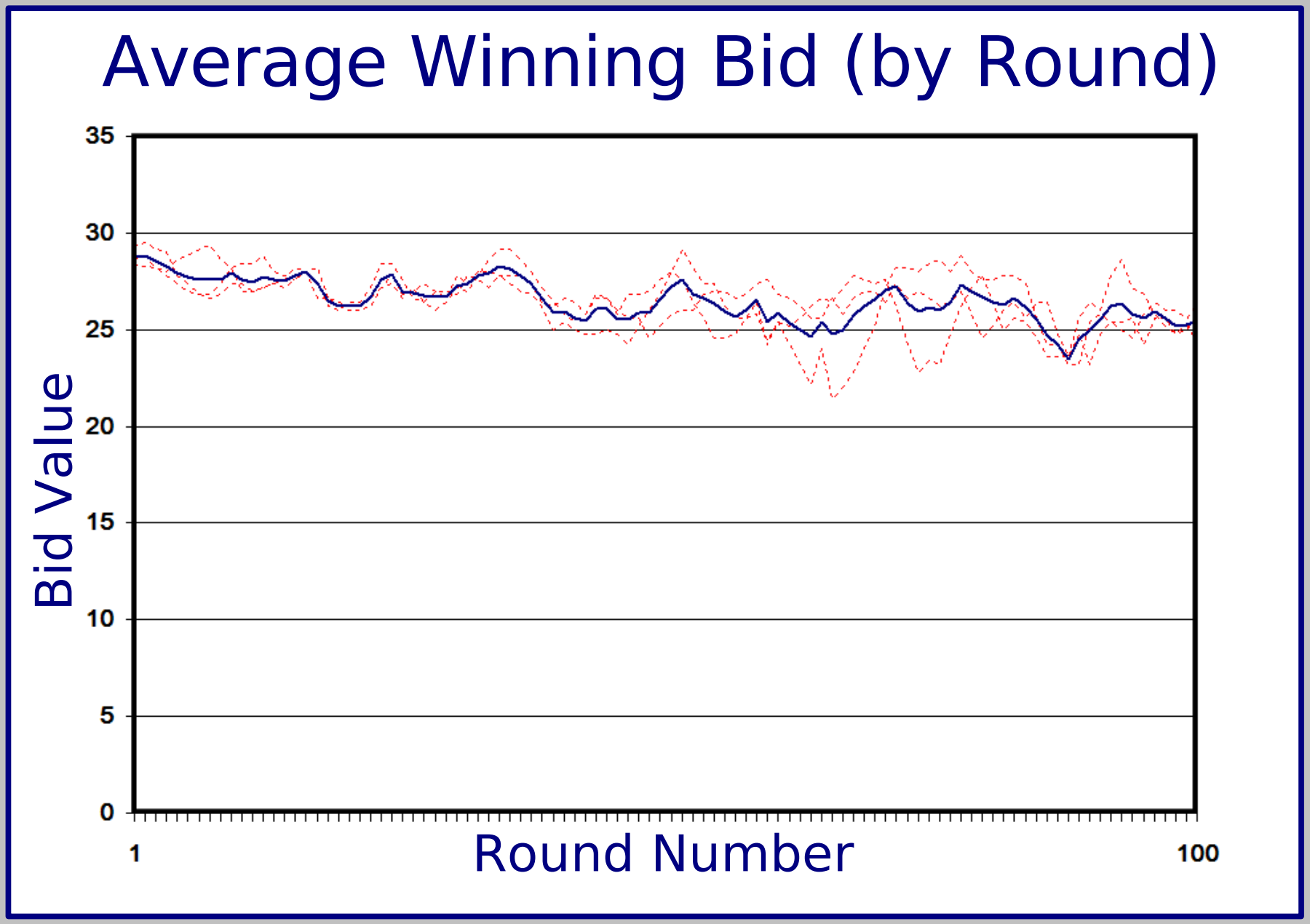
Analyzer

- Creates the histogram that displays the results of a round
  - Marks the winning bid and a bidder's bid
  - Separate versions for the Bidders, the Auctioneer, and Bidders who are forced to skip the round

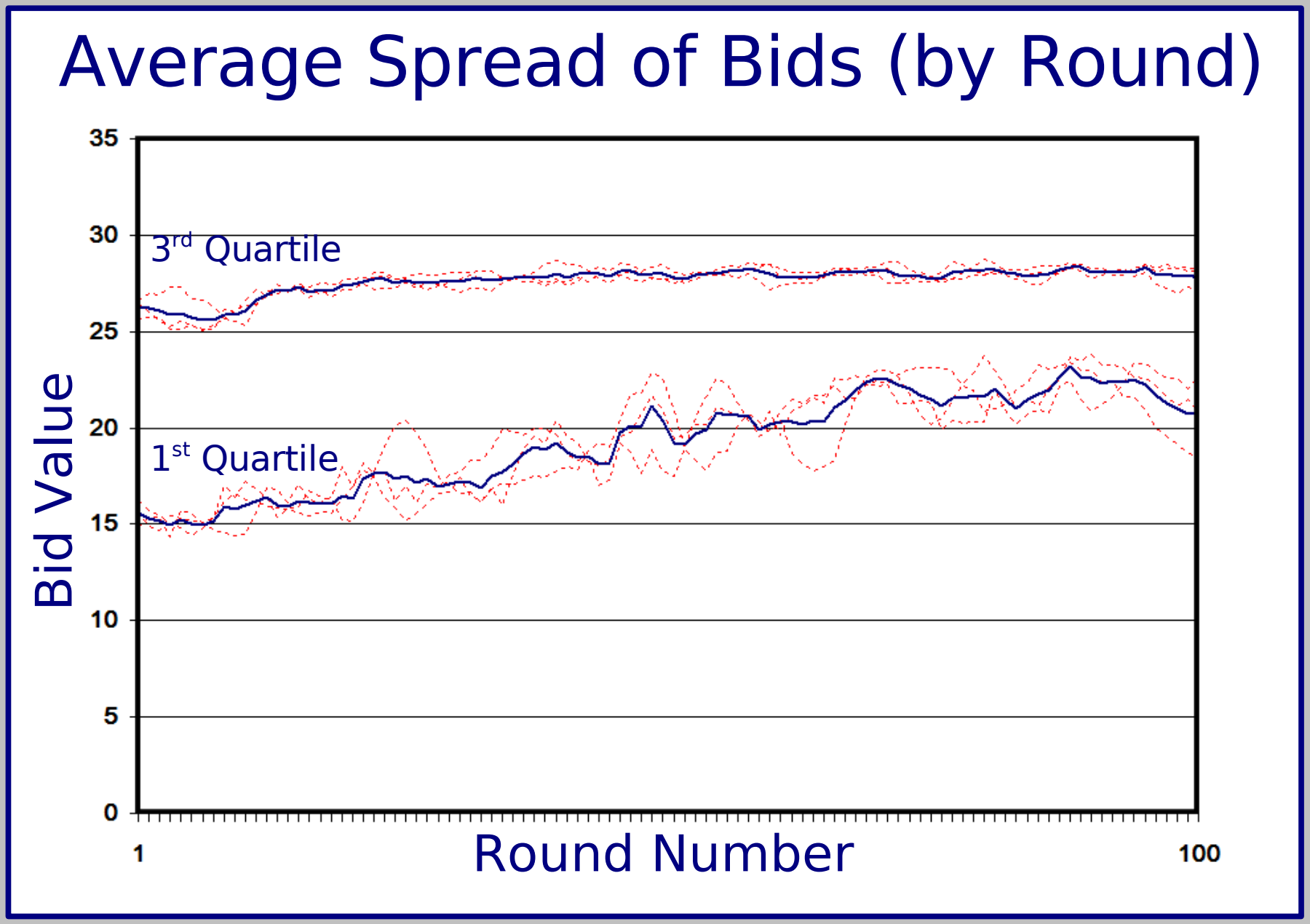
- Auctioneer
- GUI
- Player
- Strategy

Analyzer

Findings


Average Winning Bid (by Round)
Bid Value
35
30
25
20
15
10
5
0
1
Round Number
100

Findings


Average Spread of Bids (by Round)
Bid Value
35
30
25
20
15
10
5
0
3rd Quartile
1st Quartile
1
Round Number
100

Further Questions

When deciding on a value to bid, players need to evaluate the behavior of opponents.

- How does the size of the auction affect the behavior of the auction?

As the rounds progress, players are forced to reevaluate their bidding strategies.

- How does access to the previous round's information affect the behavior of the auction?