

The Unique-Bid Auction

TJHS Computer Systems Lab

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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

Round 17 Results: Player1 wins with 30. ← **Status bar**

Name of Experiment: <blank>

Round # 17 of 50

Place:	Wins:	Name:	Strategy:	Bid:
3	1	Player1	Human	30
13	0	Player2	Random	20
3	1	Player3	Random	29
3	1	Player4	Random	22
13	0	Player5	Random	13
3	1	Player6	Random	14
13	0	Player7	Random	21
13	0	Player8	Random	5
13	0	Player9	Linear	25
13	0	Player10	Linear	29
3	1	Player11	Linear	23
13	0	Player12	Linear	9
3	1	Player13	High	18
1	4	Player14	High	27
13	0	Player15	High	28
13	0	Player16	High	27
13	0	Player17	High	27
3	1	Player18	High	26
13	0	Player19	High	18
13	0	Player20	High	26
3	1	Player21	High	28
2	3	Player22	High	26
13	0	Player23	Low	13
3	1	Player24	Low	19
13	0	Player25	Low	22
13	0	Player26	Low	13
13	0	Player27	Low	9
13	0	Player28	Low	16

Number of Players: 40

Bidding Range: 1 - 30 ← **Auction information**

Number of Rounds: 50

Graph of previous round

Round 17 Results

Proceed button

Save and Begin Round 18

Summary of auction by bidder

Strategy:	# Players:	# Wins:	Wins/Player:	Win Range:
High	10	10	1.0	x
Low	9	1	0.11111111...x	
Middle	9	1	0.11111111...x	
Random	7	3	0.428571428...x	
Linear	4	1	0.25	x
Human	1	0	0.0	x

Summary of auction by strategy

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

Status bar



Number of Players: 40
Bidding Range: 1 – 30
Number of Rounds: 50

Bidding panel

Your Bid: 26

Strategy: Selected Bid

Automatic bidding strategies

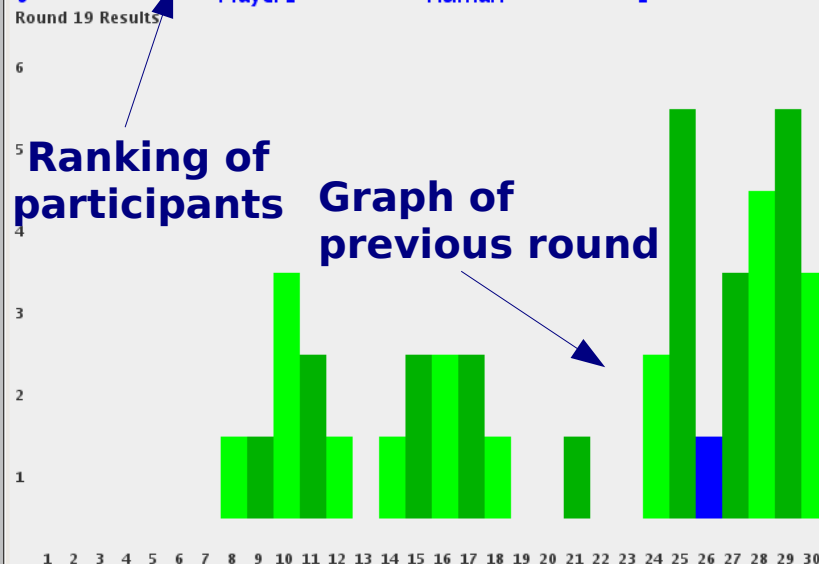
Random in top		percent of range	Select
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Random of the highest possible bids

Average of previous winning bids

Proceed button

Next Round



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

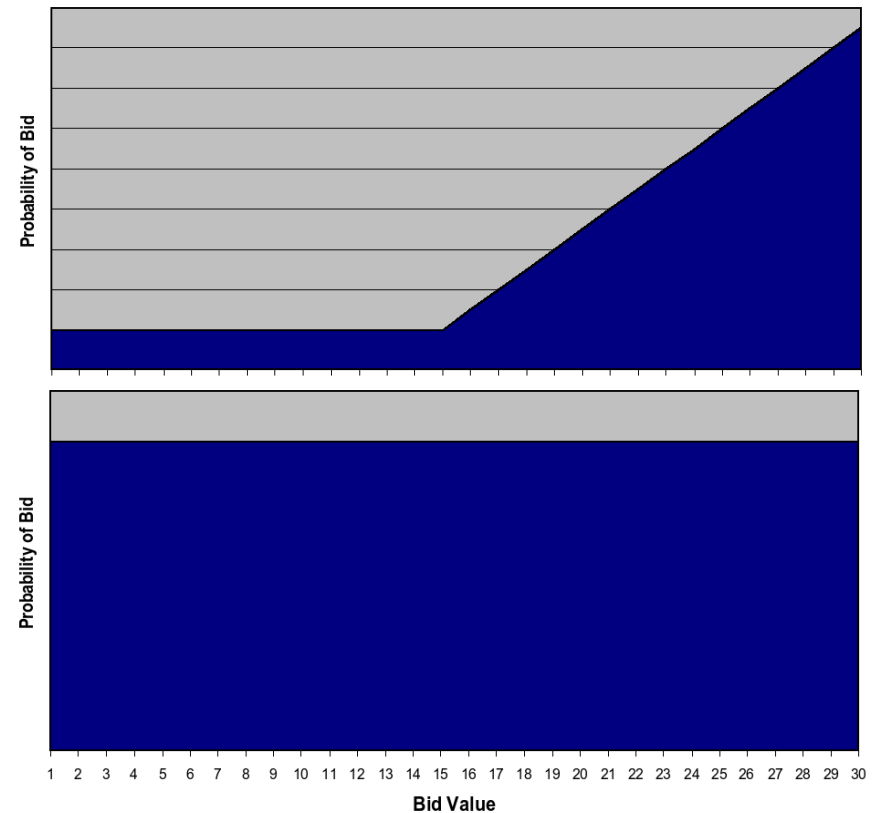
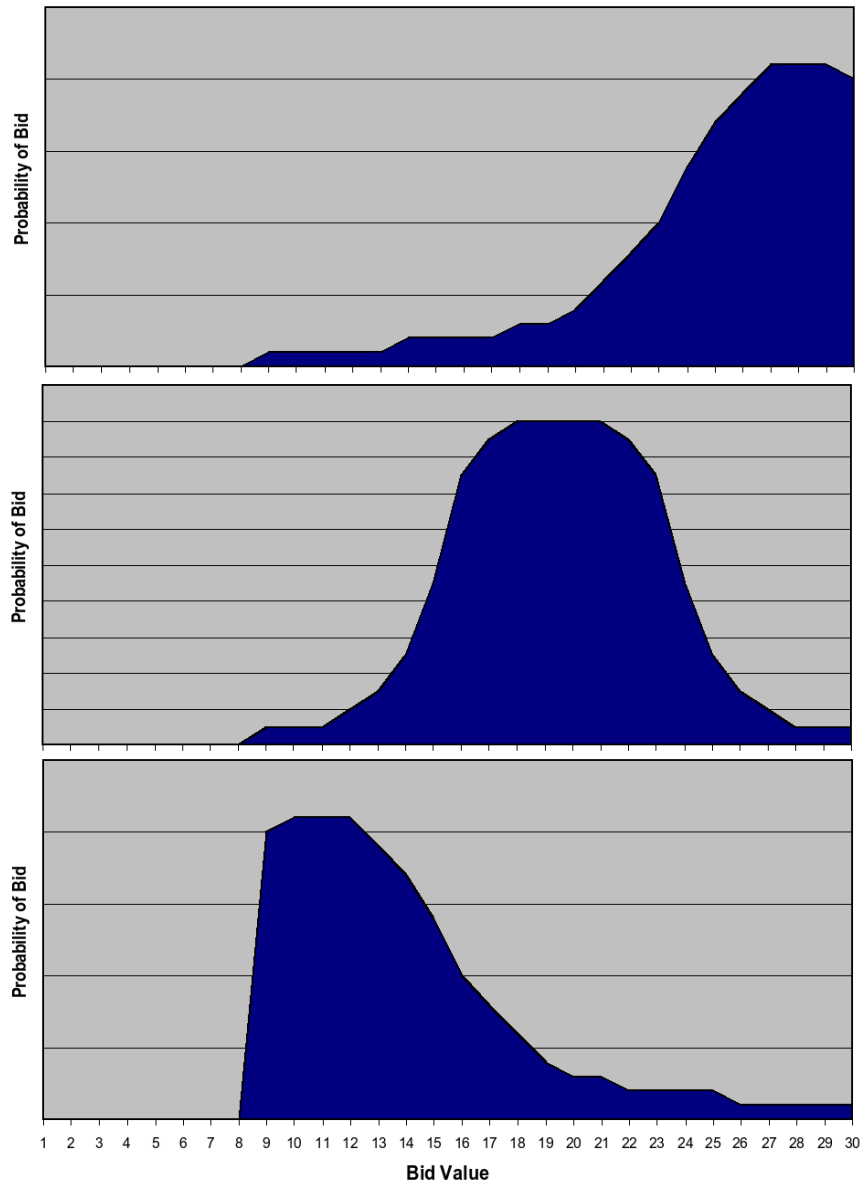
Strategy

- 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

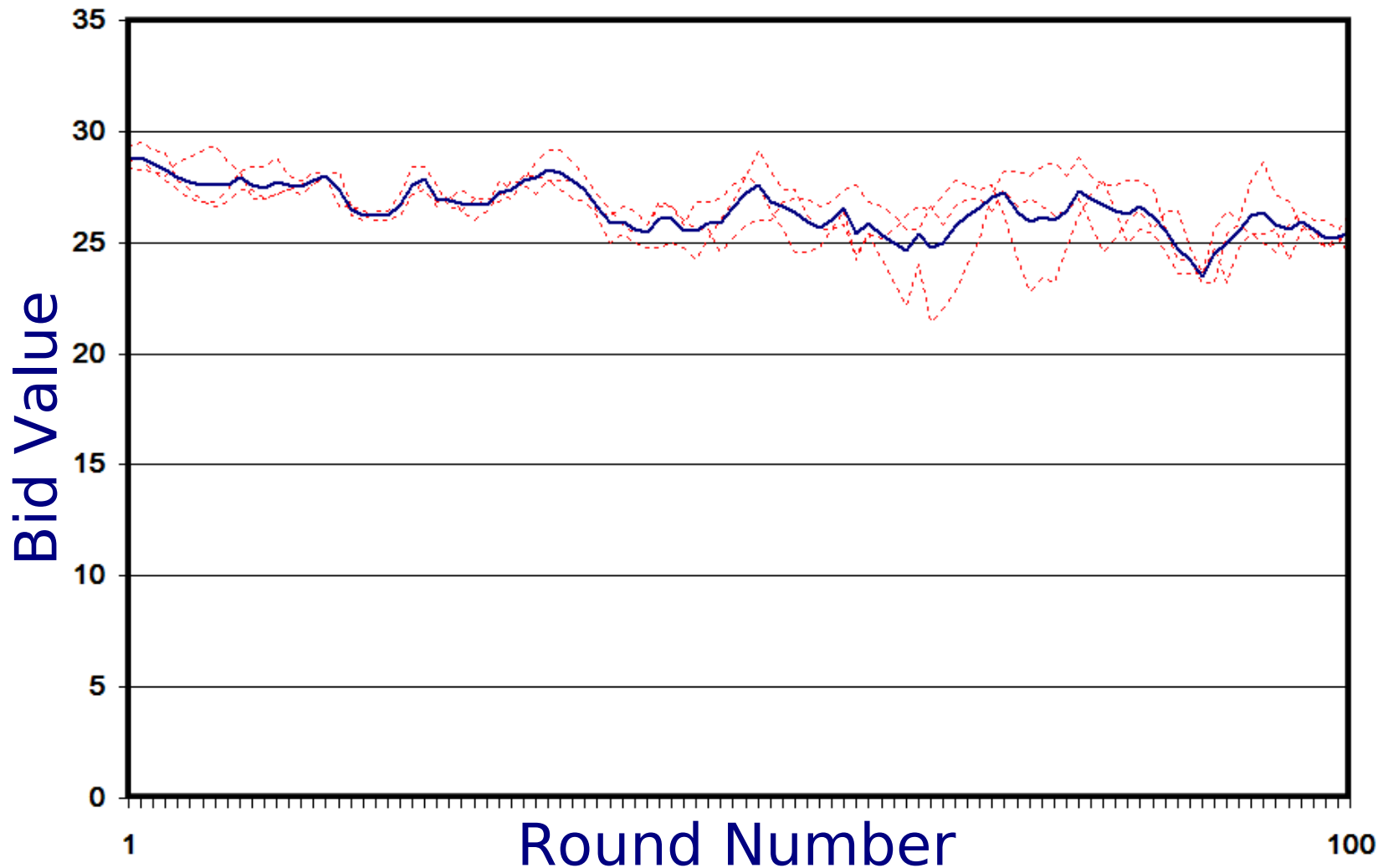
Analyzer

- 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

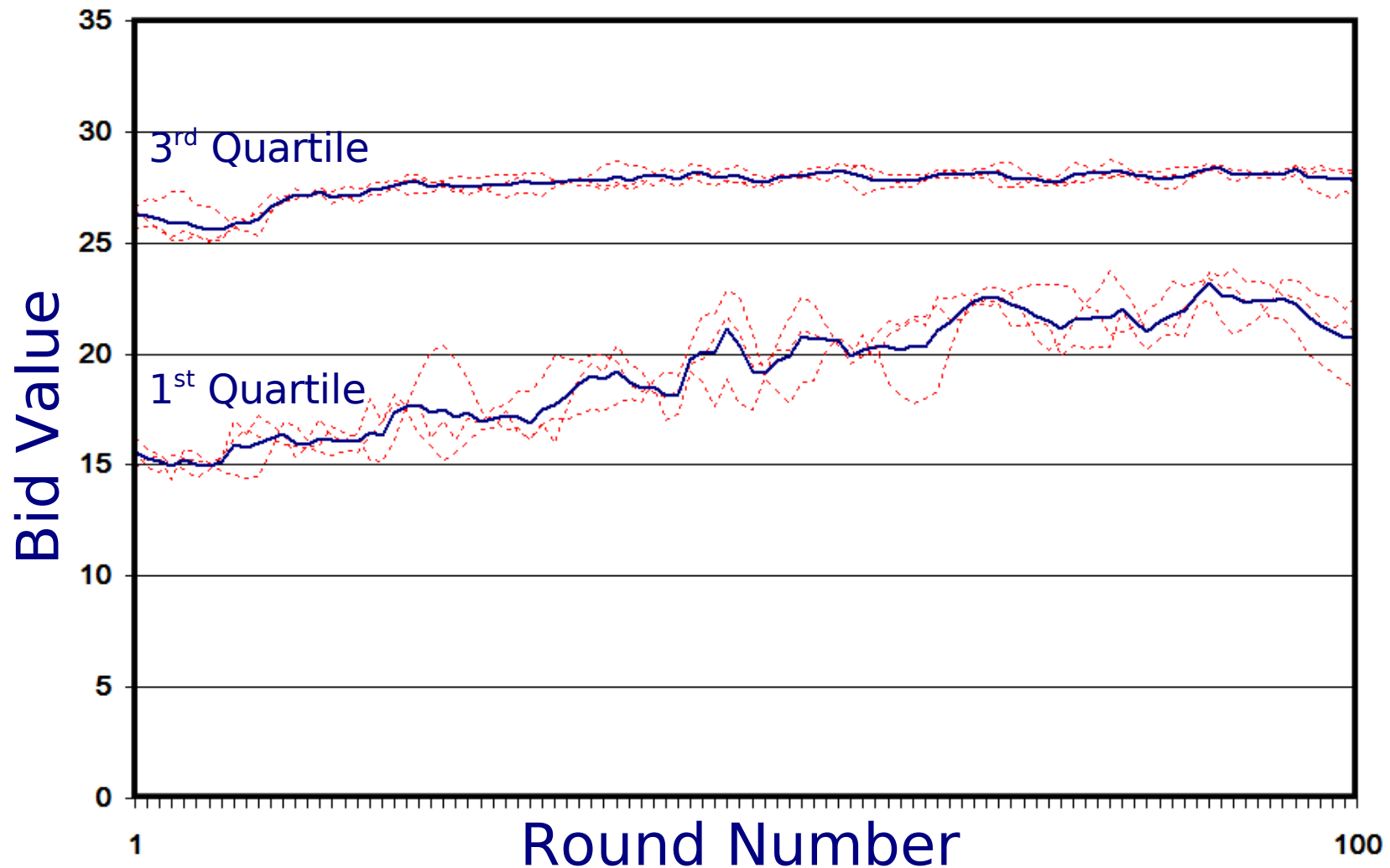
Findings

Average Winning Bid (by Round)



Findings

Average Spread of Bids (by Round)



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?