

CSCE 475/875 Multiagent Systems

Game Day 3: Auction Day

Assigned: March 31, 2020 Game Day: April 7, 2020

Introduction

On Auction Day, the teams are required to participate in various rounds of auctions. Each team's goal is to obtain goods through bidding. The key is to obtain goods that are important to you with the limited amount of resources you have. The objectives of Auction Day are to learn the various auction protocols more in-depth, to learn how to manage resources to obtain services/goods of high utility, and to learn how to observe the environment (e.g., the behavior of other agents) to support own decision making process.

Setup

First of all, as we have learned in class: in auctions, the auctioneer wants to maximize its own profit. For our game day, I will be the auctioneer. I will conduct the auctions based on the above principle; however, the evaluation of your participation as bidders will not be based on my eventual profit.

Second, each team is a bidder (an agent). Each team will be given the same amount of virtual money and a list of items. Every team thus knows the amount of virtual money initially owned by each team. However, a team's valuation of each item is only *known* to that team.

Prior to the start of the Auction Day, each team **MUST** provide the Game Day Monitor their valuations of the items. To make things interesting, here is the rule on your valuations of the ten (10) items. There are ten possible valuations: \$200, \$180, \$160, \$140, \$120, \$100, \$80, \$60, \$40, \$20. Your valuation of an item must use one of the 10 values, and all ten values must be used once. **Please fill out the form in the Appendix clearly and submit the paper copy of that to the Game Day Monitor. This must be done before the Game Day starts.**

Note that our auctions are *private value auctions*; that is, the value of an item depends only on a team's own preferences (the utilities). There is no re-sale value here.

Third, we aim to have 10 rounds of auctions. (Thus, use your resources well). There will be five different auction protocols. Here we briefly describe them. (You should know which strategies to use for which protocol and how to behave when an auction protocol is announced. You are not allowed to ask questions and the auction process will not wait for you to figure out what to do.)

IMPORTANT: Because we aim to have 10 rounds, we will not wait for teams that are slower than the others. We will try to stick to a strict schedule of auctions. Thus, please be prepared.

Fourth, all auctions are all-pay auctions. There is a fee for each round of auction (\$2). If you sit out of a round, then you will not be charged with a fee for that round.

Finally, every team is required to win at least one auction round. Any team that fails to win at least one auction round will be assessed a penalty of -\$2,000.

IMPORTANT: This is a game-changer as it should cause you to think about the strategy for your game day. Think about how you can model other teams and sabotage their bid attempts.

Protocol	Description
English Auction (first-price, open-cry)	Each bidder is free to raise its bid. When no bidder is willing to raise anymore, the auction ends, and the highest bidder wins the item at the price of his/her bid.
Japanese Auction (first-price, open-cry, open exit)	Same as above but with open-exit. Auctioneer will raise price and bidders declare whether to stay in the auction.
Dutch (descending) Auction	The auctioneer continuously lowers the price until one of the bidders takes the item at the current price. The winning transaction will be announced to all teams.
First-Price Sealed-Bid Auction	Each bidder submits one bid without knowing the others' bids. The highest bidder wins the item and pays the amount of this bid. The winning transaction will be announced to all teams.
Vickrey (Second-Price Sealed-Bid) Auction	Each bidder submits one bid without knowing the others' bids. The highest bidder wins, but at the price of the second highest bid. The winning transaction will be announced to all teams.

No bidder collusions are allowed. The auctioneer does not lie.

Software Support

Important: Prior to the start of each round, each team **is required** to submit a form on Canvas indicating if they are participating in the round or not.

For the English auctions, we will conduct them verbally.

For the Japanese auctions, we will conduct them verbally as well. Each team will be asked to enter "<Team Name> Exits" on Zoom's Chat (**use "privately" to the instructor**) whether they want to exit the auction.

For the Dutch descending auctions, the auctioneer will announce the prices verbally. If you want to bid at the current bid price, you are required to submit your intention on **Zoom's Chat**.

For the sealed-bid auctions, you will be asked to submit a form on Canvas with your bid amount.

For the sealed-bid auctions, if there are additional rounds of bidding due to ties, those involved in the tie-breaking rounds will be required to submit the form mentioned above again. If the round was 5, then the first tie-breaking round will be called 5.1, the second 5.2, and so forth. Please follow these protocols precisely.

Requirements

Each team is required to turn in three reports: pre-game strategies, mid-game strategies, and post-game lessons learned.

- Pre-game strategies are to be handed in before the Game Day starts.
- The report on mid-game strategies consists of your observations noted down on your worksheets during the Game Day
- Post-game lessons learned are handed in at the end of the Game Day.

Some ideas on what should be included in the reports: your strategies for each round of auction (are you risk-neutral or risk averse? pre-determined? adaptive to other teams? from the lectures?), how you divide the members of the team to different tasks, your net utility gained for each round (e.g., if you lose a bid, and you pay a fee, then the net utility for that round is a negative value, the fee), the amount of money left and total net utility gained, your observation of other teams during the auction process (can you figure out what they are doing?), and finally your conclusion.

Your participation on Auction Day will be graded based on:

50% Game Day Report (pre-game and mid-game strategies, worksheets)

50% Auctions

The auctions will be graded based on your in-class participation on Auction Day, and on your team's performance.

FAQs

1. If the best offer the auctioneer receives from the bidders is below the market price of the item being auctioned, the item will be kept by the auctioneer and not sold. This market price is not known to the bidders.
2. In the two "sealed bids" protocols, if multiple teams have the same bid, then there will be another round of bidding between those teams only, using the same protocol.
3. Left-over virtual money is yours to add to your final tally of utility. However, $utility(\$X) = \X .

Appendix: Independent Private Values for Auction Day

Team Name: _____

Item	Auction	Valuation
1	English	
2	Japanese	
3	Dutch	
4	Sealed, First-Price	
5	Vickrey	
6	English	
7	Japanese	
8	Dutch	
9	Sealed, First-Price	
10	Vickrey	