Auctions: Taxonomy

Game Theory Course:
Jackson, Leyton-Brown & Shoham

Motivation

Game
Theory
Online

- Auctions are any mechanisms for allocating resources among self-interested agents
- Very widely used
  - government sale of resources
  - privatization
  - stock market
  - request for quote
  - FCC spectrum
  - real estate sales
  - eBay

Auctions: Taxonomy

CS Motivation

- resource allocation is a fundamental problem in CS
- increasing importance of studying distributed systems with heterogeneous agents
- markets for:
  - computational resources
  - P2P systems
  - network bandwidth
- currency needn't be real money, just something scarce
  - that said, real money trading agents are also an important motivation

Some Canonical Auctions

- English
- Japanese
- Dutch
- First-Price
- Second-Price
- All-Pay

English Auction

- auctioneer starts the bidding at some "reservation price"
- bidders then shout out ascending prices
- once bidders stop shouting, the high bidder gets the good at that price

Japanese Auction

Japanese Auction

- Same as an English auction except that the auctioneer calls out the prices
- all bidders start out standing
- when the price reaches a level that a bidder is not willing to pay, that bidder sits down
  - once a bidder sits down, they can't get back up
- the last person standing gets the good

- analytically more tractable than English because jump bidding can't occur
  - consider the branching factor of the extensive form game...

Dutch Auction

- the auctioneer starts a clock at some high value; it descends
- at some point, a bidder shouts "mine!" and gets the good at the price shown on the clock

First-, Second-Price Auctions

First-Price Auction

- bidders write down bids on pieces of paper
- auctioneer awards the good to the bidder with the highest bid
- that bidder pays the amount of his bid

Second-Price Auction

- bidders write down bids on pieces of paper
- auctioneer awards the good to the bidder with the highest bid
- that bidder pays the amount bid by the second-highest bidder

All-Pay auction

All-Pay Auction

- bidders write down bids on pieces of paper
- auctioneer awards the good to the bidder with the highest bid
- everyone pays the amount of their bid regardless of whether or not they win

Auctions: Taxonomy

Auctions as Structured Negotiations

Any negotiation mechanism that is:

- market-based (determines an exchange in terms of currency)
- mediated (auctioneer)
- well-specified (follows rules)

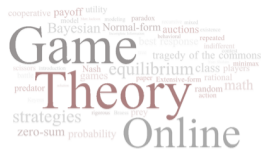Defined by three kinds of rules:

- rules for bidding
- rules for what information is revealed
- rules for clearing

Auctions as Structured Negotiations

Defined by three kinds of rules:

- rules for bidding
    - who can bid, when
    - what is the form of a bid
    - restrictions on offers, as a function of:
        - bidder's own previous bid
        - auction state (others' bids)
        - eligibility (e.g., budget constraints)
        - expiration, withdrawal, replacement

- rules for what information is revealed
- rules for clearing

Defined by three kinds of rules:

- rules for bidding
- rules for what information is revealed
  - when to reveal what information to whom
- rules for clearing

Auctions as Structured Negotiations

Defined by three kinds of rules:

- rules for bidding
- rules for what information is revealed
- rules for clearing
  - when to clear
    - at intervals
    - on each bid
    - after a period of inactivity
  - allocation (who gets what)
  - payment (who pays what)