CS344M
Autonomous Multiagent Systems

Prof: Peter Stone

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Good Afternoon, Colleagues

Are there any questions?
Logistics

- Progress reports due at beginning of class
  - 2 hard copies
  - Attach your proposals
  - Anonymized soft copy
Logistics

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• Peer reviews due next Thursday
Logistics

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- Thesis proposal on Thursday at 9am in robotics lab - game theory
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- FAI talk on Friday at 11 - poker: PAI 3.14
Distributed Rational Decision Making

Self-interested, rational agent
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- Self-interested:
Distributed Rational Decision Making

Self-interested, rational agent

- Self-interested: maximize own goals
  - No concern for global good
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- Rational:
Distributed Rational Decision Making

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• Rational: agents are smart
  – Ideally, will act *optimally*
Distributed Rational Decision Making

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The protocol is key
Evaluation Criteria

- Social welfare
- Pareto efficiency
- Stability
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- Individual Rationality
Evaluation Criteria

- Social welfare
- Pareto efficiency
- Stability
- Individual Rationality
- Efficiency (computational, communication)
Voting vs. auctions

- Voting: maximize social good
  - result affects all
Voting vs. auctions

- Voting: maximize social good
  - result affects all

- Auctions: maximize profit
  - result affects buyer and seller
Activity

• Pick an integer between 1 and 20, write it down
Activity

- Pick an integer between 1 and 20, write it down
- Draw a line under it
- Pick another number, write it under the line.
Activity

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- 1st price auction for my pen
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- The top number is your utility
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- Goal: as much profit as possible
Activity

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- Pick another number, write it under the line.
- 1st price auction for my pen
- The top number is your utility
- Goal: as much profit as possible
- Write down your bid
Activity

- Pick an integer between 1 and 20, write it down
- Draw a line under it
- Pick another number, write it under the line.
- 1st price auction for my pen
- The top number is your utility
- Goal: as much profit as possible
- Write down your bid
- Repeat with 2nd price auction
- Number under the line is your utility
Auctions

• Valuations:
Auctions

- Valuations:
  - private value
Auctions

- Valuations:
  - private value
  - common value
Auctions

- Valuations:
  - private value
  - common value
  - correlated value
Auctions

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• Types:
  – first-price open-cry (English)
Auctions

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  – first-price open-cry (English)
  – first-price sealed-bid
Auctions

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• Types:
  – first-price open-cry (English)
  – first-price sealed-bid
  – descending (Dutch)
Auctions

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• Types:
  – first-price open-cry (English)
  – first-price sealed-bid
  – descending (Dutch)
  – second-price sealed-bid (Vickrey)
Auctions

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- Types:
  - first-price open-cry (English)
  - first-price sealed-bid
  - descending (Dutch)
  - second-price sealed-bid (Vickrey)

Revenue equivalence: private-value, risk-neutral
• You value a bunch of flowers at $100
Auctions

- You value a bunch of flowers at $100

- What strategy if auction is:
  - English
Auctions

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  – Descending
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• What strategy if auction is:
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  – Vickrey
Auctions

- You value a bunch of flowers at $100

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  - first-price sealed-bid
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  - Vickrey

- What if it’s an antique?
Auctions

- Vickrey, English are truthful
Auctions

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• First-price sealed-bid: bidders bid lower than values
Auctions

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- First-price sealed-bid: bidders bid lower than values
  - Private value case: why?
Auctions

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- In common (and correlated) value case, bids lower in all mechanisms
Auctions

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• First-price sealed-bid: bidders bid lower than values
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• In common (and correlated) value case, bids lower in all mechanisms
  – Why?
Auctions vs. voting

- Auctions: maximize profit
  - result affects buyer and seller

- Voting: maximize social good
  - result affects all
Gibbard-Satterthwaite

- Example: Bush, Gore, or Nader?
Gibbard-Satterthwaite

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  - For whom should you vote?
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- 3+ candidates $\iff$ only dictatorial system eliminates need for tactical voting
  - One person appointed
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- No point thinking of a “better” voting system
- Assumption: no restrictions on preferences
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What about Clarke tax algorithm?