# CS395T Agent-Based Electronic Commerce Fall 2006

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Week 3b

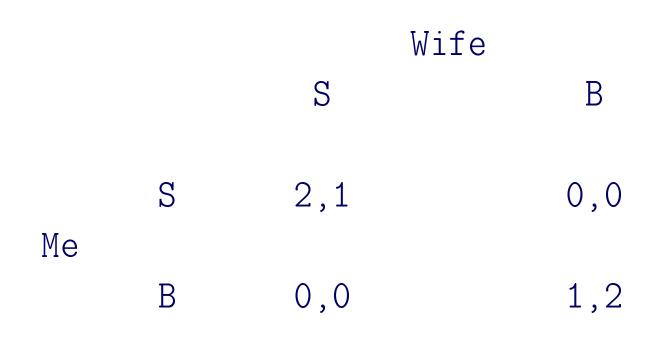
#### **Good Afternoon, Colleagues**

Are there any questions?



#### **Correlated Equilibria**

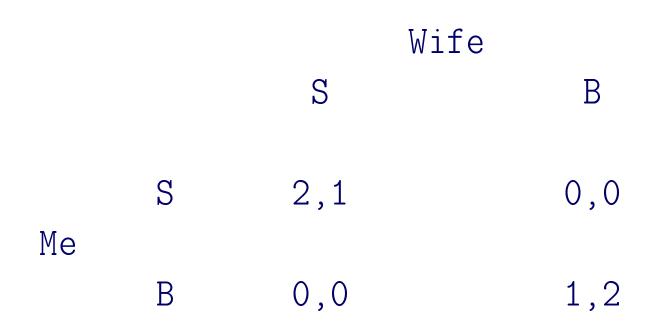
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#### **Correlated Equilibria**

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#### Want only S,S or B,B - 50% each



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- We both know that we will both be there on the 15th.



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- When and where?
- What are the Nash equilibria?



# **Mechanism Design**

• The rules of the game (what strategies are possible)



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- Defines a mapping from strategy to outcome



# Mechanism Design

- The rules of the game (what strategies are possible)
- Defines a mapping from strategy to outcome
- Terms:
  - Efficient
  - (Weak) Budget balanced
  - Individual rationality
- "An ideal mechanism provides agents with a dominant strategy and also implements a solution to the multiagent distributed optimization problem" (p. 29, last paragraph of the section)



# Relation to game theoryPlayer 2Action 1Action 1Action 14,82,0Player 1Action 2Action 26,20,8

#### • What's the mechanism in this game?



# Relation to game theoryPlayer 2Action 1Action 1Action 14,82,0Player 1Action 2Action 26,20,8

- What's the mechanism in this game?
- What's an alternative mechanism?



• Allows for uncertainty about opponent **type** 



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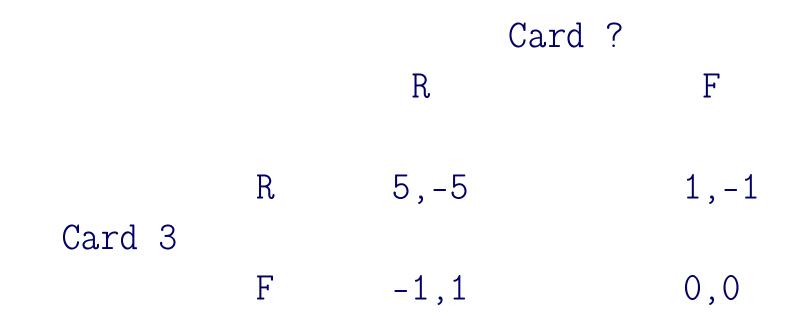
- Allows for uncertainty about opponent **type**
- Consider 1st price auction for my pen
  - Define a Nash equilibrium (what do you need to know)?
  - Define a Bayes-Nash equilibrium (what do you need to know)?
  - Is there a dominant strategy equilibrium?
  - What if I tell you, I'll take what you tell me as your value and compute for you the correct thing to do given what other people bid?



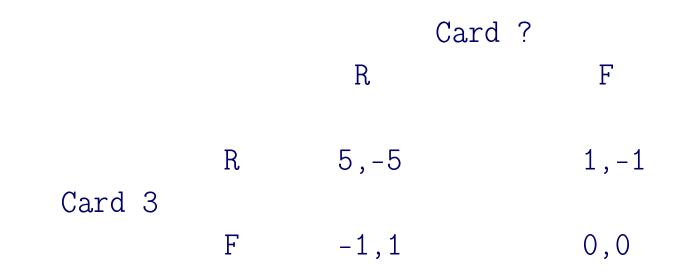
- We each get one of 3 cards: 1,2,3
- If we both fold, we both lose nothing
- If one raises and one folds, the raiser gets 1
- If both raise, the one with the higher card gets 5
- Zero sum



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|        | Card ? |      |      |  |
|--------|--------|------|------|--|
|        |        | R    | F    |  |
| Card 3 | R      | 5,-5 | 1,-1 |  |
|        | F      | -1,1 | 0,0  |  |
| Card ? |        |      |      |  |
|        |        | R    | F    |  |
| Card 1 | R      | -5,5 | 1,-1 |  |
|        | F      | -1,1 | 0,0  |  |



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  - Raise: (.5)(-5) + (.5)(1) = -2
  - Fold: (.5)(-1) + (.5)(0) = -.5



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With more numbers and/or different payoffs, bluffing can be a part of the Nash Equilibrium



#### Ex ante vs. ex post

• Mechanism: each of you give me \$1, one gets \$100 back



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#### Ex ante vs. ex post

- Mechanism: each of you give me \$1, one gets \$100 back
- Individually rational?
- Ex ante, yes
- Ex post, no



# Vickrey-Clarke-Groves

- Groves: efficient, stategy-proof
- Pivotal: individually-rational

|              | utility |
|--------------|---------|
| camera alone | \$50    |
| flash alone  | 10      |
| both         | 100     |
| tripod       | 20      |



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- Groves: efficient, stategy-proof
- Pivotal: individually-rational

|              | utility |
|--------------|---------|
| camera alone | \$50    |
| flash alone  | 10      |
| both         | 100     |
| tripod       | 20      |

|        | utility |
|--------|---------|
| camera | \$60    |
| flash  | 20      |
| tripod | 30      |



- Assume quasi-linear values, etc.
- What is the allocation?



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- What is the allocation?
- What are the payments?



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- Why is it strategy proof?



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- What is the allocation?
- What are the payments?
- Why is it strategy proof?
- What are choice set monotonic, negative externality, single-agent effects?



## **Computational considerations**

• Why is this mechanism a burden on the bidders?



# Impossibility/possibility results

• e.g. strategy-proof, efficient, inifividually rational, and (strong) budget-balanced impossible



• Iterated prisoner's dilemma with identity



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- What if you play infinitely?



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- What if you play infinitely?
- What if you play for a known finite amount of time?



- Iterated prisoner's dilemma with identity
- What if you play infinitely?
- What if you play for a known finite amount of time?
- Some strategies:
  - hawk (always Fink)
  - Grim trigger (cooperate until the other defects)
  - tit-for-tat
  - Joss (tit-for-tat with periodic defection)



• Bowling's tutorial slides

