Imperfect Information Extensive Form Games

ISCI 330 Lecture 15

March 6, 2007

Lecture Overview

1 Recap

2 Imperfect-Information Extensive-Form Games

Subgame Perfection

- Define subgame of G rooted at h:
  - the restriction of G to the descendents of H.
- Define set of subgames of G:
  - subgames of G rooted at nodes in G

- s is a subgame perfect equilibrium of G iff for any subgame G' of G, the restriction of s to G' is a Nash equilibrium of G'
- Notes:
  - since G is its own subgame, every SPE is a NE.
  - this definition rules out "non-credible threats"

Computing Subgame Perfect Equilibria

Identify the equilibria in the bottom-most trees, and adopt these as one moves up the tree

- backward induction

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Intro

- Up to this point, in our discussion of extensive-form games we have allowed players to specify the action that they would take at every choice node of the game.
- This implies that players know the node they are in and all the prior choices, including those of other agents.
- We may want to model agents needing to act with partial or no knowledge of the actions taken by others, or even themselves.
- This is possible using imperfect information extensive-form games.
  - each player's choice nodes are partitioned into information sets
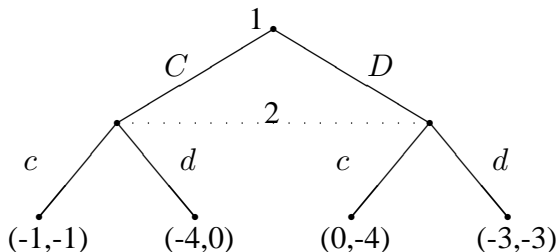 - if two choice nodes are in the same information set then the agent cannot distinguish between them.

Example
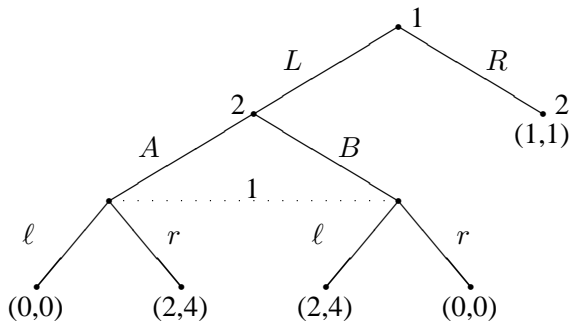
- What are the equivalence classes for each player?
- The pure strategies for each player are a choice of an action in each equivalence class.

Normal-form games

- We can represent any normal form game.

- Note that it would also be the same if we put player 2 at the root node.

Induced Normal Form

- Same as before: enumerate pure strategies for all agents
- Mixed strategies are just mixtures over the pure strategies as before.
- Nash equilibria are also preserved.
- Note that we are now able both to convert NF games to EF, and EF games to NF.