CS 798: Multiagent Systems Imperfect Information

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Outline



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Imperfect Information Games

 Sometimes agents have not observed everything, or else can not remember what they have observed

Imperfect information games: Choice nodes *H* are partitioned into *information sets*.

- If two choice nodes are in the same information set, then the agent can not distinguish between them.
- Actions available to an agent must be the same for all nodes in the same information set

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Information sets for agent 1

 $l_1 = \{\{\emptyset\}, \{(L, A), (L, B)\}\}$ $l_2 = \{\{L\}\}$

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Information sets for agent 1

$$I_{1} = \{\{\emptyset\}, \{(L, A), (L, B)\}\}$$
$$I_{2} = \{\{L\}\}$$

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More Examples





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Strategies

- Pure strategy: a function that assigns an action in A_i(I_i) to each information set I_i ∈ I_i
- Mixed strategy: probability distribution over pure strategies
- **Behavorial strategy:** probability distribution over actions available to agent *i* at each of its information sets (independent distributions)

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Behavorial Strategies

Definition

Given extensive game G, a behavorial strategy for player i specifies, for every $I_i \in I_i$ and action $a_i \in A_i(I_i)$, a probability $\lambda_i(a_i, I_i) \ge 0$ with

$$\sum_{i \in \mathcal{A}_i(I_i)} \lambda(a_i, I_i) = 1$$

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Mixed Strategy: (0.4(A,G), 0.6(B,H))

Behavorial Strategy:

- Play A with probability 0.5
- Play G with probability 0.3

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Mixed and Behavorial Strategies

In general you can not compare the two types of strategies.

But for games with perfect recall

- Any mixed strategy can be replaced with a behavorial strategy
- Any behavorial strategy can be replaced with a mixed strategy

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Mixed Strategy: (<0.3(A,L)>,<0.2(A,R)>, <0.5(B,L)>)

Behavorial Strategy:

- At I₁: (0.5, 0.5)
- At I2: (0.6, 0.4)

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