Module 2: "Static games of complete information"

Lecture 3: "NFG → EFG & EFG → NFG Conversion"

The Lecture Contains:

- Prisoner's Dilemma – EFG representation
- Definition of I set
- Singleton & Non-singleton I set
- Another example of NFG → EFG
- EFG → NFG
- Example EFG → NFG

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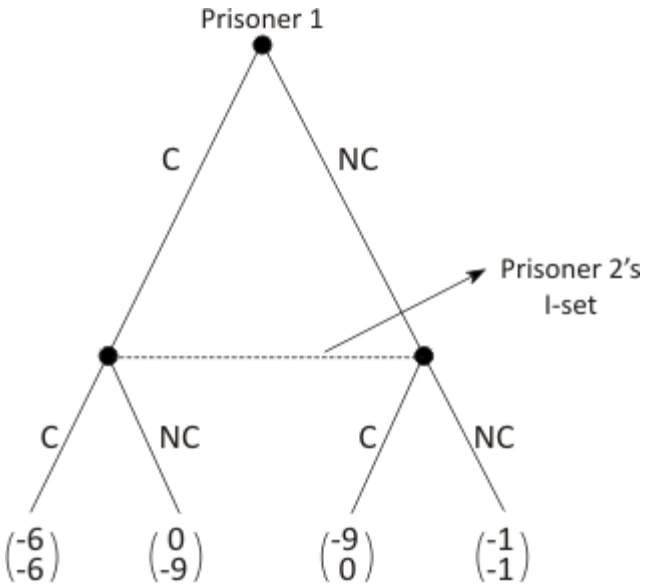
Any simultaneous game can also be represented by on EFG.

e.g. Prisoner's Dilemma – EFG representation



- Prisoner 1 or Prisoner 2 - anybody can be the first mover.
- Prisoner 1 is first mover in this example and has 2 strategies – C and NC.
- Whatever prisoner 1 chooses, prisoner 2 also has 2 strategies at his move – C and NC.
- Prisoner 2 cannot distinguish between the two decision nodes since it is a simultaneous game.
- Prisoner 2 has one information set (I - set) consisting of two decision nodes.

Note: *I-set usually represented by a dotted line connecting the two nodes.*

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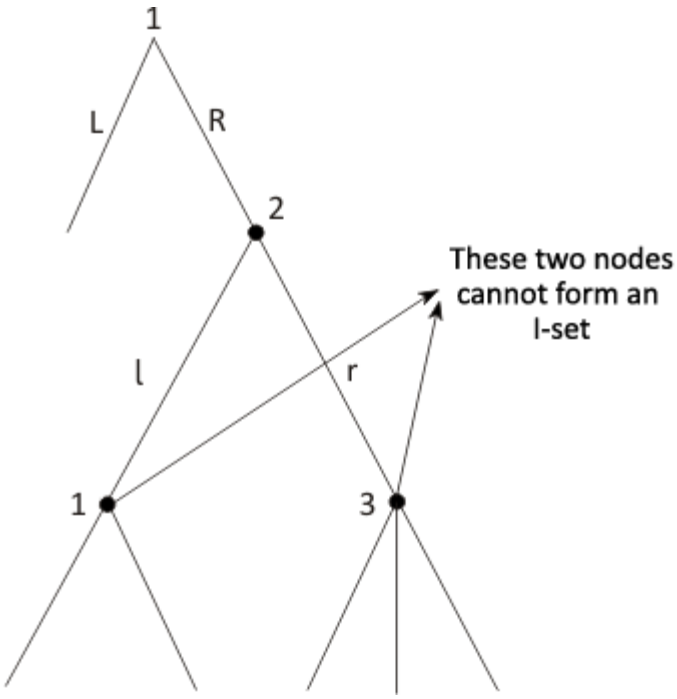
Definition of I set

An I set for a player is a collection of decision nodes such that

1. At each decision node of the information set the concerned player has the move.



2. If the play of the game reaches a particular decision node of an I set, then the concerned player does not know which node in the infoset has been reached.

- This implies that the set of feasible actions at each decision node of an I set should be the same.

Singleton & Non-singleton I set

- **Singleton I set:** An I set containing exactly one decision node.
  [Note: Any decision node (except the terminal nodes) can be viewed as a singleton I set .]
- **Non-singleton I set:** An I set containing more than one decision node.
- **Static games:** EFG representation will contain at least one non-singleton infoset.
- **Dynamic games** (with perfect information) will always contain only singleton I sets.

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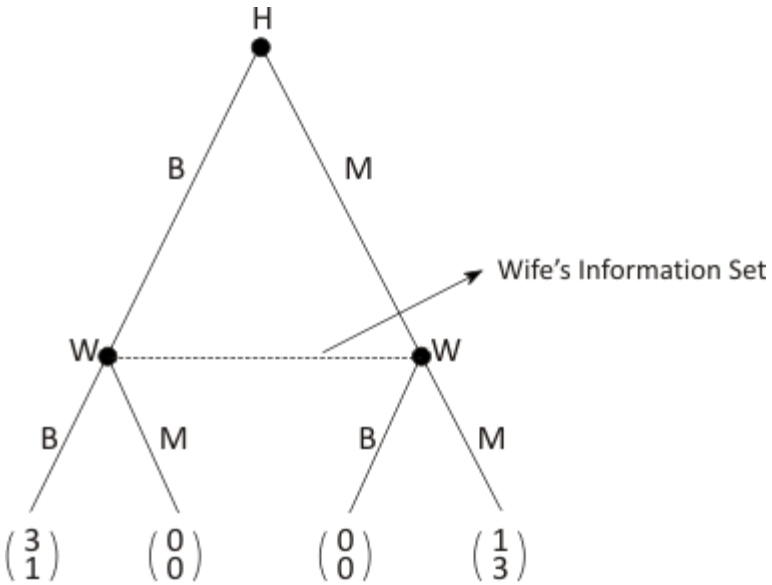
Another example of NFG → EFG

Battle of sexes:

NFG:

Wife \ Husband	B	M
B	(3,1)	(0,0)
M	(0,0)	(1,3)

EFG:



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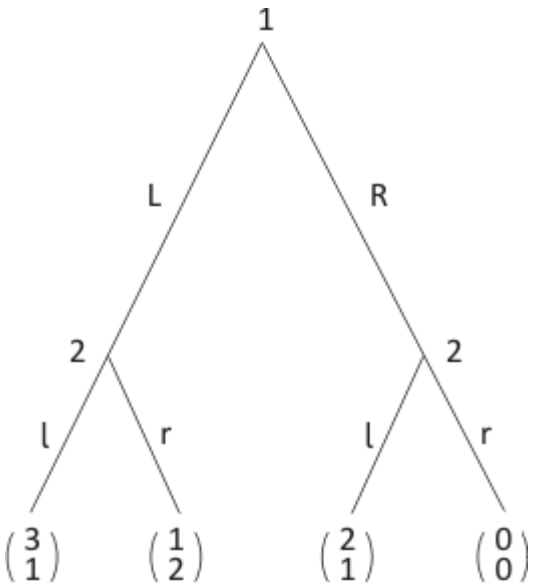
EFG → NFG

Example of a Dynamic game



Strategy – different from action.
A strategy is a complete plan of actions.

- Specifies a feasible action for the player in every contingency in which the player might be called on to act.

Here player 2 has 2 actions (l & r).
Player 2 has two contingencies in which he can act.

- After observing L by player 1.
- After observing R by player 1.

Therefore, strategies of player 2 are :

1. (l, l): If player 1 plays L then play l and if player 1 plays R then play l.
2. (l, r): If player 1 plays L then play l and if player 1 plays R then play r.
3. (r, l): If player 1 plays L then play r and if player 1 plays R then play l.
4. (r, r): If player 1 plays L then play r and if player 1 plays R then play r.

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Example EFG → NFG

Player 1 has 2 actions as well as 2 strategies (L & R)

		Player 2			
		ll	lr	rl	rr
Player 1	L	(3,1)	(3,1)	(1,2)	(1,2)
	R	(2,1)	(0,0)	(2,1)	(0,0)

Strategy of player 2 : (x y)

x : action if player 1 plays L

y : action if player 1 plays R

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