GAME THEORY LA358

Dominant Strategy

Problems:

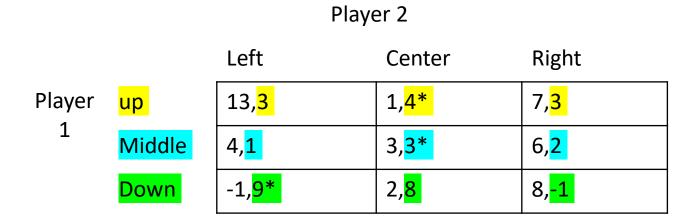
		Player 2		
		Left	Center	Right
Player 1	up	13,3	1,4	7,3
	Middle	4,1	3,3	6,2
	Down	-1,9	2,8	8,-1



- ➤ Player 1 doesn't have a DS, which implies player 1 always wants to change its strategy based on Player 2 strategy
- ➤If P2-Left: Player 1 response is Up
- ➤If P2-Center: Player 1 plays Middle
- ➤If P2-Right: Player 1 plays Down

	Player 2			
		Left	Center	Right
Player 1	<mark>up</mark>	13, <mark>3</mark>	1, <mark>4*</mark>	7, <mark>3</mark>
	Middle	4, <mark>1</mark>	3, <mark>3*</mark>	6, <mark>2</mark>
	Down	-1, <mark>9*</mark>	2, <mark>8</mark>	8, <mark>-1</mark>

- ➤ Player 2 doesn't have a DS, which implies player 2 always wants to change its strategy based on Player 1 strategy
- ➤If P1- Up: Player 2 response is Center
- ➤If P1- Middle: Player 2 plays Center
- ➤If P1- Down: Player 2 plays Left



- ➤ Player 2 doesn't have a DS, however player 2 will always choose left/center and don't choose Right in any case of P1 strategy .
- ➤ In another way Center dominates Right in all cases of P1's actions
- Hence, we can eliminate Right from the game



- \triangleright In this iterated game of 3*2 –Player 1 no DS
- ➤ P2 plays Left: P1 plays Up
- ➤ P2 plays Center: P1 plays Middle



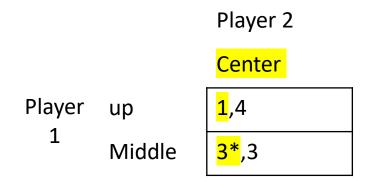
- \triangleright In this iterated game of 3*2 –Player 1 no DS
- ➤ P2 plays Left: P1 plays Up
- ➤ P2 plays Center: P1 plays Middle
- ➤ Here, Down is not a preferred strategy in either case of P2 playing left / center
- ➤ Hence, we can eliminate Down



- This iterated elimination made the game into 2*2 strategy game
- ➤In this game P1 no DS
- **≻**P2?



- This iterated elimination made the game into 2*2 strategy game
- ➤In this game P1 no DS,
- ➤ P2 has DS: Center
- ➤ Hence eliminate Left



- This iterated elimination made the game into 2*1 strategy game
- ➤ In this game P1 choose Middle
- ➤ Hence game equilibrium reaches at (Middle, Center): (3,3)

Problems:

Player 2

		Left	Center	Right
Player 1	up	0,2	3,1	2,3
	Middle	1,4	2,1	4,1
	Down	2,1	4,4	3,2

>Solution:

Player 2

		Left	Center	Right
Player 1	up	0,2	3,1	2,3
	Middle	1,4	2,1	4,1
	Down	2,1	4,4	3,2

D,C:(4,4)

➤ Eliminate Up>Right>Middle>Left

Best Response function

- Solution to game (NE/DSE): easy to find if the set of actions are few
- ➤ However, if large number of players and actions: then it is not feasible to check NE from large set of possible actions
- Then it is better to use Best Response Function (BRF/BR)
- ➤BRF for player i:
 - Best pay-off for player-i as a response to other player's action

Best Response function

- ➤BRF for player i:
 - Best pay-off for player-i as a response to other player's action
 - Best pay-off =better or atleast as good as pay-off (>=)
 - Other player = -i
 - Other player action= a_{-i}
- \triangleright Set of best response actions for player $i=B_i(a_{-i})$
- \triangleright All actions of player $i = A_i$
- \triangleright Actions of Best response set for player $i = a_i$
- \triangleright Actions of not best response set for player $i=a_i$

Best Response function

Precisely, we define the function B_i by

$$B_i(a_{-i}) = \{a_i \text{ in } A_i : u_i(a_i, a_{-i}) \ge u_i(a'_i, a_{-i}) \text{ for all } a'_i \text{ in } A_i\}:$$