Ritik Jain(2021JCS2260)

Social Network Analysis -Fall 2021
Assignment 3

Q.2

Ans. i)We also need to consider the case when we align our behaviour with the behaviour of others. Suppose a new technology comes into the market like a new OS . If many people are using it then it can be useful for developers to update the current version of it and with proper reviews it can be used to remove bugs, security issues as soon as possible. Many softwares can be made for different users in the community. Although, the main purpose of introducing the OS was to ease the human work, it indirectly affects the behavior. Thus having a good community also affects the rational decision of the person.

ii) We now need to include the new parameter we introduced in the previous part.

Along with the individual signals, one needs to consider the effect of community signals too.

We need to change the High signal that is accepting the good idea in both individual and multiple signals using this additional parameter and similarly in the Low Signal also.

Pr(comm H)=Probability of community signal

Pr(G)=p

Pr(B)=1-p

I have considered the events to be independent for community signal and individual private signal.

Now, Pr(H)=Pr(private H)*Pr(comm H) (1)

Pr(H|G)=q

Pr(L|G)=1-q

Pr(L|B)=q

Pr(H|B)=1-q

a) Individual Decision:

$$Pr[G/H] = (Pr[G] \times Pr[H|G]) \div Pr[H]$$
$$=(Pr[G] \times Pr[H/G]) \div ((Pr[G] \times Pr[H|G]) + (Pr[B] \times Pr[H|B]))$$
$$= (p \times q) \div ((p \times q) + (1 - p) \times (1 - q))$$

By adding additional parameters in the equation (1) we can calculate for real life parameters.

b)Multiple Signals:

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A sequence S of independently generated signals consisting of **a** high signal and **b** low signals here a,b consists of both the private and community signals combined.

$$Pr[G|S] > Pr[G] \text{ when } a > b$$
$$Pr[G|S] < Pr[G] \text{ when } a < b$$
$$Pr[G|S] = Pr[G] \text{ when } a = b$$

$$Pr[S] = Pr[G] \times Pr[S|G] + Pr[B] \times Pr[S|B]$$
$=pq^a(1-q)^b+(1-p)(1-q)^a q^b$
$$Pr[G|S] = Pr[G] \times Pr[S|G] \div Pr[S]$$
$Pr[G|S] = pq^a(1-q)^b / pq^a(1-q)^b+(1-p)(1-q)^a q^b$

Date:

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Q.1.

Ans: For, a 3 player game, we would consider it through an example. Three companies are deciding whether to enter the market or not.

Company 2

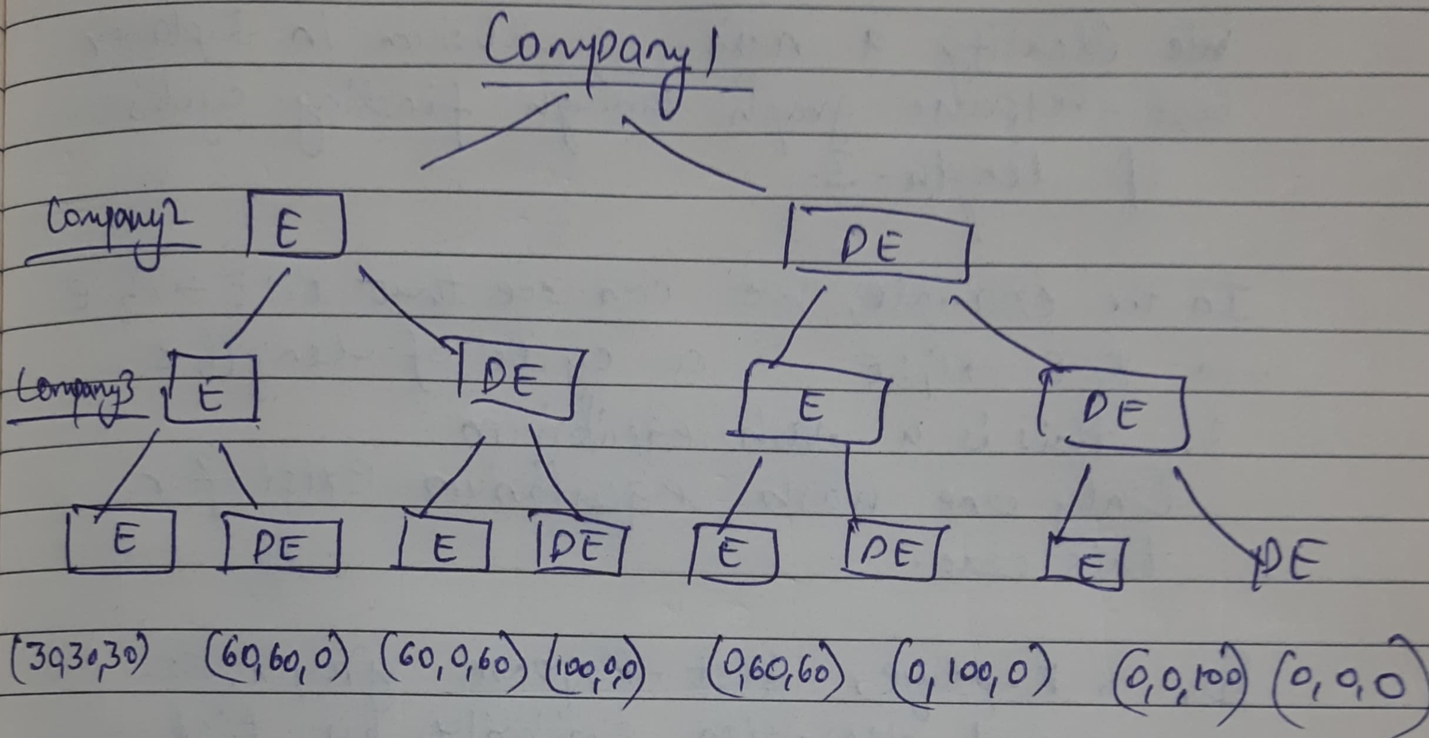
Company 1	Enter	Don't
Enter	30,30,30	60,0,60
Don't	0,60,60	0,0,100

	Enter	Don't
Enter	60,60,0	100,0,0
Don't	0,100,0	0,0,0

Enter Don't

Company 3.

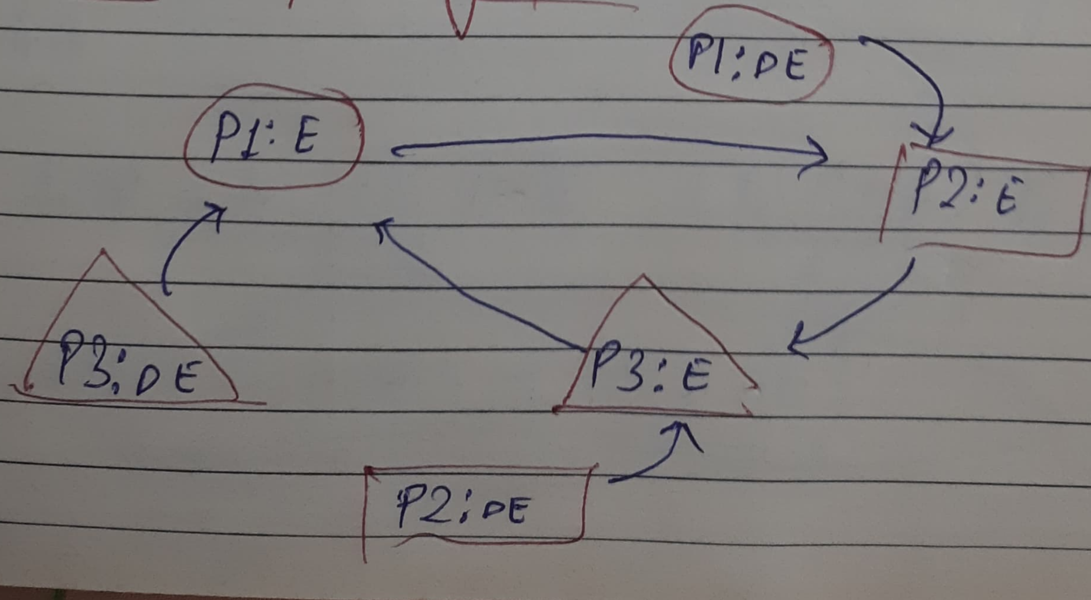
We can see, if all the companies enter the market they would earn 30 as their profit
if only two companies enter the market they would earn 60 each.
if only one enters, it would earn 100.



We can represent 3 player game using above diagram
choices $= 2^3 = 8$

If it would k-player game we would have
2^k choices.

Best Response graph



We identify a nash-equilibrium in 3-player best-response graph through finding cycles of length-3.

In the example, we can see that $P_1:E \to P_2:E \to P_3:E \to P_1:E$ is a cycle of length 3.
So this is a nash equilibrium.
Only one nash equilibrium exist for this case.

For a k-player best-response graph, we can extend definition similarily by find k-length cycle in the graph.