EE 382V: Social Computing **Fall 2018**

Chapter 6: Excercise 8, 9

Scribe: Kyle Sung

6.8 Problem Overview

The problem is a coordination game with the payoff matrix

1,1	0,0
0,0	4,4

6.8.1 Part a

Q: Find all pure-strategy Nash equilibria for this game.

A: (U, L) and (D, R) are both NE.

6.8.2 Part b

Q: Find the mix-strategy NE, and give an explanation.

A:

A plays U with prob p

B plays L with prob q

Expected payoff for A to play U: q*1 + (1-q)*0 = q

Expected payoff for A to play D: q*0 + (1-q)*4 = 4 - 4q

Indifference for B:

q = 4 - 4q, 5q = 4. q = 4/5.

Expected payoff for B to play L:

p*1 + (1-p)*0 = p

Expected payoff for B to play R:

p*0 + (1-p)*4 = 4 - 4p

Indifference for A:

p = 4 - 4p, 5p = 4, p = 4/5.

Mixed strategy NE: ((4/5,1/5), (4/5,1/5)) When player A expect player B to play L with the probability of 4/5, then A will try to match the probability as well.

6.8.3 Part c

Q: With Schelling's focal point idea, what equilibrium do you think is the best prediction of how the game will be played?

A: When a Schellings focal point can be expected, player A would expect player B to play R, since it has the better payoff of the two NE. Likewise for player B to expect A to play D. Thus (D, R) would be the converged focal point.

6.8 Problem Overview

Find all Nash equilibria given the payoff matrices:

6.8.1 Part a

8,4	5,5
3,3	4,8

Pure strategy NE:

(U,R)

Mixed strategy NE:

A plays U with prob p

B plays L with prob q

Expected payoff for A to play U:

q*8 + (1-q)*5 = 5 + 3q

Expected payoff for A to play D:

q*3 + (1-q)*4 = 4 - q

Indifference for B:

5 + 3q = 4 - q, 4q = -1. q = -14. i.e. B always plays R

Expected payoff for B to play L:

p*4 + (1-p)*3 = 1 + p

Expected payoff for B to play R:

p*5 + (1-p)*8 = 8 - 3p

Indifference for A:

1 + p = 8 - 3p, 4p = 7, p = 7/4. i.e. A always plays U

This just shows that if a pure strategy NE exists, the mixed strategy NE would be the same (i.e. U,R in this case)

6.8.2 Part b

0,0	-1,1
-1,1	2,-2

Pure strategy NE:

Does not exist

Mixed strategy NE:

A plays U with prob p

B plays L with prob q

Expected payoff for A to play U:

q*0 + (1-q)*-1 = -1 + q

Expected payoff for A to play D:

q*-1 + (1-q)*2 = -q + 2 - 2q = 2 - 3q

Indifference for B:

-1+q=2-3q,4q =3,q=3/4.

Expected payoff for B to play L:

p*0 + (1-p)*1 = 1 - p

Expected payoff for B to play R:

p*1 + (1-p)*-2 = -2 + 3p

Indifference for A:

1 - p = -2 + 3p, 3 = 4p, p = 34.

((3/4, 1/4), (3/4, 1/4))