Introduction to Game Theory for Law and Philosophy Students
Ariel Rubinstein - Fall 2004

Problem Set 3 (Nash Equilibrium)

1. Matching Game (Zug or Peret)

First play the matching game (http://gametheory.tau.ac.il/matching/)

The basic matching games involves two players called "odd' and "even". Each player has to choose a number 1, 2 or 3. The odd player "wins" the game if the sum of the numbers is odd and the "even" player wins if the sum of the numbers is even.

Model the situation as a strategic game.

Show that the game does not have an equilibrium. Are you bothered by this fact?

2. Auction

Two candidates, 1 and 2, compete for a job. The employer is not willing to pay a wage higher than $\$M$ and is obliged by law to pay at least the minimum wage $\$m$. Assume that $M > m$.

The employer asks the candidates to send him a written wage demand (which must be an integer between m and M). He promises to accept the lower demand.

In the case that both make the same demand, he promises to accept worker 1 (since he held the job previously). Assume that each worker is interested in as high a wage as possible.

Present the situation as a strategic game and show that it has a unique Nash equilibrium.

3. The Traveler's Game

[Based on: Basu, Kaushik, 1994. "The Traveler's Dilemma: Paradoxes of Rationality in Game Theory," American Economic Review, American Economic Association, vol. 84(2), pages 391-95].

Two travelers are flying home from a remote island where they bought identical antiques. On landing, they discover that the antiques are smashed and that the airline is responsible.

The airline manager is polite and promises to compensate both travelers for their losses. All agree that the value of the antique is not lower than $\$180$ and not higher than $\$300$.

The manager makes the following speech:

"My dear travelers: Although I am sympathetic, I must make sure you are not overcompensated. I would like each of you to enter a sealed room and write on a piece of paper the value of the loss (an integer between 180 and 300).

If you both make the same claim, I will believe you and pay you both accordingly. However, if one of you writes x and the other y and $x < y$ then it will become clear that the value of the object is only $\$x$. In that case, I will pay the person who made the claim x the sum of $\$x + 5$ ($5 is a reward for honesty) and I will pay the person who made the claim y only $\$x - 5$ ($\$5$ is a fine for dishonesty)".

The nervous travelers are eager to be paid as much as possible.

Describe the situation as a strategic game and show that it has a unique Nash equilibrium.

4. Liability and Accidents

[Based on : Brown, J. (1973). Toward An Economic Theory of Liability. Journal of Legal Studies 2:323-349.]

Consider the following interaction between a potential injured party and a potential injurer:

a) The two are only interested in minimizing their expected monetary loss.

b) In the case of an accident the damage to the injured party will be $D = \$100$

c) The costs of taking precautions is $e_1 = \$20$ for the potential injured party and $e_2 = \$10$ for the potential injurer.

d) The accident is certain to happen unless both parties take precautions. If both indeed take precautions, the probability of an accident is $\alpha = 0.15$

Model the situation as a strategic game under the rule of no liability and calculate its Nash equilibrium.

Modify the game to "capture" the following three legal regimes:

i) Pure strict liability (the injurer is liable whatever the injured party did).

ii) Strict liability with contributory negligence (the injurer is liable independently of what he did but only if the injured party took the appropriate precautionary action).

iii) Negligence with contributory negligence (the injurer pays the damages only if the injured party took the precautions and the injurer did not).

What are the Nash equilibria of these three games?