CSC 5350 Assignment 2

Due date: 10 November 2008

1. **(Exercise 99.1)** Give an example of an infinite horizon game for which the one deviation property does not hold. (Hint: consider a one-player game.)

2. **(Exercise 100.2)** Say that a finite extensive game with perfect information satisfies the *no indifference condition* if

   $$z \sim_j z' \text{ for all } j \in N \text{ whenever } z \sim_i z' \text{ for some } i \in N,$$

   where z and z' are terminal histories. Show, using induction on the length of subgames, that every player is indifferent among all subgame perfect equilibrium outcomes of such a game. Show also that if s and s' are subgame perfect equilibria then so is s'', where for each player i the strategy s_i'' is equal to either s_i or s_i' (i.e. the equilibria of the game are *interchangeable*).

3. **(Exercise 103.1)** Suppose that three players share a pie by using the following procedure. First player 1 proposes a division, then players 2 and 3 simultaneously respond either 'yes' or 'no.' If players 2 and 3 both say 'yes' then the division is implemented; otherwise no player receives anything. Each player prefers more of the pie to less. Formulate this situation as an extensive game with simultaneous moves and find its subgame perfect equilibria.

4. (Exercise 148.1) Consider an infinite horizon extensive game in which the strategic game G is played between player 1 and an infinite sequence of players, each of whom lives for only one period and is informed of the actions taken in every previous period. Player 1 evaluates sequences of payoffs by the limit of means, and each of the other players is interested only in the payoff that he gets in the single period in which he lives.

   a. Find the set of subgame perfect equilibria of the game when G is the Prisoner's Dilemma.
   b. Show that when G is the modification of the Prisoner's Dilemma in which the payoff to player 2 of (C, D) is 0 then for every rational number $x \in [1, 3]$ there is a subgame perfect equilibrium in which player 1's average payoff is x.

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