

Game theory

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Exercise Sheet 8

Due: Monday, June 24, 2013

Exercise 8.1 (Unambiguousness of TPGs, 1+1 point)

Let G be an extensive, two-player game and s^* as well as r^* subgame perfect equilibria of G . Show that (for $i \in \{1, 2\}$):

- (a) If G is a zero sum game, then it holds that $u_i(O(s^*)) = u_i(O(r^*))$.
- (b) In general, it does not hold that $u_i(O(s^*)) = u_i(O(r^*))$.

Exercise 8.2 (Turn sequence, 2+2 points)

Let $G = \langle \{1, 2\}, (A_i)_{i \in \{1, 2\}}, (u_i)_{i \in \{1, 2\}} \rangle$ be a finite *strategic* game.

We define two extensive, two-player games G_1 and G_2 as follows:

- In G_1 player 1 chooses an action $a_1 \in A_1$ first, then player 2 chooses an Action $a_2 \in A_2$. After that the game is finished and player i gets the payoff $u_i(a_1, a_2)$.
- In G_2 player 2 chooses an action $a_2 \in A_2$ first, then player 1 chooses an Action $a_1 \in A_1$. After that the game is finished and player i gets the payoff $u_i(a_1, a_2)$.

Let s^* be a subgame perfect equilibrium of G_1 and r^* a subgame perfect equilibrium of G_2 . Show:

- (a) If G is a zero sum game, then it holds that $u_1(O(s^*)) \leq u_1(O(r^*))$.
- (b) In general, it does not hold that $u_1(O(s^*)) \leq u_1(O(r^*))$.

Exercise 8.3 (Extensive games with simultaneous moves, 2 points)

There is a group of 1000 pirates, who are all extremely greedy, heartless, and rational. Also, every pirate knows that every other pirate has this attitude as well. Their resp. position in the group is higher the earlier they joined the group, from pirate 1 down to pirate 1000.

The pirates found a treasure and have to decide, how to split it among themselves. Every day they vote, whether to kill the lowest ranked pirate or to split the treasure among the living pirates. If at least 50% vote for splitting the treasure, they will do so. Otherwise, the lowest ranked pirate is killed and the procedure continues on the next day.

When will the treasure be split up and how does the voting proceed?