

Introduction to Game Theory

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Exercise Sheet 4

Due: Thursday, June 2, 2016

Exercise 4.1 (Linear Programming, 2 + 1 points)

Rock-paper-scissors can be formalized as a two player zero-sum game as follows:

		Player 2		
		<i>rock</i>	<i>paper</i>	<i>scissors</i>
Player 1	<i>rock</i>	0, 0	-1, 1	1, -1
	<i>paper</i>	1, -1	0, 0	-1, 1
	<i>scissors</i>	-1, 1	1, -1	0, 0

- (a) Formulate the corresponding linear program.
- (b) Use a linear programming solver (e.g. `lp_solve`¹) to compute a solution, or guess a solution and verify it manually.

Exercise 4.2 (Linear Complementary Problem, 2 + 1 + 2 points)

Consider the strategic game given by the following payoff matrix:

		Player 2		
		r_1	r_2	r_3
Player 1	r_1	0, 0	3, 1	3, 3
	r_2	1, 1	0, 0	1, 3
	r_3	1, 1	1, 1	0, 0

- (a) Formulate the corresponding LCP.
- (b) Convert the LCP into a linear program with the following pair of support sets: $(\text{supp}(\alpha), \text{supp}(\beta)) = (\{r_1, r_2, r_3\}, \{r_1, r_2, r_3\})$.
- (c) Solve the linear program and provide values for each $\alpha(r_i)$ and $\beta(r_i)$, $i \in \{1, 2, 3\}$. What is the expected payoff (u, v) of the NE computed above?

The exercise sheets may and should be worked on and handed in in groups of two to three students. Please indicate all names on your solution.

¹<http://lpsolve.sourceforge.net/5.5/>