Introduction to Game Theory

B. Nebel, R. Mattmüller
T. Schulte, D. Speck
Summer semester 2019

University of Freiburg
Department of Computer Science

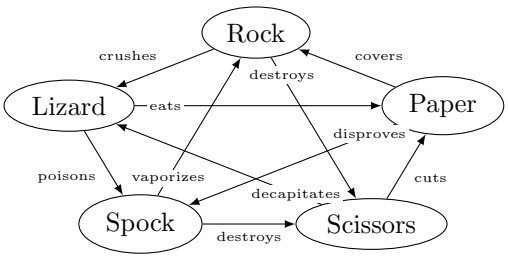
Exercise Sheet 2

Due: Thursday, May 9th, 2019

Send your solution to `schultet@informatik.uni-freiburg.de` or submit a hardcopy before the lecture.

Exercise 2.1 (Strategic Games, 2 points)

Formalize the game "Rock, Paper, Scissors, Lizard, Spock" as a strategic game, i.e., specify a set of players, sets of actions for all players, and utility functions in terms of a payoff matrix. The winners of the possible pairings follow from the following graph.



Exercise 2.2 (Elimination of strictly dominated strategies, 2+1 points)

Consider the game $G = \langle N, (A_i)_{i \in N}, (u_i)_{i \in N} \rangle$ with $N = \{1, 2\}$, $A_i = \{a_i, b_i, c_i, d_i\}$, $i = 1, 2$, and the following payoff matrix.

		Player 2			
		a_2	b_2	c_2	d_2
Player 1	a_1	$6, 2$	$2, 7$	$1, 4$	$0, 3$
	b_1	$1, 0$	$3, 2$	$2, 1$	$1, 1$
	c_1	$7, 0$	$2, 2$	$1, 5$	$6, 1$
	d_1	$8, 4$	$1, 2$	$0, 2$	$3, 9$

(a) Iteratively eliminate strictly dominated strategies for as many steps as possible. In each step, specify which strategy of which player was eliminated and by which strategy it was strictly dominated.

(b) Specify the set of Nash equilibria in this game. Which action should player 1 play accordingly?

Exercise 2.3 (Support lemma, 3 Punkte)

Let α be a mixed strategy profile, $a_i \in \mathit{supp}(\alpha_i)$, $a_i \notin B_i(\alpha_{-i})$, $a'_i \in B_i(\alpha_{-i})$ and α'_i defined by $\alpha'_i(a_i) = 0$, $\alpha'_i(a'_i) = \alpha_i(a'_i) + \alpha_i(a_i)$ and $\alpha'_i(a''_i) = \alpha_i(a''_i)$ for all $a''_i \in A_i \setminus \{a_i, a'_i\}$. Show formally that $U_i(\alpha'_i, \alpha_{-i}) > U_i(\alpha_i, \alpha_{-i})$. Use the definition of the expected reward.

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