Game theory

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Exercise Sheet 1
Due: Monday, 22.04.2013

Exercise 1.1 (Street network, 2+2+2 points)

Check the following, slightly modified instance (Figure 1(a)) of the routing example (Figure 1(b)) that was introduced during the lecture.
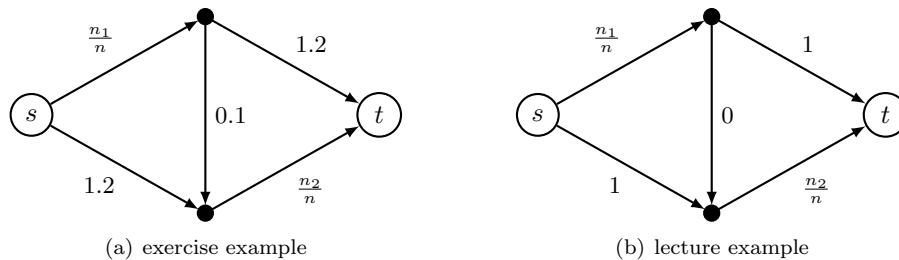

(a) exercise example   (b) lecture example

Figure 1: streets of a street network

(a) Formalize the special case of two agents as a strategic game and identify all strictly or weakly dominated actions as well as all Nash equilibria.

(b) How is this example different to the one given in the lecture? What changes occur in both games, when more than two agents take part?

(c) How do the established assumptions about the acting agents in game theory differ from those in real live traffic? How can the solution ideas of the Nash equilibrium anyways be applied to the real life traffic domain?

Exercise 1.2 (Game of thrones, 2+2 points)

On the far away continent "Westeros" the young king Joffrey I Baratheon rules the Seven Kingdoms. He is blond and he is said to be a vicious idiot.
Thus, two self-proclaimed anti-kings, namely, king Robb Stark and king Stannis Baratheon, have decided to claim his iron throne. Depending on strategy, they will either fight independently, or they might join forces. In any case, it could be considered wise to decide beforehand, who of them will be the new king and who will serve as the new king's right hand.

- If both **claim** to be king, they will start fighting against each other and young king Joffrey remains well-seated.

- If both of them **yield**, however, the young king's inevitable succession will be decided by the people in a democratic fashion.

- If only one of them steps back to let the other succeed to the crown, young king Joffrey will also quite certainly be beheaded and democracy will have to wait for its chance as well.

To make a long story short, this situation can be considered a strategic game with the following payoff matrix:

		Stannis	
		yield	*claim*
Robb	*yield*	3, 3	1, 5
	claim	5, 1	0, 0

(a) How many Nash-equilibria does this game have and, if any, which ones? Is this game strictly competitive? Justify your answer.

Let us assume next that the two anti-kings have decided to join their forces—in the literal sense, that is, by putting their men together. Unfortunately, the young king Joffrey's capital "King's Landing" can be attacked by sea and by land. The landsman Robb prefers to strike from landside, whereas the seaman Stannis favors seaside.
The following payoff matrix captures this problematic situation:

		Stannis	
		landside	*seaside*
Robb	*landside*	4, 2	0, 0
	seaside	0, 0	2, 4

(b) How many, if any, Nash equilibria do exist? In which way is this game different from that in part (a) of this exercise? Please explain.