

Introduction to Game Theory

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Exercise Sheet 1

Due: Monday, April 23th, 2018

Exercise 1.1 (Street network, 2+2 points)

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

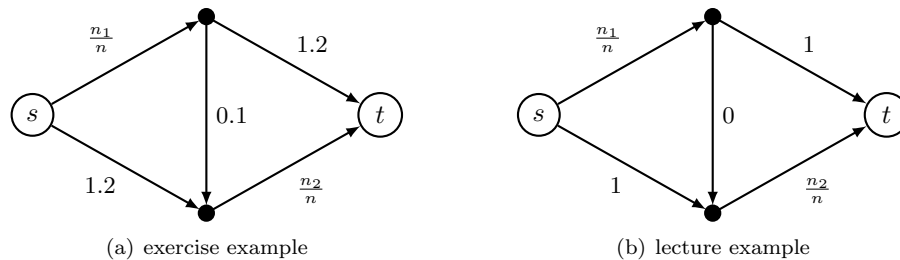


Figure 1: Streets of a street network

- 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.
- How is this example different from the one given in the lecture? What changes occur in both games, when more than two agents take part?

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 their strategies, 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

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

- (a) How many Nash-equilibria does the claim-yield game have and, if any, which ones? Is this game strictly competitive? Justify your answer.
- (b) How many Nash-equilibria does the landside-seaside game have and, if any, which ones? In which way is this game different from the claim-yield game? Please explain.

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.