Tutorial Sheet 2 **hand out: 05.12.2011**
Artificial Intelligence **due to: 12.11.2011, 8:15 am**
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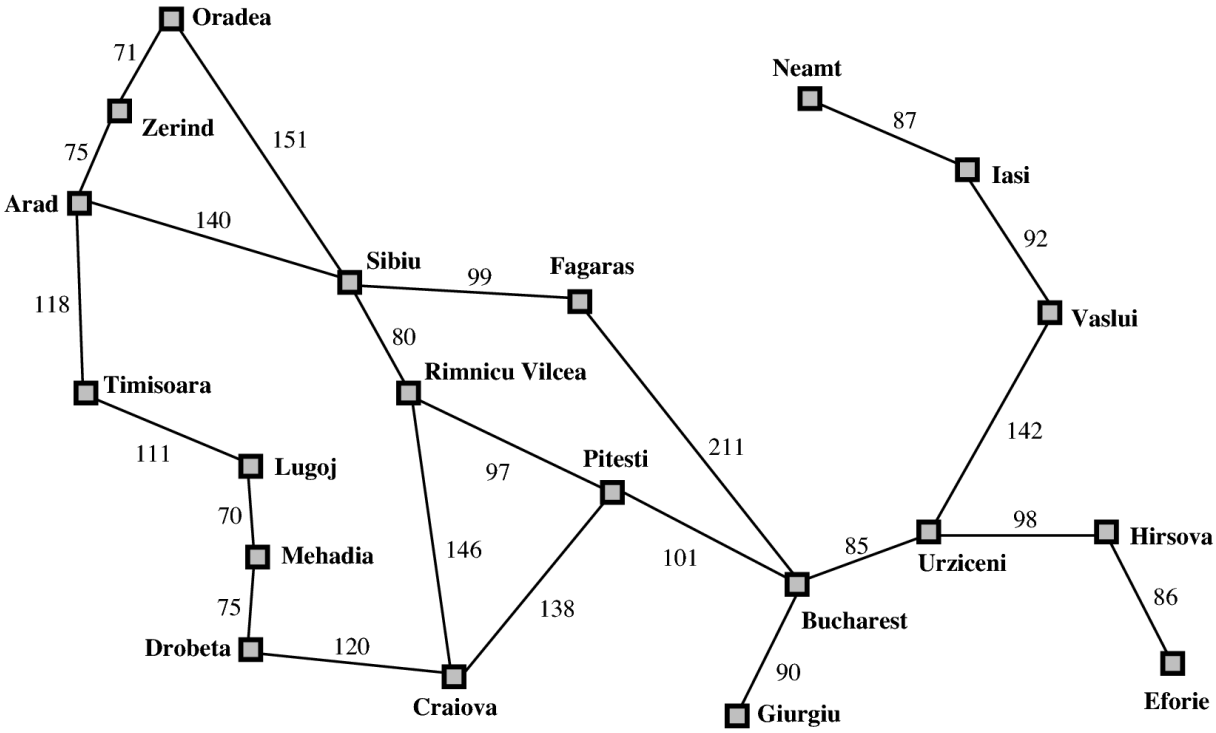
Exercise 1) **[6+1+2+1 points]**

Consider the example of Romania. We want to go from Bucharest to Drobeta. Which way is found with the following heuristics:

a) Uniform Cost Search?
b) Greedy Best-First Search?
c) A*-Search?

(heuristics estimates from the lecture slides may be used)



Give numbers on:

- the branching factor for this problem
- the minimal / maximal number of search steps that may occur for
  - the given travel (Lugoj → Fagaras)
  - any possible travel
- the memory complexity of the uniform cost search

Exercise 2a) **[4 points]**

From the lecture you know that the uniform cost search is both complete and optimal. State (Argue, explain, write 2 sentences for each):

- whether or not the A* algorithm, given non-negative path costs c > epsilon > 0 and admissible heuristics, is also either complete and / or optimal
- *whether or not the runtime speed of the A* algorithm for non-negative path costs c > epsilon > 0 and admissible heuristics exceeds that of the uniform cost search.*

Exercise 2b) **[6 points]**

Describe in your own words why heuristics should be :

- useful
- admissible
- consistent
- monotone

Write a sentence each for the case what happens if a heuristic does not fulfil those facts.

What is a „good“ heuristic?

General Advice:

Questions may be answered in either English or German. However, you are encouraged to answer in english, as mistakes do not affect your marking. You will be asked to present your solutions, in english.

For each following tutorial, please always hand in a small solution sketch, making me able to follow your ideas.

Solutions should be handed in by e-mail to busche@ismll.de. Please note that this adress differs from my moodle-email adress! Please use an email header starting with `[ai]`. You will get a manually written „recieved“ message once I read you email.