GWV – Grundlagen der Wissensverarbeitung

Tutorial 4 : Searching

Exercise 1.1 : (Heuristic Search)


```
xxxxxxxxxxxxxxxxxxx
x                 x
x       xxx       x
x       x xxxxx   x
x   s     x       x
x       x x  xxxxxxx
x  xx xxxxx       x
x      x      g   x
x      x          x
xxxxxxxxxxxxxxxxxxx
```

Figure 1 shows the known environment for a robot in an ASCII-Art representation. Again the robot starts in the field S (start) and wants to get to the field G (goal). The robot can move one field at a time in any of the four directions (up, down, left, right). The fields with an X denote a blocked field that the robot can not enter. *Hint: Again you will find the text files specifying the environments in the nats wiki.*

1. Implement the heuristic search strategy "A*" to find a path for the robot. Make sure you choose a suitable heuristic function and motivate your choice. (4 Pt.)

```
xxxxxxxxxxxxxxxxxxx
x                 x
x       xxx       x
x       x xxxxx   x
x   s     x       x
x       x x  xxxxxxx
x  xx xxxxx  x    x
x      x     xg   x
x      x     x    x
xxxxxxxxxxxxxxxxxxx
```

2. Figure 2 shows a slightly modified version of the environment. How does your search react in this case? Can you ensure termination? (2 Pt.)

```
xxxxxxxxxxxxxxxxxxx
x2                x
x       xxx       x
x   1   x xxxxx   x
x   s             x
x       x x  xxxxxxx
x  xx xxxxx       x
x      x      g   x
x   1  x  2       x
xxxxxxxxxxxxxxxxxxx
```

3. Figure 3 shows yet another modified environment. This time there are mysterious portals that transport the robot from one field to a pre determined field far away. They are denoted with numbers, that is if the robot enters a field with a 1, it is teleported to the other field with a 1 and so on. Modify your program accordingly and also modify your heuristic function accordingly. (3 Pt.)

4. For each of the three environments (and the search strategies used so far) document the time and memory resources used by the algorithm in terms of expansion operations performed on the frontier of the search and the number of nodes in the frontier. (3 Pt.)

Version: November 4, 2014
Achievable score on this sheet: 12