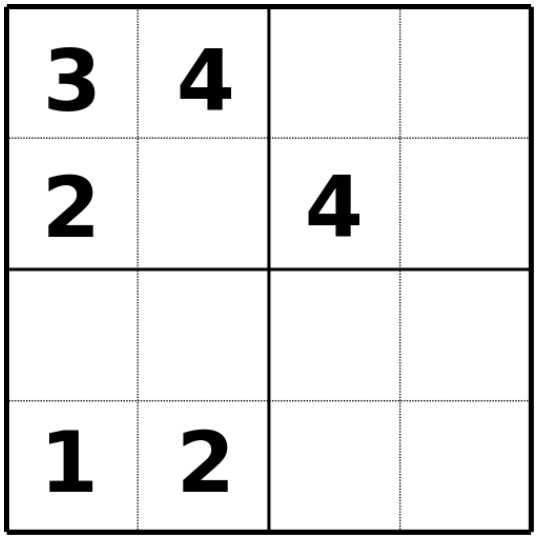
GWV – Grundlagen der Wissensverarbeitung

Tutorial 5 : Searching

Class Exercise 5.1 : (Constraint Satisfaction)



Solve the sudoku depicted above by formalizing it as a constraint satisfaction problem and using the approaches discussed in the lecture (e. g. domain & arc consistency).

Exercise 5.2: (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 (disregarding portals for now!) and motivate your choice. (3 Pt.)

2. Write a second heuristic function that works correctly with portals. What do you have to change? (1 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
```

3. The maze above is a slightly modified version of the environment. How does your search react in this case? Can you ensure termination? (1 Pt.)

4. For each of 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 maximal number of nodes in the frontier. (3 Pt.)

5. Extend your program so that it can find all paths to the goal. (2 Pt.)

6. Extend your program so that it can cope with multiple goals, finding the shortest path to one of them using A*. (2 Pt.)

provide example output where applicable!