UNIVERSITY OF INNSBRUCK
MASTERSTUDIUM INFORMATIK VERTIEFUNGSMODUL (WM 9)
Automatic Planning
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Exercises Nr. 1. **To be returned on Tuesday, Oct 23**

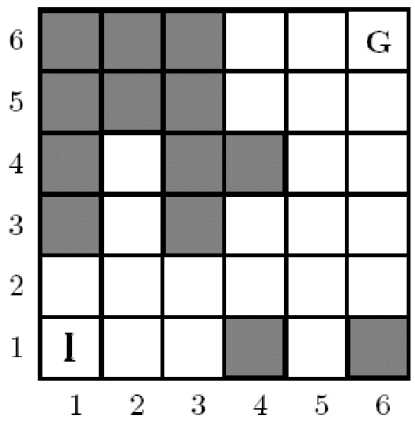
Exercise 1. (2=1+1 points)

Consider the Blocksworld example ("search algorithms" slide 8). Write up, in STRIPS notation, all search states that can be reached ...

1. ... within 1 step from the start state in progression.
2. ... within 1 step from the start state in regression.

Exercise 2. (8=5+3 points)

A knignt moves on a chessboard in an L-shaped pattern, two squares in one direction and one square in the orthogonal direction. Suppose the knight is at position (1,1) in the 6x6 board displayed in the figure, and that the gray squares are not accessible, or in other words, that only the white squares can be entered. The goal is to move the knight to position (6,6) with the smallest number of moves.



1. Solve the problem with the A^* algorithm and the heuristic function

   $h_1(x_s, y_s, x_g, y_g) = max\left\{\frac{|x_s - x_g|}{2}, \frac{|y_s - y_g|}{2}\right\}$

   where (x_s, y_s) are the coordinates of the knight and (x_g, y_g) those of the goal. If there are two nodes σ, σ' with the same minimal f-cost $f(\sigma) = f(\sigma')$, you can expand first the node that is actually better.

   For convenience, assume x is the horizontal axis, y the vertical axis.

2. Define a heuristic h_2 with the following properties:

   (a) $h_1 \leq h_2$,

   (b) h_2 is admissible and

   (c) h_2 is computable in polynomial time.

   Prove that h_2 is admissible and that it is better than h_1.

   Hint: h_2 can be a maximum of more than one admissible heuristics.