Artificial Intelligence for Robotics – Lab

Prof. Dr. Erwin A. Prassler: *erwin.prassler@h-brs.de*

Maximilian Schöbel: *maximilian.schoebel@h-brs.de*

Patrick Nagel: *patrick.nagel@h-brs.de*

Assignment 03

Due Date: Sunday, 20.11.2018, 08:00

Notes: Make sure to provide parts of the output of your programs in text-files along with your submissions!

1. Give an explanation to prove the following statements:
   - Breadth-first search is a special case of uniform-cost search.
   - Breadth-first search, depth-first search, and uniform-cost search are special cases of Greedy Best-First Search.
   - Uniform-cost search is a special case of A* search.
2. Answer the following questions regarding A* search:
   - When is A* complete?
   - When does A* end the search process?
3. During the lecture you have discussed two heuristics for the 8-puzzle: Manhattan distance and misplaced tiles (see slides if not yet covered in class). Your tasks for this week are:
   - Implement a **Greedy** and **A*** agent for the 8-puzzle. The agents should be able to switch between both heuristics. Make sure to produce proper output to "visualize" the working of your program.
   - **Compare the performance of the solvers and the two heuristics**. Provide data in your report to support your arguments (number of visited nodes, path cost, execution time, etc). Which works better?
     - Use the following initial configuration: $\begin{bmatrix} 1 & 5 & 7 \\ 3 & 6 & 2 \\ 0 & 4 & 8 \end{bmatrix}$

       If your program takes a long time to run, you can test its functionality with a configuration closer to the goal, i.e.: $\begin{bmatrix} 8 & 7 & 6 \\ 5 & 1 & 4 \\ 2 & 0 & 3 \end{bmatrix}$
     - Note: A solution to the puzzle means that the numbers are arranged in ascending order and 0 is at position (0,0), i.e.: $\begin{bmatrix} 0 & 1 & 2 \\ 3 & 4 & 5 \\ 6 & 7 & 8 \end{bmatrix}$