Artificial Intelligence for Robotics

- Homework 6 -

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1. Give theoretical 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?
   - Briefly describe the behaviour of A* with a consistent heuristic.
3. During lecture you have discussed two heuristics for the 8-puzzle: Manhattan distance and misplaced tiles. Your tasks for this week are:
   - Implement a **Greedy** and **A*** agent for the 8-puzzle. The agents must be able to switch between both heuristics.
   - **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).
   - Comment if the heuristics are consistent or inconsistent.
     - You can use the following initial configuration: $\begin{bmatrix} 1 & 4 & 8 \\ 3 & 6 & 2 \\ 0 & 5 & 7 \end{bmatrix}$
     - Note: A solution to the puzzle means that the numbers are arranged in descending order and 0 is at position (3,3).

Notes

- Your are allowed to work in a team of two. **Team members must submit the same files. Each team member should be able to present the submitted solution.** Peer programming can be a useful resource.
- In the "example" folder you can find a sample solution for this exercise. You can run it by typing:
  1. chmod +x main
  2. ./main
- You can use any editor to complete this assignment. The following steps will show you how to use eclipse to compile and run your code:
  - Extract the files.
  - Open a terminal and go into the "air_assignment_06/build" directory.
  - Generate the MakeFile by running the command: cmake ..
  - Compile your code by running the command: make
  - Open eclipse.
  - Select File − > New − > MakeFile Project from Existing Code.
    * Project Name: Set this field to "air_assignment_06".
    * Exiting Code Location: Browse and select the "air_assignment_06" folder.
    * Toolchain for Indexer Settings: Select the option "Linux GCC".
    * Press finish.
  - Select your project in the Project Explorer and carry out the following actions:
    * Right click
    * Select properties
    * Select C/C++ Build
      · Change the build directory from ${workspace_loc:/air_assignment_06}/ to ${workspace_loc:/air_assignment_06}/build/
    * Select Run/Debug settings:
      · Select New
      · Select C/C++ Application
      · Press "OK"
      · Under the "Main" tab:

1. Set "C/C++ Application:" to "bin/assignmet06".

· Under the "Arguments" tab:

1. Uncheck "Use default" under "Working Directory:".
2. Change "Working Directory:" from ${workspace_loc:/air_assignment_06} to ${workspace_loc:/air_assignment_06}/bin/

– Run your program.