

Artificial Intelligence for Robotics

- Homework 5 -

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1. Create a comprehensive mind map about informed (heuristic) search strategies.
2. Describe an example state space or problem in which iterative deepening search performs much worse than depth-first search.
3. On LEA you will find the template of your programming assignment. The search agent can perform in three different types of maps which can be interpreted as follows:
 - (Numbers from 1 to 9) goals in the order to be visited.
 - (Space) free space.
 - (s) is the initial position of the robot.
 - Any other character represents an obstacle.

Each character in the text file represents a cell in the map. The rules for the robot are the following:

- At each step, the robot can move from one cell to another.
- The robot can only move to the left, right, up or down cells from the current position.
- The robot does not have previous knowledge about the environment, such as goal positions or obstacles. It has to "explore".
- Of course, the robot cannot move through obstacles and the map is closed.
- The robot has knowledge about number of goals to be reached.
- If a goal is not reachable, robot should skip and the next goal should be considered.

Your tasks are:

- Implement **iterative deepening depth-first search** (`agent.cpp`) to find a path for the robot to reach the goal cells in order. **When a goal is reached, you should backtrack the visited nodes and print the path from the current start cell to the current goal cell.** For goal 1, the robot's initial position would be the start position, for goal 2, goal 1 would be the start position and so on.
- Describe the performance of the algorithm in each map.

Notes

- You 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_05/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_05".
 - * Existing Code Location: Browse and select the "air_assignment_05" 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 `${workspace_loc:/air_assignment_05}/` to `${workspace_loc:/air_assignment_05}/build/`
 - * Select Run/Debug settings:
 - Select New
 - Select C/C++ Application
 - Press "OK"
 - Under the "Main" tab:

1. Set "C/C++ Application:" to "bin/assignmet05".
- Under the "Arguments" tab:
 1. Uncheck "Use default" under "Working Directory:".
 2. Change "Working Directory:" from `${workspace_loc:/air_assignment_05}` to `${workspace_loc:/air_assignment_05}/bin/`
- Run your program.