CS 3030 Spring 2019 Project 1: State-Space Search

Due: Tuesday, April 2nd at 11:59pm [60 points]

This assignment is designed to give you experience with modeling real-world problems into search state space and applying uninformed and heuristic search algorithms to solve problems.

General Requirements:

1. You will form a group of 3 students to work on the project. Please sign up for groups by 3PM, Feb 21.
2. You will choose one of the three problems below to work on:
    1) 8-puzzle problem as described in class and in the textbook
    2) Maze problem
    3) Other problem
3. Once you decide the problem, you should model the problem into search state space, including
    1) Initial states
    2) Actions and transition models (Operators)
    3) Goal state test
    4) Path cost function

    Use a graph example to represent the state-space. You can use the smaller scope problem or a subset of the state-space as the example.

4. For the chosen problem, you need to implement three search algorithms to solve the problem. Here are some requirements on the solutions:
    1) There should be one uninformed search algorithm and two heuristic search algorithm.
    2) For each search algorithm:
        - Use pseudo code to describe the algorithm.
        - Analysis the properties of the algorithm: Complexity, Completeness, Admissibility and Irrevocability.
    3) For each heuristic search algorithm, use one paragraph to describe the heuristic and formally define the heuristic function *h(n)* and evaluation function *f(n)* (if applicable).
    4) Implement your algorithms to solve the problem and compare the results.
5. You can use any language that can be run on a lab computer to implement your algorithms and experiments. GUI is not required but would be nice to have. Your implementation should also serve the purpose of algorithm comparisons.
6. **Extra credits**: you may earn up to 5 extra credits for additional features not required.

Submission guideline:

- Submit your source code to Canvas Dropbox.
- Use the project report template to finish your project report. Name the report as GroupX-project1-report.docx and submit it in Canvas Dropbox.

- Write a Readme.txt file including your group members' names and the build instruction to run your program. Assume the audience has no programming knowledge. Submit the file in Canvas Dropbox.
- You need to schedule a demo appointment with me within 3 days of the project due date. Every group member should attend the demo. I will ask questions during the demo and your answers will affect your grade.

Grading rubrics:

Rubric	Grade	Comment
[10pts] Modeling		
[9pts] Description of each algorithm. 3 points each.		
[9pts] Property analysis of each algorithm. 3 points each.		
[24pts] Implementation of each algorithm. 8 points each.		
[6pts] Empirical analysis based on implementations.		
[2pts] Professional appearance and time log.		