CS170: Assignment 1 Write Up

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1 Introduction

This assignment is the first project in Dr. Eamonn Keogh's Introduction to AI course at the University of California, Riveside during the quarter of Fall 2017. The following write up is to detail my findings through the course of project completion.

It explores Uniform Cost Search, and the Misplaced Tile and Manhattan Distance heursitics applied to A*. My lanugage of choice was Python (version 3), and the full code for the project is included.

2 The Code

Relevant files:

- nPuzzle.py

- TreeNode.py

  Running is as follows:

```
python3 nPuzzle.py
```

3 Comparison of Algorithms

The three algorithms implemented are as follows: Uniform Cost Search, A* using the Misplaced Tile heuristic, and A* using the Manhattan Distance heuristic.

3.1 Comparison of Algorithms on Sample Puzzles

There were six puzzles of varying "difficulty" given to implement. The easiest of the six is a trivial puzzle (already the goal state) and the hardest puzzle is impossible to solve (the goal state, but the position of tiles 7 and 8 swapped). While the feature of user-inputted puzzles supported, this write up will only use Dr. Keogh's in examples.

3.2 Mathematic Verification

4 On Utility of the Two Heuristics

5 Closing Thoughts

The most interesting thing to me was realizing that as impractical Breadth First Search and Depth First Search are in the context of real world problems, they are still the heart of most practical feasible algorithms used for such real world problems.
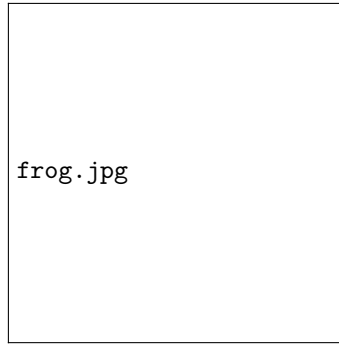
Figure 1: This frog was uploaded via the project menu.

Item	Quantity
Widgets	42
Gadgets	13

Table 1: An example table.

6 Some examples to get started

6.1 How to include Figures

First you have to upload the image file from your computer using the upload link the project menu. Then use the includegraphics command to include it in your document. Use the figure environment and the caption command to add a number and a caption to your figure. See the code for Figure 1 in this section for an example.

6.2 How to add Comments

Comments can be added to your project by clicking on the comment icon in the toolbar above. To reply to a comment, simply click the reply button in the lower right corner of the comment, and you can close them when you're done.

Comments can also be added to the margins of the compiled PDF using the todo command, as shown in the example on the right. You can also add inline comments:

This is an inline comment.

Here's a comment in the margin!

6.3 How to add Tables

Use the table and tabular commands for basic tables — see Table 1, for example.

6.4 How to write Mathematics

LaTeX is great at typesetting mathematics. Let $X_1, X_2, \ldots, X_n$ be a sequence of independent and identically distributed random variables with $\mathrm{E}[X_i] = \mu$ and $\mathrm{Var}[X_i] = \sigma^2 < \infty$, and let

$$S_n = \frac{X_1 + X_2 + \cdots + X_n}{n} = \frac{1}{n} \sum_i^n X_i$$

denote their mean. Then as n approaches infinity, the random variables $\sqrt{n}(S_n - \mu)$ converge in distribution to a normal $\mathcal{N}(0, \sigma^2)$.

6.5 How to create Sections and Subsections

Use section and subsections to organize your document. Simply use the section and subsection buttons in the toolbar to create them, and we'll handle all the formatting and numbering automatically.

6.6 How to add Lists

You can make lists with automatic numbering ...

1. Like this,

2. and like this.

...or bullet points ...

- Like this,

- and like this.

6.7 How to add Citations and a References List

You can upload a `.bib` file containing your BibTeX entries, created with JabRef; or import your Mendeley, CiteULike or Zotero library as a `.bib` file. You can then cite entries from it, like this: [**?**]. Just remember to specify a bibliography style, as well as the filename of the `.bib`.

You can find a video tutorial here to learn more about BibTeX.

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