University of Sheffield: Department of Computer Science

COM1080: AI Techniques

Assignment 1 2005

The 8-puzzle

This assignment carries 30% of the assessment for COM1080.

1. The 8-puzzle problem

1		3
4	2	6
7	5	8

Initial State

1	2	3
4	5	6
7	8	

Goal State

The 8-puzzle is played on a square 3-by-3 board or *tray*. Each *tile* on the tray contains an integer between 1 and 8. No integer is repeated.

The aim is to convert the initial arrangement of tiles into some specified goal arrangement by a sequence of moves

A move consists of transferring an adjacent horizontal or vertical tile into the empty space.

In this assignment you will implement a solution to the 8-puzzle by state-space search, using the search engine described in the lectures, and experiment with search strategies and different variants of the problem.

2. What you must do

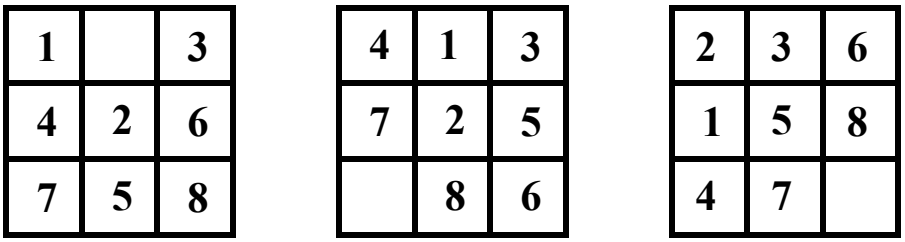
In

/share/public/com1080/java/search2 (unix)

\\holly\public\com1080\java\search2 (windows)

Is the code for the search engine and for Jugs problems.

- Following the instructions in section 2.9 of the lecture notes, write classes to implement a state-space search for 8-puzzle problems.
- You should not need to change the code for the search engine except perhaps to control how much it prints as a search proceeds, and to stop the search after a given number of iterations (in an 8-puzzle the search tree can become large).
- Test your implementation with **breadth-first** searches for the following initial configurations and the same goal state as above:



- Experiment with both depth-first and breadth-first searches for other 8-puzzle problems of your own choosing.
- Discuss your results and suggest ways in which 8-puzzle solutions might be found more efficiently. *If you want to code and experiment with your suggestions you are welcome, but this is not necessary to obtain high marks.*

3. What to hand in

Prepare a single unformatted text document (i.e. ASCII, not word or html or anything like that), consisting of

1. A first line looking like

   <your name> <your course> COM1080 Assignment
2. Commented code for the classes **epuzz_state** and **epuzz_search**
3. Results (i.e. the solutions and efficiency scores returned by **run_Search**) for breadth-first searches with starting configurations C1,C2 and C3.
4. A summary of other experimental results.
5. Your discussion and suggestions for improvements.

4. How to hand in

The project hand-in and marking will be handled electronically, not on paper.

You must obey the following exactly, or else your work may not be marked.

- We will create a sub-directory of your home directory on the DCS network called **handin/COM1080/as1**
- Put your exercise in this directory, readable only by you, in a file with the name **<your-dcs-login-name>.ex1** , e.g. **u3pdg.as1.**

Beware: if you are using notepad your file may be saved with extension .ex1.txt

- The report should be in place by the deadline date (see below).
- Any other files in the handin directory will be ignored.

An automatic collection script will run at 23.59 on the deadline day and for the next seven days including weekends thereafter. Note that this script will move not copy your work, so if you want to keep it, make sure you have a copy somewhere else. You will know when your work has been collected because the directory you placed it in will disappear. If the directory is empty it will remain until the script next runs.

DEADLINE: Monday 14th March (week 6)