COMP304: Artificial Intelligence
Assignment One
Due Date: 13 November 2020: 10 am

Dangerous Crossing Problem

There is a set of n people who wish to cross a bridge at night. The following constraints apply.

- Each person has a travel time (given in minutes) to cross the bridge.
- No more than two people can cross the bridge at one time.
- If two people are on the bridge together, they must travel at the pace of the slower person.
- There is only one flashlight and no party (of one or two people) can travel across the bridge without the flashlight.
- The flashlight cannot be thrown across the bridge, and nobody can go to the store to purchase another flashlight

The input to the problem is a list of positive distinct integers denoting the crossing time of n people and a single integer specifying the minimum time required for all n people to cross the bridge.

Some instances of the problem include:

1. (1, 2, 5, 8) and 15
2. (1, 2, 5, 10) and 17
3. (3, 5, 9) and 17
4. (3, 4, 5, 6) and 21
5. (1, 2, 5, 10, 12) and 25

Instructions

1. Write a program that (35 marks) that takes as input an instance of the problem as described above and :
   (a) Implements the following algorithms to solve instances of the problem:
      - depth-first search,
      - breadth-first search
      - greedy best first search
      - A^*

   (b) Provides the user with the option of solving the problem using either the depth-first search, breadth-first search or A* algorithm.
   (c) Solves the problem using the chosen search.
   (d) Outputs the solution path.
   (e) Your program should work for $n = 3, 4, 5$

2. Submit a report describing (15 marks):

   (a) The heuristic evaluation function used for the A* algorithm.

   (b) A comparison of the performance of the three search methods in solving problems of differing difficulty.

Notes:

- You may implement the solution in either Java or python.
- Submit both the source code and you must submit executable programs that run without the IDE being installed on the user's system.
  - Java programs: Submit a jar file or the class files that will run. Ensure that the jar/class files can be run on a machine with only the JDK installed (please use only java version 8 or 11). NB any code requiring to be run from an IDE will not be assessed.
  - For the python program you must use python ver. 3.x The python script must run from the command line. You may use the search.py framework on the website.
- The interface can be text-based or graphical.
- Programs that do not run will be allocated a mark of zero.

Submission

- The assignment **must** be submitted on or before 13 November 2020: 10 am.
- You must use the Course website to submit. Click on **Assignments** in the Activities block (top left). Then click on **Assignment One**. You will be taken to a page which allows you to upload a file. You can re-upload a file but this will overwrite any file that was previously uploaded. **Emailed assignments will not be assessed**
- Please be warned against plagiarism. This is an individual assignment and group work is **not** permitted. The school has access to software to check for plagiarism. Cases of suspected plagiarism will either be submitted to the University proctor or a mark or 0 will be awarded to all students involved in plagiarism (i.e. students whose work is copied will also be penalized).