CS 335: Beyond Search

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1 TASK

This assignment has two parts. One is conceptual (some pseudocode) and in the second part you will compare two searching algorithms to solve the 8-queens problem.

1.1 PART 1:Conceptual

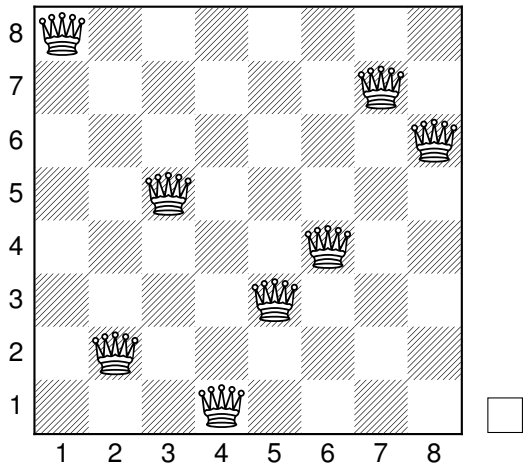
Write pseudo code for the following conditions:

- Simulated Annealing with T=0 at all times and ommiting the termination test
- Genetic algorithm with population of size 1
- Modify the Hill Climbing algorithm so that it implements random restarts H.C.

1.2 PART 2:Comparing Searching Algorithms

Create a python program called `8-queens.py` that takes in one parameter from the command line: an integer. This integer will indicate the number of puzzles it will have to solve. Run it like so (for example, to solve 5 random puzzles): `8-queens.py 5`. Follow the directions/advice below:

1. The program should genereates as many 8-queens initial states as the number indicates. Each puzzle should be represented by a list with 8 elements. Each element indicates the position of a queen in a column. For example: $[8, 2, 5, 1, 3, 4, 7, 6]$ represents the following board:



2. In `8-queens.py`, there should be two functions that implement a different algorithm to solve a puzzle. each of these should implement one of the following algorithms: regular hill climbing with steepest assent, random restart, genetic algorithms or simulated annealing.

3. Each function should also measure the search cost (number of boards generated until you hit a local/global minimum) and whether the problem was solved.

4. At the end of the execution of `8-queens.py` there should be a message with: The number of problems tried, percentage of solved problems using each algorithm, and average search cost of each algorithm. A program testing hill-climbing and simmulated annealing may output something along the following lines[1]:

```
350 puzzles.
Hill-climbing:75% solved, average search cost:2489;
Simm. Annealing:97% solved, average search cost:1453;
```

2 MUST HAVE

- You must type your answers to the first task. Model it after the pseudo code on the slides. You can use the following statements:`for, if, else, while` and auxiliary functions such as `max, min, cool_down,select_best` and the like.

- The answers to the first task must be in a PDF document titled `algorithms.pdf`.

- You must have only ONE python file called `8-queens.py` that can read directly from the command line. It should not ask the user for a number. For example, to test 350 puzzles you could invoke the program as follows:

  ```
  python 8-queens.py 350
  ```

- You must comply with the guidelines for python listed in the next section.

[1] I made up the numbers. Your numbers will be different

3 SUBMIT

ONE ZIP file with (a) a PDF with the solutions to the first question and (b) one PYTHON file with the program.

The python file must comply with the following convention (THIS IS VERY IMPORTANT)

- The first line of your file should indicate the python version as follows:
  - If you are using a flavor of python 3.x, your first line should be: `#!/usr/bin/env python3`
  - If you are using a flavor of python 2.7.x your first line should be: `#!/usr/bin/env python2`
- The second line should have the name of the homework and optionally a couple of words about it. These should be enclosed in three quotation marks. For example: `""" Eliza homework. Relationship advisor """`
- The third line should have your name assigned to the `__author__` variable. For example if your name is "John Doe" your next line should be:

  `__author__="John Doe"`
- Optionally, you can specify a file encoding on your second line and then follow the convention. You do this by adding the following line as a second line: `# # -*- coding: utf-8 -*-`

A sample hello world file created with python 2.7.x for John Doe looks like this:

```
#!/usr/bin/env python2
# # -*- coding: utf-8 -*-
""" Hello World program """
__author__="John Doe"

print "Hello World"
```

The same file created with python 3.x looks like:

```
#!/usr/bin/env python3
# # -*- coding: utf-8 -*-
""" Hello World program """
__author__="John Doe"

print ("Hello World")
```