Assignment 1: Search

Submission: Wednesday September 19th
Groups of maximum 2 students

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Intelligent Systems - 2018-II
Maestría en Ing. de Sistemas y Computación

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1. (2.5) The Masterball

   The Masterball is a puzzle which consists of a ball sliced into 8 segments and divided horizontally into 4 layers:

   There are two types of moves: a half turn along any longitude line and an $\frac{1}{8}$ turn of any of the 4 layers.

   Your goal is to model the Masterball as a search problem and solve it using different search algorithms.

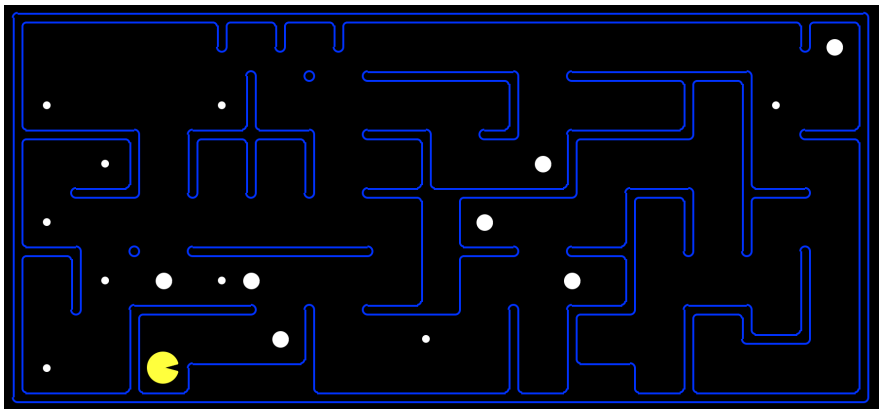
   (a) Create a class to the model the Masterball problem.

   (b) Implement iterative deepening search and A* search.

   (c) Implement different heuristics for the problem. The heuristics must be admissible and consistent. Compare A* using the different heuristics against IDS calculating the number of expanded nodes and the effective branching factor, in the same way as it is done in figure 3.29 of [Russell10]. Present the data in a table and discuss the results.

   (d) The solution has to be reported in an IPython notebook following the format and instructions in the notebook in `https://github.com/fagonzalezo/is-2018-2/blob/master/masterball.ipynb`.

2. (2.5) Pacman food and pellets problem



This problem is based on the search problems posed in the Project 1 of [AI-edX]. In this search problem you have to find a route that allows Pacman to eat all the power pellets and and food dots in the maze. All the power pellets must be eaten before eating any food dot.

(a) Download and uncompress the compressed file in `http://fagonzalezo.github.io/is-2018-2/pacman.zip`.

(b) Model the problem as a search problem. Modify the class `CornersAndCapsulesProblem` in the file `searchAgent.py`.

(c) Design a heuristic (it must be admissible and consistent) to solve the problem. Modify the `cornersAndCapsulesHeuristic` function in in the file `searchAgent.py`. You can see your solution in action with the following command:

```
python pacman.py -l tinyMaze -p AStarCornersAndCapsulesAgent
```

(d) Evaluate your solution using the following grader:

```
python autograder.py
```

To receive full credit your heuristic is expected to solve the problem with a small number of expanded states (less than 4,000 and 10,000 respectively for the two tests in the autograder). The solution will be tested with additional test mazes.

3. The assignment must be submitted as a compressed file containing both the `masterball.ipynb` and the `searchAgent.py` files, **only these files**, through the following Dropbox file request, before midnight of the deadline date. The file must be named as `is-assign1-unalusername1-unalusername2.zip`, where `unalusername` is the user name assigned by the university (include the usernames of all the members of the group).

References

[Russell10] Russell, S y Norvig, P. 2010 Artificial Intelligence: a Modern Approach, 3rd Ed, Prentice-Hall

[AI-edX] CS188x_1 Artificial Intelligence, UC Berkley, edX, Springer 2016, `https://edge.edx.org/courses/course-v1:BerkeleyX+CS188x-SP16+SP16/`.