

Assignment 1: Search

Submission: Wednesday March 8th
Groups of maximum 2 students

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Intelligent Systems - 2017-I
Maestría en Ing. de Sistemas y Computación

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:

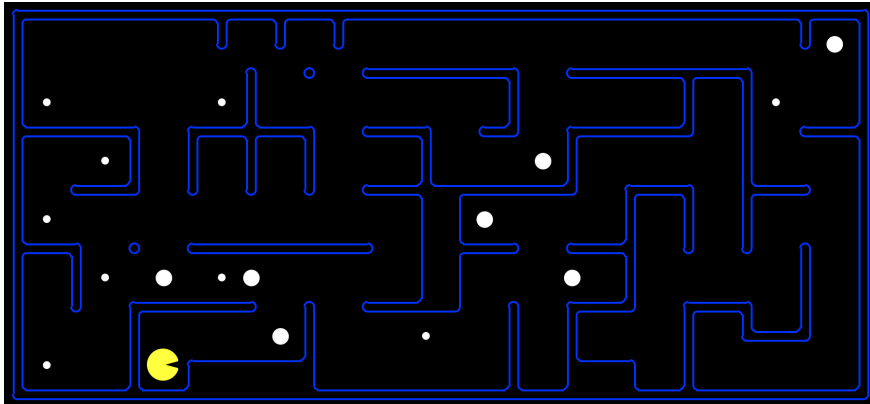


There are two types of moves: a half turn along any longitude line and an $\frac{1}{8}$ turn of any of the 4 layers.

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

- Create a class to model the Masterball problem.
- Implement iterative deepening search and A* search.
- 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.
- The solution has to be reported in an IPython notebook following the format and instructions in the notebook in <https://github.com/fagonzalezo/is-2017-1/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 food dots in the maze. All the power pellets must be eaten before eating any food dot.

- Download and uncompress the compressed file in <http://fagonzalezo.github.io/is-2017-1/pacman.zip>.
- Model the problem as a search problem. Modify the class `CornersAndCapsulesProblem` in the file `searchAgent.py`.
- Design a heuristic (it must be admissible and consistent) to solve the problem. Modify the `cornersAndCapsulesHeuristic` function in the file `searchAgent.py`. You can see your solution in action with the following command:

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

- 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.

- 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/>.