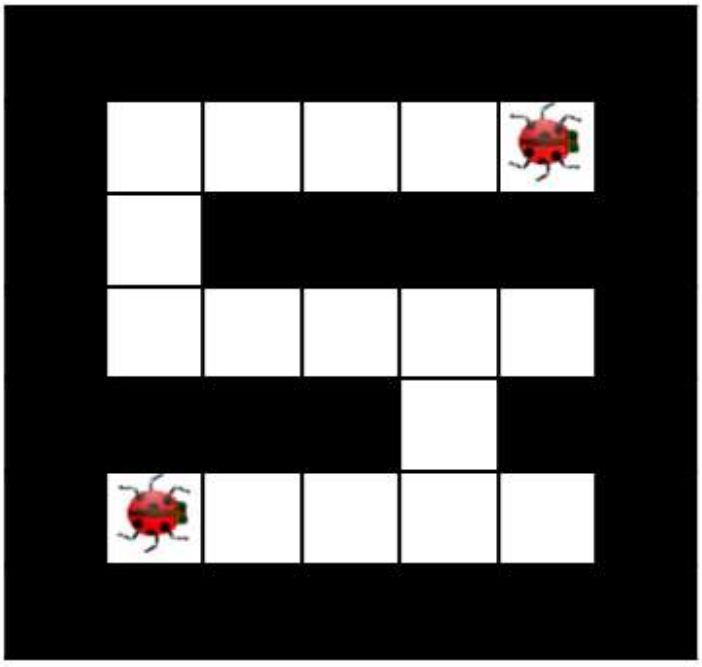
Q2: Hive Minds

Problem 2: Hive Minds

Let's revisit our bug friends from Homework 1. To recap, you control one or more insects in a rectangular maze-like environment with dimensions $M \times N$, as shown in the figure below. At each time step, an insect can move North, East, South, or West (but not diagonally) into an adjacent square if that square is currently free, or the insect may stay in its current location. Squares may be blocked by walls (as denoted by the black squares), but the map is known.

For the following questions, you should answer for a general instance of the problem, not simply for the example map shown.



You now control a pair of long lost bug friends. You know the maze, but you do not have any information about which square each bug starts in. You want to help the bugs reunite. You must pose a search problem whose solution is an all-purpose sequence of actions such that, after executing those actions, both bugs will be on the same square, regardless of their initial

positions. Any square will do, as the bugs have no goal in mind other than to see each other once again. Both bugs execute the actions mindlessly and do not know whether their moves succeed; if they use an action which would move them in a blocked direction, they will stay where they are. Bugs *cannot* jump onto walls. Both bugs can move in each time step. Every time step that passes has a cost of 1.

Part 1

0.0/2.0 points (ungraded)

Which of the following is a *minimal* state representation for the above search problem?

- (•) A list of boolean variables, one for each position in the maze, indicating whether the position could contain a bug. ✔
- ( ) Two lists (one for each bug) of boolean variables, one for each position in the maze. The first list indicates whether each position could contain the first bug and the second list indicates whether each position could contain the second bug.
- ( ) The position of each bug in the maze.
- ( ) A list of boolean variables, one for each position in the maze, indicating whether each position has ever contained a bug at any timestep.
- ( ) Two lists (one for each bug) of boolean variables, one for each position in the maze. The first list indicates whether each position has ever contained the first bug at any timestep and the second list indicates whether each position has ever contained the second bug at any timestep.

Submit You have used 0 of 1 attempt

Answers are displayed within the problem

Part 2

0.0/2.0 points (ungraded)
Which of the following gives the size of the state space for this search problem?

- MN
- $2MN$
- $(MN)^2$
- $2(MN)^2$
- 2^{MN} ✔
- 2^{2MN}
- $(MN)^4$

Submit You have used 0 of 1 attempt

Answers are displayed within the problem

Part 3

0.0/2.0 points (ungraded)
Suppose we use the heuristic

> h = the maximum Manhattan distance of all possible pairs of points the bugs can be in.

Is this an admissible heuristic for the above search problem?

- Yes ✔

No

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You have used 0 of 1 attempt

Answers are displayed within the problem