Test Data for Amazing Robots

Algorithms:

Note that the guards simultaneously return to their starting location every 12 minutes.

For analysis purposes, assume that the mazes are of equal size. More over, let *n* be the number of squares in the maze (R·C).

Algorithm 1: Perform a breadth-first search where the state of the search is the location of the two robots and the current minute within the guard cycle of 12 minutes. Use memorization to ensure that no state is visited more than once.

This algorithm takes O(12 n^2) time. It is expected to receive full marks, although this may vary based on implementation.

Algorithm 2: Perform breadth-first search where the state of the search is the location of the two robots and the current minute. Use memorization (with a hash table) to ensure that no state is visited more than once.

This algorithm takes O(12 T n^2) time, where T is the minimum amount of time it takes for both robots to exit their maze. It is expected to receive about 65% of the points.

Algorithm 3: Perform breadth-first search where the state is the location of the two robots and the time. Do not eliminate duplications.

This algorithm takes O(4^T) time. It is expected to receive about 40% of the points.

Algorithm 4: Perform breadth-first search where the state is the location of the two robots and the value of the state is minimum time it takes to obtain that state. Do not visit any state more than once.

This algorithm takes O(n^2) time, but is not always correct. It only considers the shortest path to each location pair. It may be of value to get to a location pair later, as you cannot waste time in the middle of an open space.

This algorithm is expected to receive about 30% of the points.

The efficiency of this algorithm varies based on the outer algorithm used. This algorithm is expected to get about 45% of the points, although this will vary depending on algorithm and implementation.

Test Data

Test #	Points	Maze 1	Maze 2	Guards	Answer
1	5	1x1	5x4	0	6
2	5	5x4	5x4	2	10
3	5	5x5	3x3	2	9
4	5	8x8	8x8	5	9
5	5	8x8	8x8	6	17
6	5	5x8	8x8	5	8
7	5	8x8	8x8	7	13
8	5	8x8	8x8	8	15
9	5	4x8	7x8	4	15
10	5	12x12	13x13	5	49
11	5	12x12	13x13	14	-1
12	5	12x12	13x13	13	41
13	5	20x20	20x20	3	66
14	5	20x20	15x20	4	68
15	5	20x20	20x20	5	200
16	5	20x20	20x20	19	200
17	5	20x20	20x20	20	-1
18	5	20x20	20x20	20	99
19	5	20x20	20x20	20	314
20	5	20x20	20x20	20	328