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Introduction to AI CS440
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Assignment 2

Question 1 and 2

If searched cell A and failed. The probabilities are updated with these following equations:

Let `type_of_cell_A = P(target not found in cell A | target in cell A)`

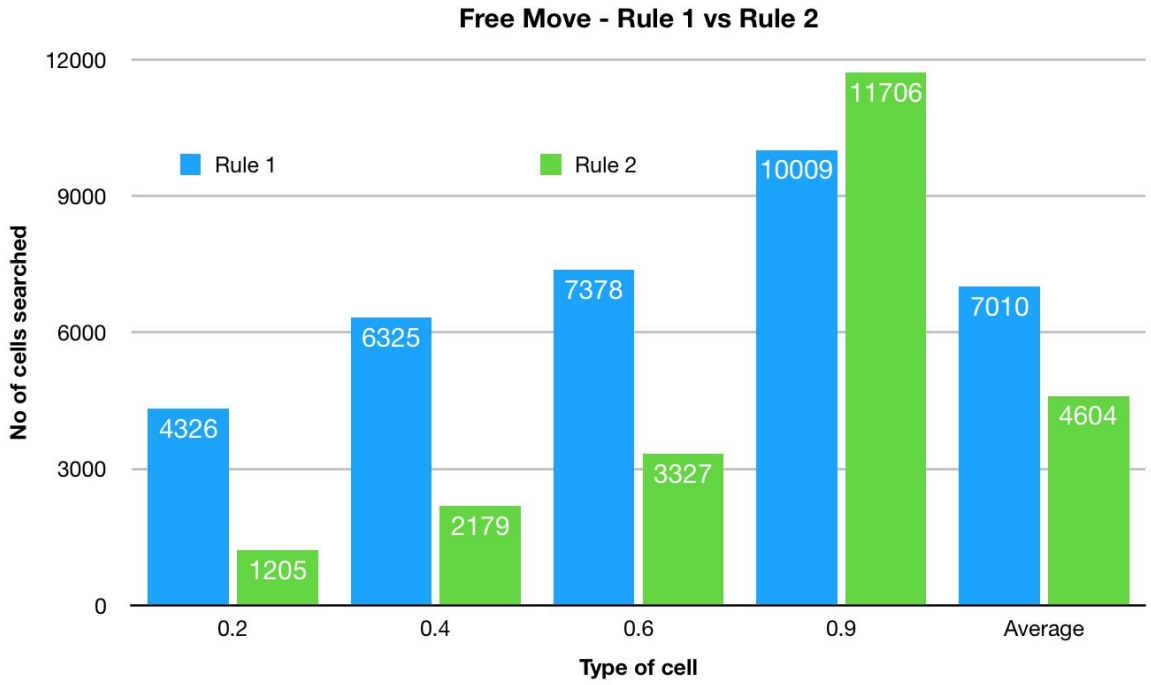
For cell A:

```
new_belief_in_A = (type_of_cell_A * old_belief_in_A) / (type_of_cell_A * old_belief_in_A + 1 - old_belief_in_A
```

For cell B (or any other cells):

```
scale_factor = 1 / (type_of_cell_A * old_believe_in_A + 1 - old_believe_in_A)
new_belief_in_B = old_belief_in_B * scale_factor
```

Question 3



Rule 2 performs better if the target is in easy to search terrain types (flat, hilly, forested) and Rule 1 perfoms better in cave of mazes.

This is the case because if target is in cave of mazes, according to **Rule 2** we'll only focus on searching easy terrain types first **P(found in A|inA) * P(Target in A)**. **P(found in A|inA)** in this case is very small = 0.1. Hence if target is in cave of mazes and we always look for easy places to search first, and keep lower the probabilities that the target is in easy terrain types.

Finally when **P(Target in flat, hilly, forested) < P(Found in cave of mazes) * 0.1** do we consider searching cave of mazes

Rule 1 ignores terrain types hence, it performs better in this case.

However, in average cases Rule 2 performs better.

Question 4

Decision rule

Start at a random cell
Search that cell
If can't find anything, update probabilities of entire map.
Check probabilities of neighbors cell (according to Rule 1 or Rule 2).
Move to the neighbor with highest probability
Repeat
Note: List of neighbors has the current cell itself. In case after searched and failed at current cell and the probability of current cell is still higher than neighbors cell, search the current cell again.

Rule 2 generally performs better except when target is in cave of mazes.


Rule 1 - Free Move vs Restricted Move
18000
13500
9000
4500
0
No of steps
Free Move
Restricted Move
3471
9156
5542
11005
7832
14747
9191
17920
6509
13207
0.2
0.5
0.6
0.9
Average
Type of cell


Rule 2 - Free Move vs Restricted Move
18000
13500
9000
4500
0
No of steps
Free Move
Restricted Move
1794
6627
2806
7590
4856
11994
11845
16369
5325
10645
0.2
0.5
0.6
0.9
Average
Type of cell

Question 5

The old man used Rule 2 in an over exaggerating way. As discussed in question 3, when the target is in hard to find places, searching easy places first will cost more time. The old man doesn't update his belief when he cannot find the key in the light. Also, he knows that the key is in the park, searching somewhere else will give no result.

This is opposite to the algorithm used in this assignment as the algorithm update the current belief based on each search. Eventhough based on Rule 2, we search easy places first, be if we cannot find target in those easy places, we'll move to more difficult places to search.