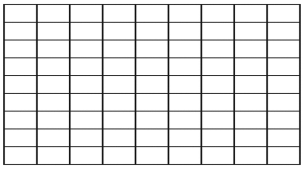
Introduction to AI, Assignment 1

Week 05/ Due Friday, 4pm

You are dealing with some agents who have their beliefs and their own perception of the environment. Your Goal is to take one of the agents (Red Riding Hood), with a basket full of Berries, to her target (Granny).

The environment in which all agents operate is a forest, which is a 2-Dimensional 9*9 lattice shown below.



9*9 Square Lattice

Agents and Beliefs

1) Red Riding Hood:

- Red Riding Hood is holding a basket full of Berries. A full basket means, she has 6 points. She should reach her Granny with the full basket (i.e. total 6 points).
- Red Riding Hood knows that other agents such as Wolf, Bear, Wood cutter and Granny are in the forest.
- She knows that Wood Cutter can be found in one of two places in the forest, either at work, cutting woods or at his house. She knows the exact location of both places but does not know at which place he can be found at the current moment.

- The detection range of Red Riding Hood for the bear is shown as:

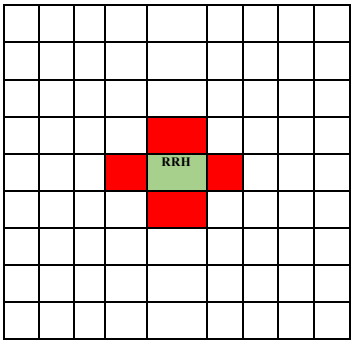


Figure 1: Red Riding Hood's Detection range for Bear shown by red colored cells, 5 cell Von Neuman Neighborhood

Red Riding Hood can also detect a Wolf. Her detection range for Wolf is shown in Figure 2.

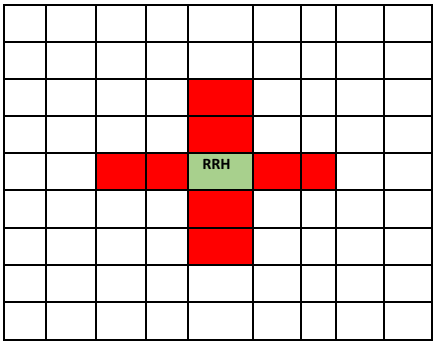


Figure 2: Red Riding Hood's Detection range for Wolf, shown by red colored cells, Von Neuman Neighborhood

- Red Riding Hood can reach Woodcutter if she is exactly inside the same cell in which wood cutter stands.
- Red Riding Hood can reach Granny if she is exactly inside the same cell in which Granny stands.

Bear:

Bear eats Berries and It can finish all berries of Red Riding Hood if she comes in his detection range 3 times, which means each encounter of Red Riding Hood with a Bear makes her lose 2 points.

Bear has a detection range that can be specified as 3*3 Moore neighborhood.

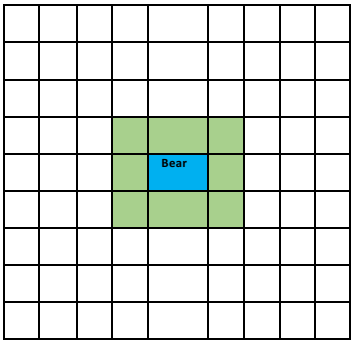


Figure 3: Bear's detection range for Red Riding Hood, 3*3 Moore Neighborhood

Wolf:

The detection range of Wolf is shown in Figure 4.

The Red Riding Hood is killed by the wolf as soon as she comes in his detection range.

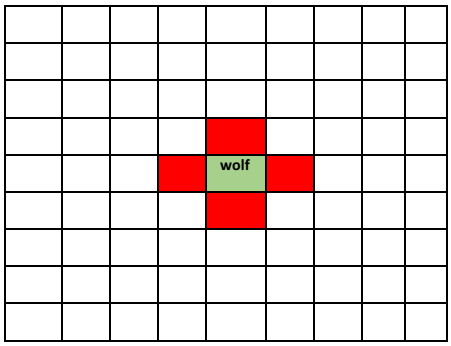


Figure 4: Detection Range of Wolf for Red Riding Hood, 5 cell Von Neuman Neighborhood

Wood Cutter:

Wood Cutter should be at one of the two places. Two places are generated randomly.

When Riding Hood meets Wood Cutter, he gives ALL her points back. So, she can try gaining back her points if she lost some because of the Bear.

Note: Red Riding Hood must be aware of two places where Wood Cutter can be found. But she does not know in which one of these places Wood Cutter is currently located. Also, she can reach the Wood Cutter only if she goes to the same cell in which wood cutter is standing.

Remember that Red Riding Hood is the only moving agent. Rest of the agents are static in their positions.

Please make sure that Granny and Wood Cutter are not in the detection ranges of Bear and Wolf for Red Riding Hood. Otherwise Bear and Wolf can attack her if she tries to approach Wood Cutter or Granny.

Granny:

Granny will be positioned randomly in the environment. Red Riding Hood knows the location of Granny.

Red Riding Hood will be considered reached Granny only if she goes to the same cell in which Granny is standing.

What can lead to Failure:

1) All Berries eaten, i.e losing all 6 points.
2) Red Riding Hood being killed by the Wolf.

Algorithms:

Use Backtracking and A* search algorithms and compare the outcomes using a statistical argument in your final document. You should run each, 100 times on different settings of the map to show a projected time till solution.

Programing Language:

You can use the following languages: C++ or Java

Submission:

You will have to submit e-mail to your TA with

1) A source code with comments

2) A document describing types of used agents and types of environments for these agents. It should describe your findings of the projected time till solution. Try to find the arrangement/settings of all agents in the environment which makes task unsolvable or very difficult. Show these settings on a grid.

Note:

Plagiarism in your work will lead to a fail grade in the assignment. We reserve the right to use software for comparisons against your classmates.