

AI assignment one – Humans v. Orcs Rugby

Part 1 [10pts]

You are the coach for the big Humans v. Orcs Rugby match.

The field is 20 square yards and your runner catches the ball in at (0,0). You must minimize the number of moves by your team to find the goal point while avoiding Orcs not defended by humans. Your players are confused in the general melee that Orc football contains and can only see about in a one-yard neighbourhood (note neighbourhood is to be defined as a one-unit move in the x or y direction – no diagonals).

The player holding the ball may move one step per turn in its neighbourhood. If your current ball carrier moves into a yard with an orc – then he will be tackled, if they visit a square with a human, the ball is handed off in a running play, an extra free step may now be made this turn if it visits a yard with the touchdown point then a point is scored.



Figure 1- A Human, Orc, and a Touchdown Point on the Field (note the yard markers)

Once per round, as per the rules of orc rugby, your player might attempt a passing play to toss the ball from one player to another. A pass happens instead of a move action in a straight line or diagonal from

the holder of the ball. If the ball is intercepted or there is a receiver, then it is ruled a turnover, and no point is scored for the Human team.

Input:

A file with the following format, as predicates for Prolog, with newlines between them

O – Followed by two integers; is an orc

H – Followed by two integers; is a human

T – Followed by two integers is a touchdown point

e.g.

H(0 2)

O(1 2)

T(1 3)



Figure 2 - the setup according to the sample file.

Output:

The number of moves and the pathway generated by your system or a message saying that it is not a solvable mission, followed by the time utilized by the method to find this solution. A pass is always successful to the first human along this line so long as: there is a human on the line of the pass; there are no orcs in the line of the pass.

e.g.

4

P 0 2

0 3

1 3

0.2 msec

The solution is to pass forward to 0 2, the human at 0 2 then runs to 1 3 via 0 3, avoiding the orc at 1 2

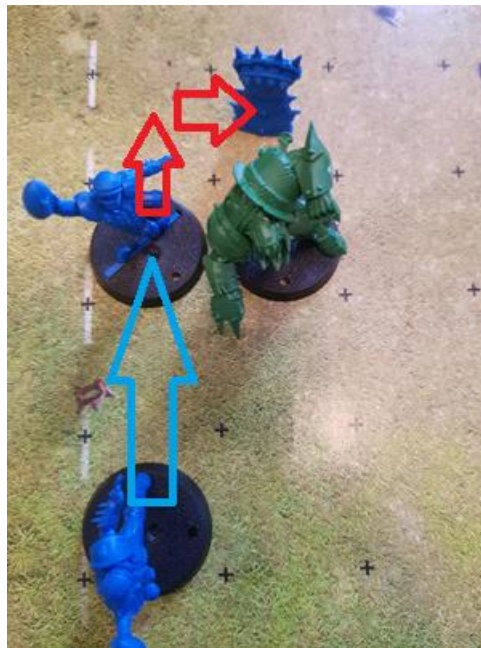


Figure 3-The Winning Play! (pass in blue, moves in red)

Implement:

A random search method with 100 attempts taking the least number of moves to a solution

A backtracking search (use your prolog tree)

Another search method of your choosing (e.g. A-star, Simulated Annealing, etc.)

Compare and contrast the methods using statistical arguments against several test maps developed.

How did you decide upon these maps as functional tests of your method? Justify your selections.

Part 2 [5 pt]

Your team has become more advanced in the ways of Orc Rugby and can now see 2 yards rather than one.

Run the same experimental method as above – are there any significant changes with this new ability?

Can you produce a map where this leads to a significant increase in time savings or can allow an

impossible map to be made solvable? Does it make any solvable maps unable to be solved? If so, prove it via a worked example.

Part 3[5 pt]

What arrangements of Orcs, Humans, and goal points that are hard to solve or impossible? Produce an argument demonstrating an arraignment which provides for a hard to solve map. Produce an argument demonstrating an arraignment which provides for arrangements for impossible maps. Is there a commonality between impossible arrangements?

What to hand in:

Your source code and a report which answers the questions from above.