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AI Assignement Report

Part 1 (Source code)

Prolog implementation in "AI Assignement 1.pl".

Part 2 (Report Description)

This assignment is implemented in SWI-Prolog V**8.2.4-1**.

The goal of this assignment is for the actor to reach home. The environment consists of a map of 9x9 square lattices (81 places). There are 6 elements in the environment which are: **an actor**, **a doctor**, **two covids**, **a mask** and **a home**. The actor should be able to reach home even if the environment consists of covids. The code returns "Win" if it's possible depending on the generated map and it returns "Lose" if the actor caught covid or the generated map is unsolvable (to be discussed below).

1. Backtracking algorithm (implemented)

   For backtracking algorithm, the actor tries to reach the home trying all possible paths/possibilities that can lead to the goal making sure he/she keeps away from the infected areas or passing through to the doctor or mask cell. For this algorithm, the actor doesn't go back to the visited cells so we can keep track of the visited cells in a list. After all, we record the number of steps taken to reach at home. In other words, the code creates several lists, one of them consists of all the possible move, another one that saves the most optimal path, another one saves the place for the elements inside the map (covid, mask, etc…).

2. A* Algorithm (didn't manage to implement it fully)

   In A* algorithm, the actor tries to reach the home trying all possible paths/possibilities but the main difference between this and backtracking is that it makes sure it trying the path with minimum number of steps using heuristics to guide its search. Heuristics is the measure of how close it is to the goal (in our case how close the actor is to home). I considered the distance

between each square lattice in any direction (up, up-right, up-left, down-right, down-left, down, left, right) to be 1 unit.

3. Statistical analysis

   Without statistical comparison, I identified that the variants won't have that big difference since both algorithms just find the minimum steps to reach home and the time taken will be the same for both algorithms will be the same. In this case, I prefer ignoring variants while comparing the two algorithms.

   - **Backtracking compared to A* algorithm**

     No comparison since A* isn't implemented.
   - **Backtracking (variant 1) compared to Backtracking (variant 2)**

     Same time and number of steps since the variant doesn't affect anything in the implementation or the results got.
   - **2nd algorithm (variant 1) compared to A* algorithm (variant 2)**

     Same time and number of steps since the variant doesn't affect anything in the implementation or the results got.

4. PEAS of the actor

   In this assignment or system (if we can call it so), the agent is the Actor whose goal is to be able to reach home. In this section, I'm going to discuss the PEAS (Performance, Environment, Actuators and Sensors) of the actor.

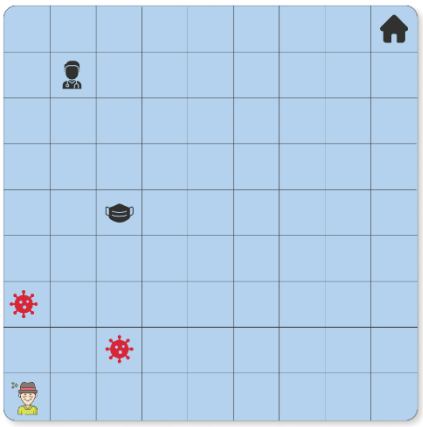
   - **Performance**: The performance of this agent can be evaluated according to the results of this system whose goal is reaching home.
   - **Environment**: Its environment consists of the space (map) which is 9x9 square lattices and all the elements in the map that the actor can interact with which are the doctor, mask, home and two covids.
   - **Actuator**: The actor's actuators are his legs which help him to move and maybe other parts of the body that can hep him to do a displacement.
   - **Sensors**: The actor's sensors are the eyes that plays the biggest part but again it won't be wrong to include other organs that can help him/her to recognize the environment.

Part 3 (Impossible maps)

From this given task, I have discovered **two particular** cases where the goal is impossible to satisfy or impossible to solve.

1st case:

In this first case, from the randomly generated map, the actor is surrounded by the two covids in his cell and he can't make any move from his corner but the map is valid. The map is shown below.



2nd case:

For this case; the home, mask and the doctor are all surrounded with covids from the randomly generated map which is valid and the actor is not able to access none of those. Such a kind of map is impossible to solve and it can have many variants and here are some examples: