Maze solver with a few twists

The objective of this question is to implement maze solver in Prolog.

Maze specification

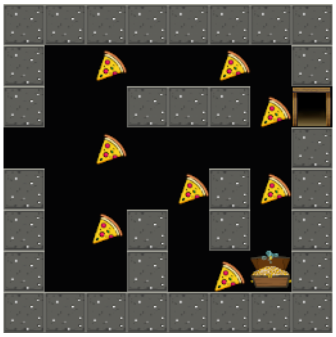

Figure 1: An example Maze

In Fig.1 you can see a maze that consists of 5 types of cells.

- The gray cells correspond to walls, i.e., cells that cannot be traversed.
- The black cells correspond to empty cells, which are traversable by your AI player.
- The cells with pizza slices are food cells, that are traversable and when reached, will restore the food reserves of your AI player.
- In each maze, there exists a single treasure cell that contains a treasure.
- Each maze also has one exit cell shown in the image as an open door.

In an accompanying file to this assignment, you are given a textual representation of the above maze. In that file, wall cells are shown by '#', black cell by '0', food cells by 'F', the treasure cell is shown by 'T'. The starting position is shown by 'S' and the exit is shown by 'E'. All mazes are square and the first line of each maze file contains the length of a maze's side.

Your first task in this question is to write a small program that reads the maze file and produces its Prolog specification. What are the predicates of your specification?

Solvers

In this part of the question you are asked to implement three maze solvers with an increasing difficulty.

L1: Simple maze solver

First implement a simple solver in Prolog, where an AI player only attempts to find the maze exit. The player starts at the starting position. For this part of the question, you may consider all pizza cells and the treasure cell as empty cells. What is the quickest way to get to the exit?

L2: Maze solver with starvation

Assume that the player has a fixed energy capacity that decreases by one after each move. The player cannot move when it's starved (the energy level becomes zero) and thus the game is lost. Write a solver that will traverse the maze without starving, if that is possible.

L3: Maze solver with starvation and treasure

The final constraint we add is a treasure. The player now has to traverse the maze without starving, get the treasure and then get to the exit. Write a suitable solver to take the quickest way to get to the exit while not starving and having gotten the treasure?

Deliverables:

- Three source code files, one for your program generating the specification, and three prolog files for the solvers.
- A short report that explains how you specify the world and how each of your solvers works.