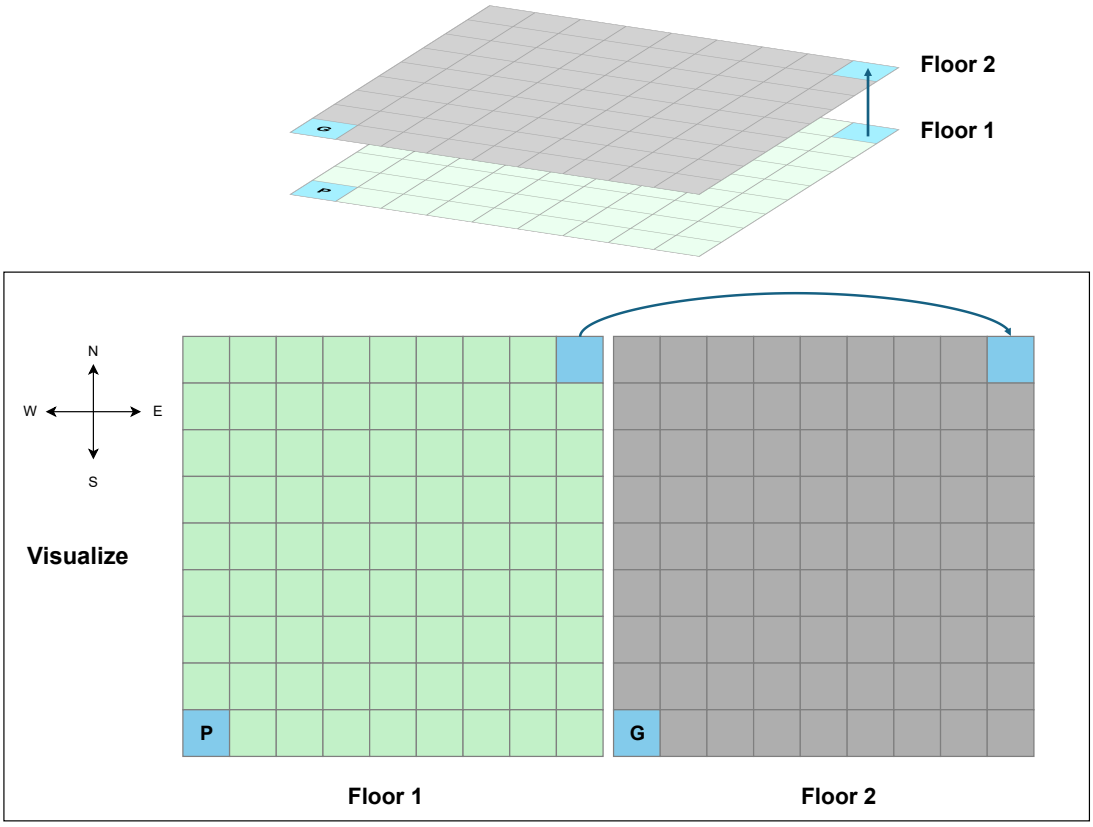
Course: Artificial Intelligence
Midterm Examination

June 20, 2024

Use search tools, ChatGPT, Copilot, Gemini, … to create a path-finding problem

Design a simple 3-dimensional $15 \times 15 \times 2$ maze. Each square can be either an obstacle (denoted by -1) or a cost value $\in \mathbb{R}$ in the range $[1, 20]$. At least 50% of cells are obstacle.



Pacman (labeled P in the diagram) always starts at the bottom-left square of Floor 1, *Goal* (labeled G in the diagram) is at the the bottom-left square of Floor 2. Pacman can take these actions in the grid

- Move to an adjacent square on the same floor (north, south, east, or west).
- From the top-right corner in floor 1, take an elevator to the top-right corner in floor 2. The elevator cannot go down.

Q1. [2pt] **Draw** the maze and **define** the problem clearly

Q2. [2pt] **Execute** two search algorithm DFS and BFS

a) **Compare** their complexities (time, space) in a table

b) **Visualize** their results

Q3. [2pt] **Develop** a heuristic function and execute the A* algorithm using it.

a) Show its complexities (time, space) in a table

b) Visualize its result

Q4. [2pt] **Develop** a objective function and execute a local search algorithm to find a path

a) Show its complexities (time, space) in a table

b) Visualize its result

Q5. [1pt] Suppose that there is another *Goal* is at the the bottom-right square of Floor 2, modify the A* algorithm to reach both goals in any order.

a) Show its complexities (time, space) in a table

b) Visualize its result

Q6. [1pt] Clear writing

Note

- Save your work as a PDF file named "`midterm-[id].pdf`".
- Submit the file through Moodle