

A* Pathfinding in Dynamic Environments

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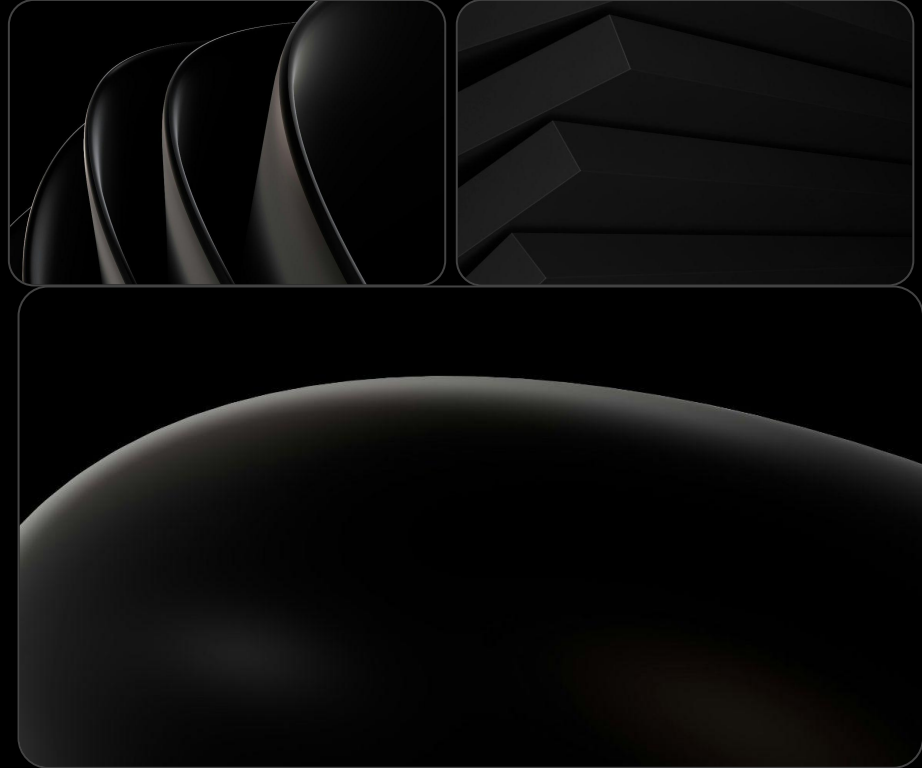


pathfinding problem

Problem Statement

Implement an AI agent that optimizes pathfinding in dynamic environments (e.g., urban traffic, warehouse robots) using informed heuristic search, A^* , or metaheuristic methods like genetic algorithms.

We choose A^* pathfinding in our dynamic environment



1



Python for the A * algorithm

2



Pygame for visualization

Pseudocode for A*

Initialize the frontier list

Initialize the visited list

Put starting source cell into frontier

While frontier list is not empty

 Get cell with smallest f value from frontier list and pop it off the list

 Get the cell's successors

 Add cell to visited list

 For each successor

 If successor is goal, rebuild the list using cell's parent cell until source is reached and return the list

 Otherwise

 Compute g and h for successor then calculate f

 If successor cell is not in the frontier or it's f value is smaller than what already exists on the frontier, place cell on frontier

If path was not found

 Return empty path list

Psuedo-code for constructing path

Start with current cell and empty path list

While not current cell is not source cell(source cell parent is itself):

- Append current cell to path list

- Get row and col of parent cell and make that the current cell

Append the source cell to empty path list

Reverse the list to get path from source to destination instead of destination to source

Return the path

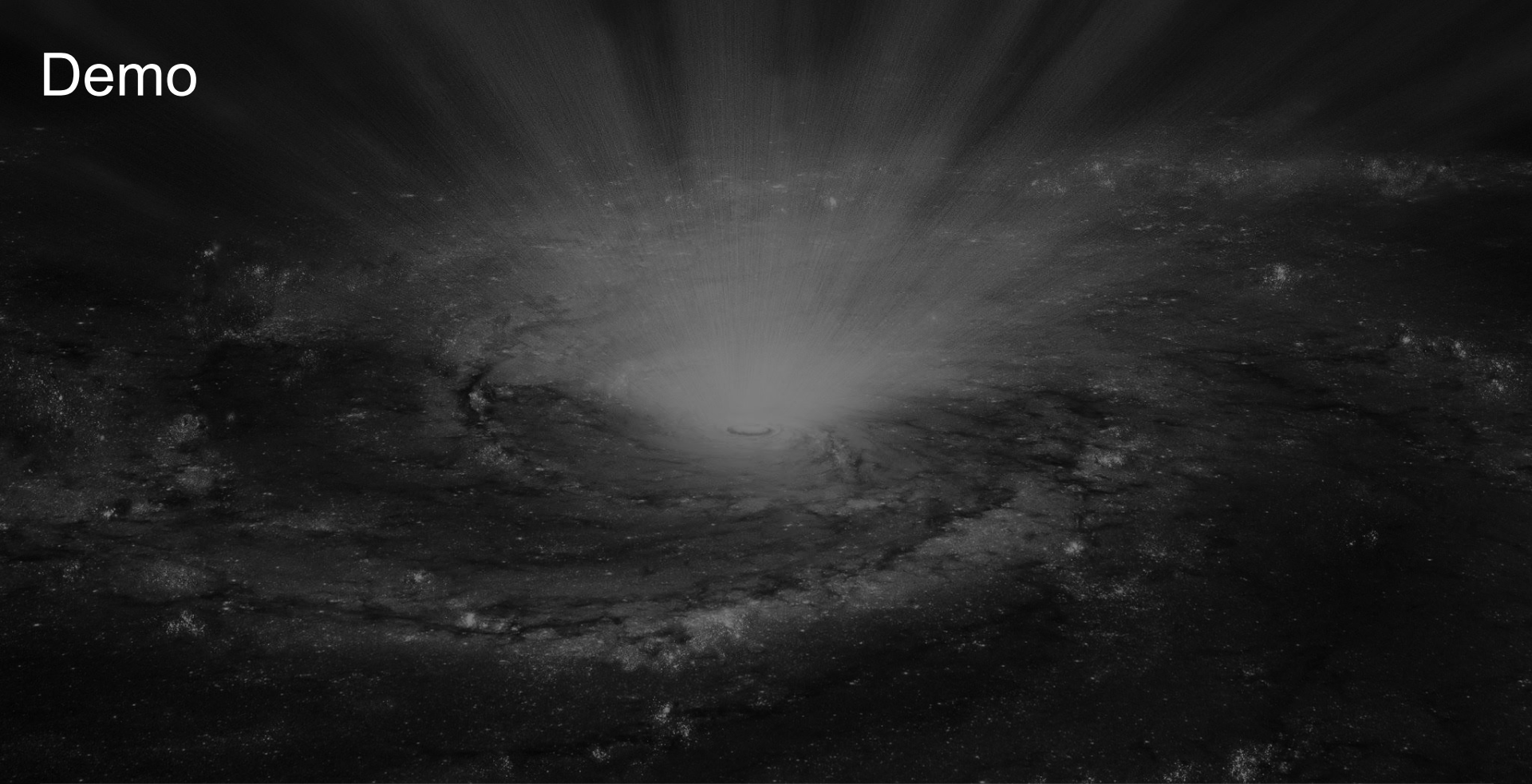
Implementation details

(open code and explain)

Resources used for implementation

- <https://www.geeksforgeeks.org/a-search-algorithm-in-python/>
- <https://www.redblobgames.com/pathfinding/a-star/introduction.html>
- <https://www.pygame.org/docs/>
- <https://stackoverflow.com/questions/33963361/how-to-make-a-grid-in-pygame>
- <https://stackoverflow.com/questions/19117062/how-to-add-text-into-a-pygame-rectangle>
- <https://www.geeksforgeeks.org/a-search-algorithm-in-python/>
- <https://medium.com/@sabahat.usman.su/a-small-paint-program-1d6cb64f8da7>

Demo





Thank you

Any Question