AALIYA ROY GUPTA'S

BOTBRAIN

CORE COMPONENTS OF THE CODE

a
- Location Graph: Campus locations & weighted paths stored as dictionaries.

b
- GUI: Tkinter-based interface for user input and visualization.

c
- Visualization: Matplotlib used to plot campus map & highlight routes.

d
Search Algorithm: A* used to calculate shortest path efficiently.

A* SEARCH ALGORITHM EXPLAINED

- Combines cost-so-far (g) with heuristic estimate (h) to prioritize nodes.
- Heuristic: Euclidean distance between current node and goal.
- Efficiently finds the shortest path with minimal node exploration.
- Code maintains open set (priority queue), g-scores, f-scores, and came-from links

STEP-BY-STEP SEARCH DISPLAY

- The GUI shows textual stepwise process for transparency.
- Each step:
  - Node exploration,
  - Neighbor checks,
  - Tentative cost calculation (g),
  - Node updates (new g, f),
- Helps users understand how the algorithm progresses and arrives at the path.

WHY A* IS BEST FOR THIS PROJECT

- Guarantees optimal shortest path due to admissible heuristic.
- More efficient than BFS or DFS in weighted graphs.
- Combines path cost and spatial heuristic making it suitable for campus navigation.
- Scales well with realistic campus graph size.

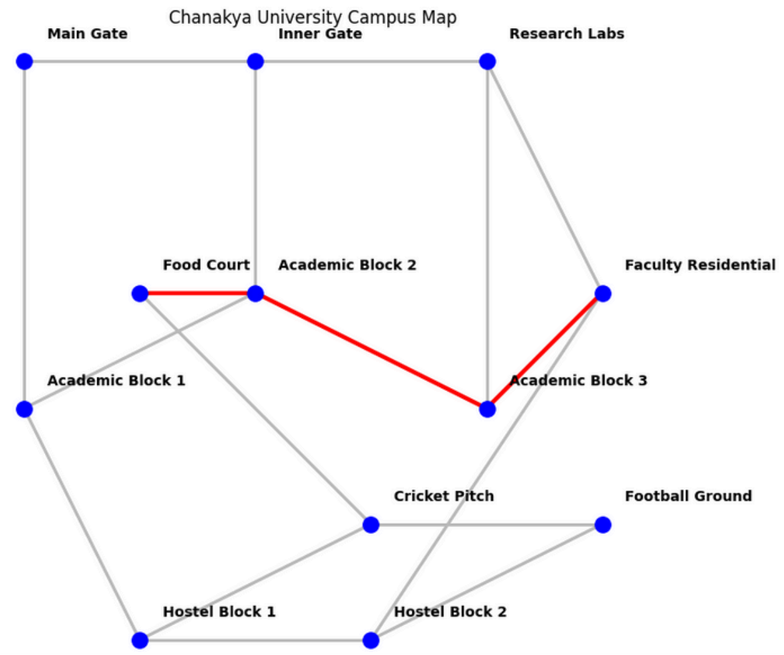
OUTPUT DEMO

Select Current Location: Food Court

Select Destination: Faculty Residential

Find Best Path

Campus Map Visualization:



Recommended Path:
Food Court -> Academic Block 2 -> Academic Block 3 -> Faculty Residential

Total Distance: 6.00 units
Nodes Explored: 5

Step-by-Step Search Process:

```
Exploring node: Food Court
Checking neighbor: Academic Block 2, tentative_g: 1.00
Updated Academic Block 2: g=1.00, f=4.00
Checking neighbor: Cricket Pitch, tentative_g: 2.00
Updated Cricket Pitch: g=2.00, f=4.83
Exploring node: Academic Block 2
Checking neighbor: Academic Block 1, tentative_g: 3.00
Updated Academic Block 1: g=3.00, f=8.10
Checking neighbor: Academic Block 3, tentative_g: 3.00
Updated Academic Block 3: g=3.00, f=4.41
Checking neighbor: Inner Gate, tentative_g: 3.00
Updated Inner Gate: g=3.00, f=6.61
Checking neighbor: Food Court, tentative_g: 2.00
Exploring node: Academic Block 3
Checking neighbor: Academic Block 2, tentative_g: 5.00
Checking neighbor: Faculty Residential, tentative_g: 6.00
Updated Faculty Residential: g=6.00, f=6.00
Checking neighbor: Research Labs, tentative_g: 5.00
Updated Research Labs: g=5.00, f=7.24
Exploring node: Cricket Pitch
Checking neighbor: Food Court, tentative_g: 4.00
Checking neighbor: Hostel Block 1, tentative_g: 5.00
Updated Hostel Block 1: g=5.00, f=10.00
Checking neighbor: Football Ground, tentative_g: 4.00
Updated Football Ground: g=4.00, f=6.00
Exploring node: Faculty Residential
Goal reached! Path constructed.
```

THANK YOU