Report – Week 2

Project Title: Campus Graph Modeling for Autonomous Navigation
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Week: 2

1. Overview

During the second week, the focus shifted from graph construction to verification and preliminary testing. The main objectives included validating spatial data accuracy, checking graph connectivity, and executing basic pathfinding algorithms. These steps were essential in confirming that the model is reliable for autonomous navigation experiments.

2. Process Followed

a) Graph Integrity Checks

Landmark coordinates were validated against satellite imagery and reference maps.

Path continuity was reviewed to ensure there were no breaks or disconnected nodes.

b) Graph Visualization

Visualization was carried out using Python libraries such as NetworkX, GeoPandas, and Matplotlib.

Landmarks were highlighted with distinct markers, while paths were drawn using line segments for better clarity.

c) Pathfinding Implementation

Dijkstra's Algorithm was applied to determine shortest-distance routes.

Breadth-First Search (BFS) was used to verify reachability throughout the network.

Results from both algorithms were cross-checked to ensure consistency.

3. Key Findings

Network Connectivity: All major nodes were accessible from the Main Entrance, and no isolated clusters were detected.

Graph Visualization: Initial navigation maps were generated, and the plotted routes matched well with actual campus pathways.

Pathfinding Results:

Main Gate → Hostel: ~540 m (via In–Out route and hostel connector).

Block A → Block B: ~180 m (using A–B connector).

Food Court → Cricket Ground: ~320 m (through food court link and sports connector).

4. Issues Encountered

High node density in certain regions resulted in redundant edges, which required simplification.

Minor variations in coordinate precision were noticed along overlapping pathways.

Map readability decreased in areas where nodes were too closely packed.

5. Week 2 Outcomes

Geographic accuracy of landmarks and path nodes was successfully verified.

Complete connectivity across the campus graph was confirmed.

BFS and Dijkstra's algorithms were implemented and tested with positive results.

Initial visualizations of the graph were produced for further analysis.

Findings were documented for refinement in Week 3.