Report – Week 1

Project Title: Campus Graph Navigation
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Week: 1

1. Overview

In the first week, the project focused on building a graph-based digital model of the campus to facilitate autonomous navigation and route optimization. The campus was represented as a network of nodes and edges, where nodes indicate landmarks or junctions, and edges represent accessible pathways. This base model will later be used for implementing search and coverage algorithms.

2. Approach

a) Data Acquisition

- **The campus map in KML format was parsed to obtain geographic coordinates.**
- **Landmarks such as academic blocks, hostels, gates, sports facilities, and service areas were identified to create nodes.**

b) Path Processing

- **Path polylines were divided into smaller segments.**
- **Intermediate points along these paths were preserved to ensure accuracy in the network structure.**

c) Graph Development

- **Each node was associated with latitude and longitude coordinates.**
- **Connectivity between nodes was established based on the extracted pathways.**
- **Edge weights were calculated using geodesic distance, ensuring precise measurement of path lengths.**

3. Landmark Node Mapping

The main nodes identified within the campus graph include:

- **Academic: Block A, Block B, Bridge**
- **Residential & Services: Hostel, Food Court, Rest Point**
- **Security & Entry: Main Entrance (In Gate), Out Gate, Check Post, Flag Post**
- **Sports Facilities: Basketball, Cricket, Football, Volleyball, and Tennis Courts**

4. Campus Pathway Network

The pathway system was divided into the following sections:

- **Main Entry Route: Extends from the Main Gate (In) to the Out Gate, with ~39 intermediary nodes.**
- **Block A Circuit: Loop surrounding Block A (~5 nodes).**
- **Block B Network: Circulation inside Block B (~11 nodes).**
- **Food Court Link: A small pathway loop (~2 nodes).**
- **Sports Zone Paths: Pathways connecting the cricket, football, volleyball, and basketball courts (~8 nodes).**

5. Graph Model Characteristics

- **Type: Undirected and weighted**
- **Node Count (V): ~120 (including landmarks and intermediate points)**
- **Edge Count (E): ~150+ (weighted by distances)**
- **Application: Suitable for navigation algorithms such as BFS, Dijkstra's, and A*.**

6. Outcomes for Week 1

- **Geographic coordinates for all key landmarks and pathways were extracted.**
- **A structured pathway network with distance calculations was designed.**
- **An undirected weighted graph of the campus was constructed.**
- **An adjacency data structure was generated for algorithm testing.**
- **Week 1 progress was formally documented in report format.**