**Report – Week 2**

**Project Title:** Campus Graph Modeling for Autonomous Navigation

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**Week:** 2

**1. Overview**

In the second week, the project transitioned from graph construction to **verification and initial testing**. The emphasis was on ensuring the accuracy of the spatial data, validating graph connectivity, and running baseline pathfinding algorithms. These steps confirm the usability of the model for autonomous navigation experiments.

**2. Process Followed**

**a) Graph Integrity Checks**

* Landmark coordinates were cross-verified using satellite imagery and reference maps.
* The continuity of paths was checked to ensure there were no gaps or unlinked nodes.

**b) Graph Visualization**

* Python-based libraries such as *NetworkX, GeoPandas, and Matplotlib* were employed to generate visual renderings.
* Distinct markers were used for landmarks, while path connections were represented with line segments for clarity.

**c) Pathfinding Implementation**

* **Dijkstra’s Algorithm** was used to compute minimum-distance routes.
* **Breadth-First Search (BFS)** was applied to validate reachability across the network.
* Cross-checking results ensured algorithmic consistency.

**3. Key Findings**

* **Network Connectivity:** All major nodes were accessible from the Main Entrance, and no isolated clusters were found.
* **Graph Visualization:** Preliminary navigation maps were created, with plotted routes aligning well with real campus pathways.
* **Pathfinding Results:**
  + *Main Gate → Hostel*: approx. **540 m** (via In–Out route and hostel connector).
  + *Block A → Block B*: approx. **180 m** (through A–B connector).
  + *Food Court → Cricket Ground*: approx. **320 m** (via food court link and sports connector).

**4. Issues Encountered**

* High node density in certain areas created redundant edges, requiring simplification.
* Slight variations in coordinate precision were observed in overlapping paths.
* Map readability needed refinement when nodes were closely packed.

**5. Week 2 Outcomes**

* Verified geographic correctness of landmarks and path nodes.
* Confirmed full connectivity across the constructed campus graph.
* Implemented and tested BFS and Dijkstra’s algorithms successfully.
* Produced initial graph visualizations for analysis.
* Compiled results into documented form for iteration in Week 3.