**Report – Week 1**

**Project Title:** Campus Graph Navigation

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**Week:** 1

**1. Overview**

During the initial week, the project concentrated on creating a graph-based digital representation of the campus to enable autonomous navigation and route optimization. The campus was abstracted into a network of nodes and edges, where nodes symbolize landmarks or junctions, and edges define accessible paths. This foundational model will later support the implementation of search and coverage algorithms.

**2. Approach**

**a) Data Acquisition**

* The campus map in KML format was parsed to extract geographic coordinates.
* Landmarks such as academic blocks, gates, hostels, sports facilities, and service areas were identified for node creation.

**b) Path Processing**

* Path polylines were segmented into smaller components.
* Intermediate points along pathways were retained to maintain accuracy in route structure.

**c) Graph Development**

* Each node was tagged with latitude and longitude values.
* Connectivity between nodes was established through extracted pathways.
* Edge weights were assigned using geodesic distance calculations, ensuring precise measurement of path lengths.

**3. Landmark Node Mapping**

The following were identified as primary nodes within the graph model:

* **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 structured into distinct segments:

* **Main Entry Route:** From Main Gate (In) to Out Gate, consisting of ~39 intermediary nodes.
* **Block A Circuit:** Loop structure around Block A (~5 nodes).
* **Block B Network:** Circulation inside Block B (~11 nodes).
* **Food Court Link:** Short pathway loop (~2 nodes).
* **Sports Zone Paths:** Connections linking cricket, football, volleyball, and basketball courts (~8 nodes).

**5. Graph Model Characteristics**

* **Graph Type:** Undirected and weighted
* **Node Count (V):** ~120 (including landmarks and intermediate points)
* **Edge Count (E):** ~150+ (weighted by distances)
* **Application:** Supports navigation algorithms such as Breadth-First Search (BFS), Dijkstra’s, and A\*.

**6. Outcomes for Week 1**

* Extracted coordinates for major landmarks and path points
* Designed structured pathway network with calculated distances
* Built undirected weighted graph representation of the campus
* Generated adjacency data structure for algorithmic testing
* Documented Week 1 progress in report format

**Appendex 1 :**

A map of a city

AI-generated content may be incorrect.

Cordiantes:-  
nodes:-

|  |  |  |
| --- | --- | --- |
| **name** | **lat** | **lon** |
| **in out path\_pt21** | 13.2247284599198 | 77.75881018276080 |
| **Untitled path\_pt0** | 13.22349987305840 | 77.75760983785760 |
| **Untitled path\_pt1** | 13.22848140271980 | 77.75749132893050 |
| **path\_pt2** | 13.22667459676970 | 77.75640101441570 |
| **block a path\_pt4** | 13.22142253949790 | 77.75569950922980 |
| **path\_pt0** | 13.22815785335480 | 77.75775003387340 |
| **block b path\_pt9** | 13.22401224317250 | 77.75633605250320 |
| **rest area** | 13.22850098297320 | 77.75777721438730 |
| **block a path\_pt0** | 13.2221645159599 | 77.75437183733030 |
| **in out path\_pt18** | 13.22462164158830 | 77.75938383345200 |
| **sports\_pt6** | 13.22814337731770 | 77.75776799068250 |
| **block b path\_pt7** | 13.22367834375100 | 77.75591433768990 |
| **in out path\_pt4** | 13.22140764149490 | 77.75540067910810 |
| **path\_pt1** | 13.2237967126006 | 77.75879312565570 |
| **in out path\_pt11** | 13.22319397358560 | 77.75699271302130 |
| **in out path\_pt24** | 13.22451717999700 | 77.75860469511850 |
| **food court** | 13.22484839810390 | 77.75730499294360 |
| **block b path\_pt6** | 13.22348200682110 | 77.75625844262310 |
| **in out path\_pt32** | 13.22398860789990 | 77.75492924489520 |
| **hostel** | 13.22451873532030 | 77.75897591899190 |
| **tennis court** | 13.22844592595370 | 77.75837243930010 |
| **in out path\_pt26** | 13.22524008961260 | 77.75749035762140 |
| **bridge** | 13.22444440291840 | 77.7565825972745 |
| **Untitled path\_pt0** | 13.22332008569360 | 77.75700597220970 |
| **flag post** | 13.22166758147100 | 77.75494814242640 |
| **sports\_pt1** | 13.22633249433510 | 77.75925897094790 |
| **sports\_pt4** | 13.22771310603600 | 77.75822309326550 |
| **in out path\_pt35** | 13.22245345425510 | 77.7542173415826 |
| **block b path\_pt2** | 13.22316863399250 | 77.75582084607600 |
| **a to b connection\_pt1** | 13.22235939713640 | 77.75538470853500 |
| **Untitled path\_pt1** | 13.22338822824730 | 77.75691413836830 |
| **path\_pt1** | 13.22424690144010 | 77.75732110187270 |
| **sports\_pt2** | 13.22685726050460 | 77.75913956796270 |
| **in out path\_pt5** | 13.22141866152650 | 77.7557399188685 |
| **in out path\_pt16** | 13.22467015131080 | 77.75837330988700 |
| **path\_pt6** | 13.22414811665510 | 77.75560915548950 |
| **Biometric entry** | 13.22134834988590 | 77.75506057351000 |
| **Untitled path\_pt0** | 13.228166384911 | 77.75776645839040 |
| **in out path\_pt34** | 13.22314044525940 | 77.75423470777740 |
| **in out path\_pt23** | 13.22460499205820 | 77.75865898988810 |
| **sports\_pt7** | 13.22862049276640 | 77.75806751904610 |
| **in out path\_pt12** | 13.22332626166740 | 77.75700106134620 |
| **a to b connection\_pt2** | 13.22233756938870 | 77.75538574264920 |
| **in out path\_pt36** | 13.22199819938130 | 77.75443075886940 |
| **in out path\_pt30** | 13.22414833354780 | 77.75592446025540 |
| **block b path\_pt0** | 13.22416372344050 | 77.75554326305410 |
| **path\_pt2** | 13.22455037856450 | 77.7567010904228 |
| **path\_pt4** | 13.22467978379380 | 77.75588997501910 |
| **path\_pt1** | 13.22581893469300 | 77.75642828838770 |
| **in out path\_pt0** | 13.22014838185920 | 77.75406698769020 |
| **food court\_pt0** | 13.22484026403300 | 77.7571543660177 |
| **in out path\_pt22** | 13.22477108566050 | 77.75873400262180 |
| **block b path\_pt10** | 13.22364070939650 | 77.75670534320010 |
| **exit gate** | 13.22012132174140 | 77.75499627331420 |
| **entry gate** | 13.22014595317830 | 77.75403135586810 |
| **in out path\_pt38** | 13.22119416009930 | 77.75526076592860 |
| **volley ball ground** | 13.22868751604710 | 77.75857754333980 |
| **in out path\_pt33** | 13.22361991424160 | 77.75449147746810 |
| **path\_pt1** | 13.22502979261890 | 77.75785460795920 |
| **path\_pt0** | 13.22339084861570 | 77.7569156790353 |
| **in out path\_pt31** | 13.22414738752070 | 77.75543174187350 |
| **in out path\_pt15** | 13.22350116701330 | 77.75763683089390 |
| **sports\_pt0** | 13.22466836840760 | 77.75835587425780 |
| **a to b connection\_pt0** | 13.22316090987730 | 77.75585732083080 |
| **path\_pt0** | 13.22771336897390 | 77.75713011282680 |
|  |  |  |
| **sports\_pt5** | 13.22794261845860 | 77.75789660658520 |
| **in out path\_pt6** | 13.2214821816786 | 77.75608140773240 |
| **block b path\_pt1** | 13.22321819374410 | 77.75555714639430 |
| **path\_pt0** | 13.22418397664140 | 77.7580659696002 |
| **in out path\_pt39** | 13.220042239128 | 77.75502072209100 |
| **path\_pt5** | 13.22431747838820 | 77.75565020551320 |
| **cricket ground** | 13.22894430733000 | 77.75712817933990 |
| **in out path\_pt37** | 13.22162328948330 | 77.75462068324350 |
| **food court\_pt1** | 13.22496955319650 | 77.75694278387310 |
| **in out path\_pt7** | 13.22163744909020 | 77.75639506881420 |
| **in out path\_pt3** | 13.22119736025060 | 77.75526022498960 |
| **in out path\_pt10** | 13.22272453101840 | 77.75702383871490 |
| **in out path\_pt9** | 13.22234227484710 | 77.75694119085110 |
| **block b path\_pt5** | 13.22363200013470 | 77.75670770860710 |
| **in out path\_pt25** | 13.22466817148510 | 77.75837469882830 |
| **in out path\_pt19** | 13.22473556498670 | 77.75918815656140 |
| **block b path\_pt8** | 13.22411376174000 | 77.75586409295980 |
| **path\_pt1** | 13.22787778748850 | 77.75638008699910 |
| **in out path\_pt13** | 13.22334319154180 | 77.7572192468133 |
| **path\_pt2** | 13.22419187664300 | 77.75911535474230 |
| **foot ball** | 13.22805437738190 | 77.7564117271198 |
| **in out path\_pt17** | 13.22419328244740 | 77.75911791916190 |
| **block b** | 13.22338495888420 | 77.75590334931230 |
| **in out path\_pt27** | 13.22539834725180 | 77.75717387306800 |
| **in out path\_pt1** | 13.22012099273790 | 77.75413761558200 |
| **sports\_pt3** | 13.2273359378927 | 77.75885474966340 |
| **block b path\_pt4** | 13.22338780303520 | 77.75689932296900 |
| **block a path\_pt2** | 13.22236438712760 | 77.75532935673470 |
| **in out path\_pt29** | 13.22402731270590 | 77.75634609626590 |
| **block a path\_pt1** | 13.22254959779560 | 77.75516264427950 |
| **path\_pt0** | 13.22423258949080 | 77.75730743375460 |
| **Untitled path\_pt1** | 13.22358006797430 | 77.75737764139180 |
| **path\_pt0** | 13.22539869155360 | 77.75719603916100 |
| **path\_pt1** | 13.22803281817540 | 77.75730033831390 |
| **path\_pt3** | 13.2257887929317 | 77.756443180125 |
| **block b path\_pt3** | 13.22296526555350 | 77.75606776964480 |
| **in out path\_pt8** | 13.22196803195430 | 77.7567581292966 |
| **block a path\_pt3** | 13.22231213436890 | 77.75567878102350 |
| **in out path\_pt28** | 13.22461560120250 | 77.75676218344220 |
| **basket ball ground** | 13.22878896158640 | 77.75811860881560 |
| **in out path\_pt2** | 13.22137841503780 | 77.75491382559580 |
| **in out path\_pt20** | 13.22457954164510 | 77.75910045581300 |
| **in out path\_pt14** | 13.22340556019500 | 77.75749587878420 |
| **admin block** | 13.22218146593190 | 77.75536079208620 |

Edges:-

|  |  |  |
| --- | --- | --- |
| **from** | **to** | **distance\_m** |
| **in out path\_pt0** | in out path\_pt1 | 8.233125256828300 |
| **in out path\_pt1** | in out path\_pt2 | 162.57373822815100 |
| **in out path\_pt2** | in out path\_pt3 | 42.55449355716870 |
| **in out path\_pt3** | in out path\_pt4 | 27.802251916106600 |
| **in out path\_pt4** | in out path\_pt5 | 36.78965099322470 |
| **in out path\_pt5** | in out path\_pt6 | 37.67442326979490 |
| **in out path\_pt6** | in out path\_pt7 | 38.09024317032610 |
| **in out path\_pt7** | in out path\_pt8 | 53.72260506040760 |
| **in out path\_pt8** | in out path\_pt9 | 45.912182042537700 |
| **in out path\_pt9** | in out path\_pt10 | 43.22825786531060 |
| **in out path\_pt10** | in out path\_pt11 | 52.04501280259100 |
| **in out path\_pt11** | in out path\_pt12 | 14.663292990138200 |
| **in out path\_pt12** | in out path\_pt13 | 23.722509086873400 |
| **in out path\_pt13** | in out path\_pt14 | 30.766984282750000 |
| **in out path\_pt14** | in out path\_pt15 | 18.58157998177860 |
| **in out path\_pt15** | in out path\_pt16 | 151.97880631081600 |
| **in out path\_pt16** | in out path\_pt17 | 96.41941375065650 |
| **in out path\_pt17** | in out path\_pt18 | 55.466473561197500 |
| **in out path\_pt18** | in out path\_pt19 | 24.671040978916500 |
| **in out path\_pt19** | in out path\_pt20 | 19.70548394843450 |
| **in out path\_pt20** | in out path\_pt21 | 35.51431205747310 |
| **in out path\_pt21** | in out path\_pt22 | 9.508669320737580 |
| **in out path\_pt22** | in out path\_pt23 | 20.093671661813800 |
| **in out path\_pt23** | in out path\_pt24 | 11.358236724349500 |
| **in out path\_pt24** | in out path\_pt25 | 30.007838930716200 |
| **in out path\_pt25** | in out path\_pt26 | 114.85090761249500 |
| **in out path\_pt26** | in out path\_pt27 | 38.51243021644320 |
| **in out path\_pt27** | in out path\_pt28 | 97.41730276768180 |
| **in out path\_pt28** | in out path\_pt29 | 79.18174011106670 |
| **in out path\_pt29** | in out path\_pt30 | 47.62061126332470 |
| **in out path\_pt30** | in out path\_pt31 | 53.40415879605760 |
| **in out path\_pt31** | in out path\_pt32 | 57.22666699992450 |
| **in out path\_pt32** | in out path\_pt33 | 62.57084010921720 |
| **in out path\_pt33** | in out path\_pt34 | 59.90230833146190 |
| **in out path\_pt34** | in out path\_pt35 | 76.02676475971070 |
| **in out path\_pt35** | in out path\_pt36 | 55.42386879797600 |
| **in out path\_pt36** | in out path\_pt37 | 46.30460958131730 |
| **in out path\_pt37** | in out path\_pt38 | 84.06617087103470 |
| **in out path\_pt38** | in out path\_pt39 | 130.0685295438280 |
| **block a path\_pt0** | block a path\_pt1 | 95.71716503428390 |
| **block a path\_pt1** | block a path\_pt2 | 27.31958592809300 |
| **block a path\_pt2** | block a path\_pt3 | 38.31182539011070 |
| **block a path\_pt3** | block a path\_pt4 | 98.44364468106660 |
| **block b path\_pt0** | block b path\_pt1 | 104.61704523129800 |
| **block b path\_pt1** | block b path\_pt2 | 29.102767916231200 |
| **block b path\_pt2** | block b path\_pt3 | 34.96407227465430 |
| **block b path\_pt3** | block b path\_pt4 | 101.53107593250300 |
| **block b path\_pt4** | block b path\_pt5 | 34.076384124227500 |
| **block b path\_pt5** | block b path\_pt6 | 51.444346898767100 |
| **block b path\_pt6** | block b path\_pt7 | 43.16058534913030 |
| **block b path\_pt7** | block b path\_pt8 | 48.478194259617900 |
| **block b path\_pt8** | block b path\_pt9 | 52.372533089228800 |
| **block b path\_pt9** | block b path\_pt10 | 57.37254730593320 |
| **a to b connection\_pt0** | a to b connection\_pt1 | 102.40586948252000 |
| **a to b connection\_pt1** | a to b connection\_pt2 | 2.417455732253120 |
| **food court\_pt0** | food court\_pt1 | 27.027689108887400 |
| **path\_pt0** | path\_pt1 | 104.40492951604000 |
| **path\_pt1** | path\_pt2 | 75.12119881786770 |
| **path\_pt0** | path\_pt1 | 106.28194128603400 |
| **path\_pt0** | path\_pt1 | 89.7064728188613 |
| **path\_pt1** | path\_pt2 | 55.95567502603240 |
| **sports\_pt0** | sports\_pt1 | 208.5094857680570 |
| **sports\_pt1** | sports\_pt2 | 59.48109745248960 |
| **sports\_pt2** | sports\_pt3 | 61.297905765107100 |
| **sports\_pt3** | sports\_pt4 | 80.17610754767160 |
| **sports\_pt4** | sports\_pt5 | 43.55359121873770 |
| **sports\_pt5** | sports\_pt6 | 26.222657979398400 |
| **sports\_pt6** | sports\_pt7 | 61.968768125427000 |
| **Untitled path\_pt0** | Untitled path\_pt1 | 45.867502398657800 |
| **path\_pt0** | path\_pt1 | 50.66512766044130 |
| **path\_pt1** | path\_pt2 | 179.10926199979800 |
| **path\_pt2** | path\_pt3 | 98.10513343454950 |
| **path\_pt3** | path\_pt4 | 136.55982491447300 |
| **path\_pt4** | path\_pt5 | 47.77015814039020 |
| **path\_pt5** | path\_pt6 | 19.25791489814850 |
| **path\_pt0** | path\_pt1 | 95.32061895740960 |
| **path\_pt0** | path\_pt1 | 83.301788812047 |
| **Untitled path\_pt0** | Untitled path\_pt1 | 12.486273292313900 |
| **Untitled path\_pt0** | Untitled path\_pt1 | 26.685110450009100 |