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OPTIMUM ROUTE PLANNING OF A CITY USING GIS: A REVIEW

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Abstract - *One of the industries that uses Geographic Information System software most frequently is transportation. A crucial planning and management tool for those working in the transport industry is the geographic information system. Our project primarily focuses on the work that has to be done on Bangalore Urban District's road networks, which is located in the Indian state of Karnataka. The examination of road networks is the primary usage of geographic information system software. The project is very beneficial for discovering new routes, alternate routes, and the shortest distances between any two locations, among other things. Accessibility and effective route planning promote and result in sustainable growth. Currently, information on the locations and features of roads is kept in geographic databases, allowing a variety of Geographic Information Systems (GIS) applications. A number of services and sources of information are made possible by road network data, including satellite navigation, planning for healthcare accessibility, route-planning, modelling of transportation systems, management of road infrastructure, and traffic system management. Network analysis aids in determining the best places for services to be offered in a region while taking travel times into account. Some service centres and roads in a section of the city of Bangalore have been chosen for the network analysis in this study. To extend the movement of people, commodities, services, and the flow of resources in a good manner, complex networks of road data must be analysed. In order to do these tasks, Geographical Information System (GIS) software is utilised to accurately analyse spatial and non-spatial (attribute) data in order to find the fastest or shortest route between those sites. To create a road network database (catalogue) and the best route, non-spatial data about the road network is gathered. An ideal route is constructed, indicating the overall distance of the journey both in metres and in minutes. The guidelines for using that route are part of the analysis's conclusion.*

Key Words: QGIS · Digitization of maps · Road network ·Closest facility analysis· Shortest route analysis

1. INTRODUCTION

A network is a set of lining features with the proper attribute for object flow. A network is a collection of linked objects, such lines joining points. Examples of networks include streets that are connected to one another at junctions, roads that connect to cities, sewage and Network analysis, a GIS feature, was used to estimate how long it would take emergency vehicles to travel between different parts of the city and fire stations. Transportation planning is one of the main areas where network analysis is used. Here, the challenge may be to find paths that meet certain criteria, such as the shortest or least expensive route between two or more locations, or to find all locations within a given travel cost from a given origin. A GIS often portrays the real world using one of two spatial models: raster-based, which uses the cells of a continuous grid surface, or vector-based, which uses points, lines, and polygons. In order to compare the two geographical models, this study will look at network analysis in both raster and vector GIS. Organisations that manage or utilise networked infrastructure, such as utilities and transportation networks, might benefit from network analysis. Businesses utilise networks to plan and optimise the distribution of products and services, whereas municipal public works departments use them to model, analyse bus and waste routes. Planning for retail stores may also include network analysis. For instance, the identification of retail shop trade regions can be aided by the solution of the driving times. Today, Network analysis is crucial because of the cities' fast urbanisation and the need to reduce traffic congestion by developing and supplying all commuters with enough surface transportation options.

2. OBJECTIVES AND SCOPE

1. To develop spatial database for the road network of a study area.
2. To determine the quickest way or the shortest way between those locations in accurate analysis by using spatial and non-spatial(attribute) data.
3. To determine the alternative routes for traffic management.
4. To determine the amount of traffic in the research area's congested areas.

3. LITERATURE REVIEW

The extensive literature review was carried out by referring standard journals, reference books and conference proceedings. The major work carried out by the different researchers is summarized below.

Lisa Watson & BrankoI.Cavric [1] Inthisstudy, the spatial MCE approach was applied as an integrated part of an environmental impact assessment(EIA) to determine optimal by pass alignments in the Tlokweng Planning area in Botswana. Also, One-At-a-Time(OAT) sensitivity

Analysis was applied to identify sensitive criteria. The latter has not been studied much in spatial MCE.

IshaqA. Abdulkarim[2] Road traffic crash, which has resulted in injurying and losing of several lives and properties, is unavoidable in Kano Metropolis, owing topopulationgrowthandthedensityoftrafficflow,particularl yalongthe state's high ways connecting it to neighboring states.

Liang-Tay Lin [3] The article has shown that the combined analysis of space and time in identifying RTA hotspots enables traffic authorities to capture the situation accurately and timely.

Dong-KunLee[4] This study proposes an initial model that considers the offset problem by using a quantitative method to construct a road in a mountainous area, and it has become the basis for improving the ecological uncertainty by using a predictive model for insufficient field survey data.

Stephen F. Smith [5] The previous sections discussed twomain representations for solving the CARP, i.e., one based on the sparse arc routing graph and one based on the transformation into a denser node routing instance, bothofwhichhavebeensuccessfullyappliedinpreviousopti mizationapproaches.

Marek Wyszyńsk[6] This article presents the methodology that enables to determine the access routes to places locate dout side the transportation network and the analysis of accessibility of three areas situated in the Figure 17. Paved roads in areas covered by vegetation and semi-natural ecosystems in the analysed areas: (a) DE; (b)UA; (c) PL. 1924 W. DAWID ET AL. vicinity of the capitalcities(Berlin,Warsaw,andKiev)ofthreeEuropeanCo untries(Germany, Poland, and Ukraine).

Damoulas & Stephen A. Jarvis [7**]** Through the use of a practicalur ban modeling case study, we demonstrate that vario gram functions do not always remain valid with non-Euclidean distance inputs, and therefore establishing the validity of each distance function becomes essential.

Eng. Haidar Assa [8] The construction cost of road slope stability using freestanding retaining walls may affect the extracting result of the final optimal horizontal corridor, and it may be dominant according to site conditions. In this study, the effect of retaining walls was analyzed.

Matt Duckham[9] This study set out to investigate whether the methods used to visualize map risk can make a significant difference to people's decision-making performance. The approach extended that of Cheong et al.(2016), who tested a simple, binary stay-or-leave emergency decision scenario, by investigating decision

Performance on a much more complex spatial task: emergency route-planning.

Christos Chalkias [10] In summary, this study presents a methodology for validating/calibrating the primary results of a GIS based spatio temporal analysis of direct sunlight throughout a rural road with the use of spatial video.

Yimin Chen [11] This study investigates the quantitative relationships between straight-line ED and ND. In the 25selected Chinese cities, we estimated the DI, ie. the ratio of ND to ED, at the city level and analysed their variations at the intra- city level.

Viktor Květoň [12] U. The results provide an answer to which municipalities were affected by the construction of new road infrastructure or how the accessibility of individual regional centres changed. The study works with two key variables: a change in the accessibility of regional centres and a change in traffic load inside municipalities.

Mrinal Kr. Dutta1) [13] Thus Network Analysis is one of the most powerful tool s to deal with the real time transportation problems. It is reliable, user friendly and efficiently solves the network problems.

VinitaShinkar[14]In this research, an augmented approach of Arc GIS based network analysis using Vehicle Routing problem is applied to the Basmat city area. With the outbreak of Covid-19, sanitisation of public spaces has been made mandatory and this involves spending of huge monetary cost and time on account of government authorities.

Dirk Wittowsky) [15**]** This paper discusses the possibility to use mobile phone network data to monitor spatial policies in land use and transport planning. Monitoring requires robust time series and reproducible concepts linking spatial policies to monitoring out comes, a requirement differing from current literature where mobile phone data analysis is exemplified in selected areas with privileged data access.

4. STUDY AREA

A part of Dayananda Sagar Institutions, Dayananda Sagar College of Engineering is a small private college located at Shavige Malleshwara Hills in the district of Kumaraswamy Layout which is a part of Bengaluru city in Karnataka, India. The latitude of Dayananda Sagar College of Engineering, Bangalore Karnataka India is **12.909477**, and the longitude is **77.566833**. **Dayananda Sagar College of Engineering, Bengaluru, Karnataka, India** is located.

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At India country in the Colleges place category with the GPS coordinates of 12°54'34.1172''N and 77°34'0.5988''E .

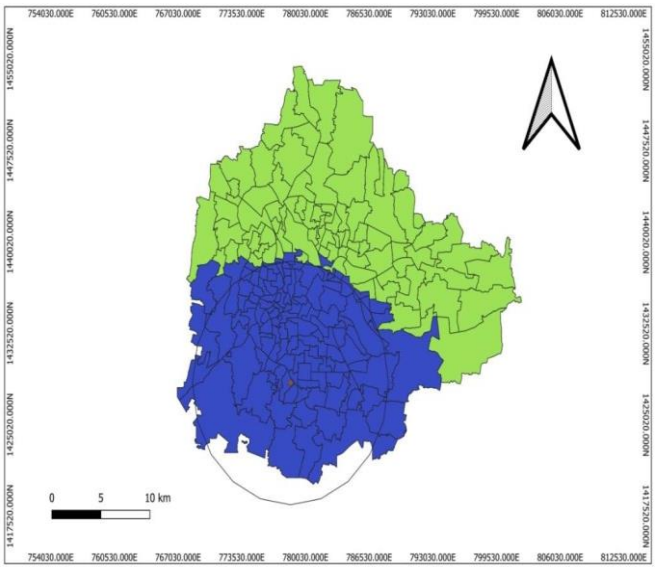


FIG1.BENGALURU URBAN DISTRICT

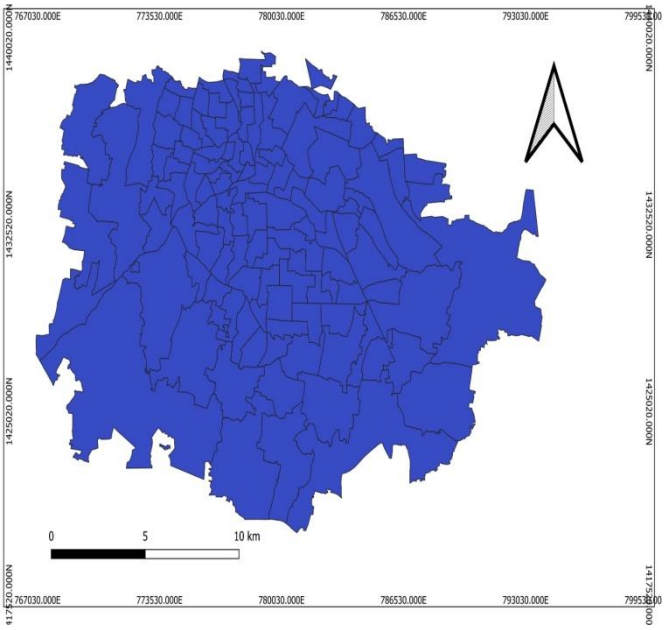
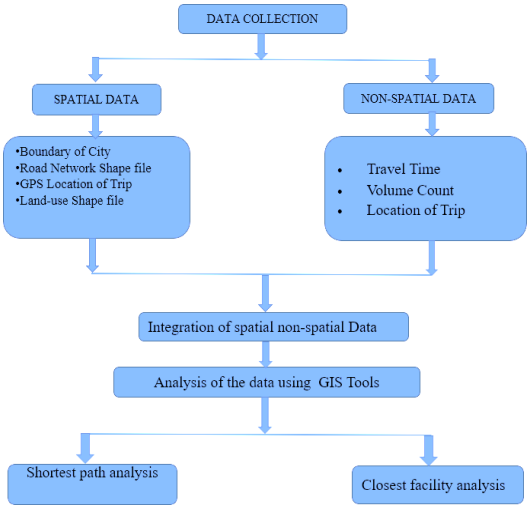


FIG2. STUDY AREA

5. METHODOLOGY



➢ Using the Q-GIS Network analysis tool, it is possible to analyse the data for the Road Network system.

➢ In this study, a GIS Network analysis tool has been utilised to identify the best route under various circumstances.

➢ In order to handle and analyse network-based spatial data and resolve routing issues, such as point-to-point routing and time-based delivery issues, numerous geographical features were taken into consideration.

➢ The following significant actions have been taken to address the issues:

• The best spot for services and facilities.

• Travel distance and time.

• Development of a trip cost matrix encompassing all locations from a facility or service.

• Locating nearby amenities in a certain location.

• Providing route guidance.

• Executing transportation routing from point to point.

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6. GIS DATA ANALYSIS

6.1 DATA PREPARATION

In order to prepare the data, Dayananda Sagar College of Engineering's GPS coordinates are 12° 54' 34.1172'' N and 77° 34' 0.5988'' E. This college's OSM network data and satellite pictures are downloaded. The study area is 336 sq.km (33600 hectre) in size and is located 10 kilometres from Dayananda Sagar College of Engineering. The Sub Arterial, Arterial, Collector, and Local roads are all categorised under the Road type attribute, which also covers local roads. The roads whose lengths were determined using the compute geometry tool are included in the Road length property.

6.2 DATA COLLECTION

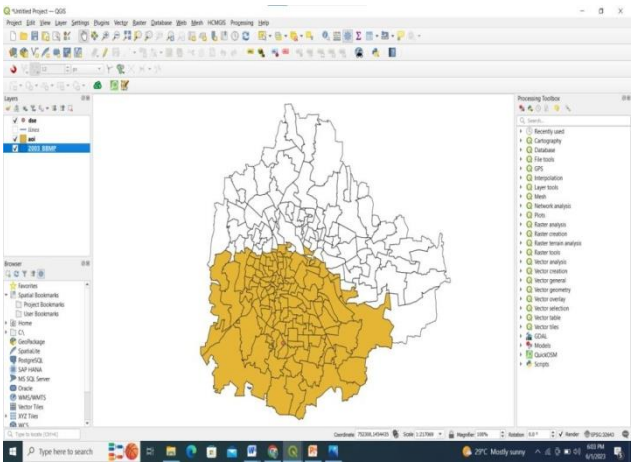

Fig3. STUDY AREA ANALYSIS

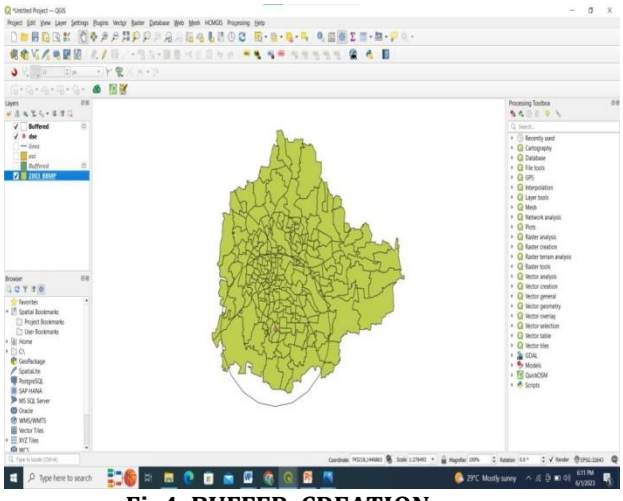

Fig4. BUFFER CREATION

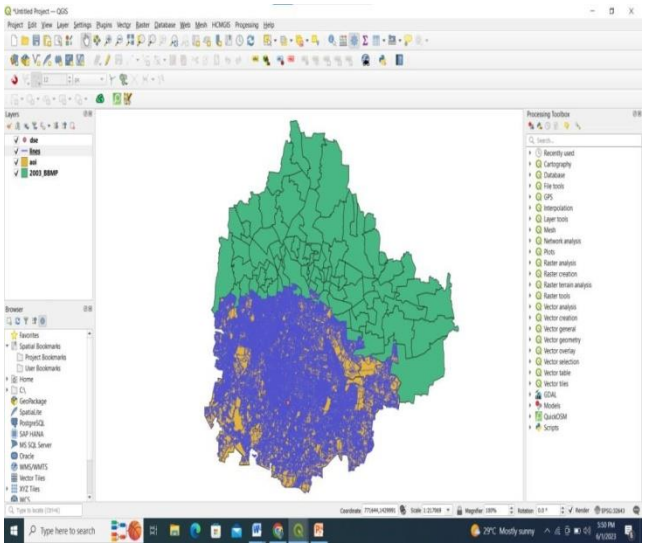

Fig5. NETWORK ANALYSIS

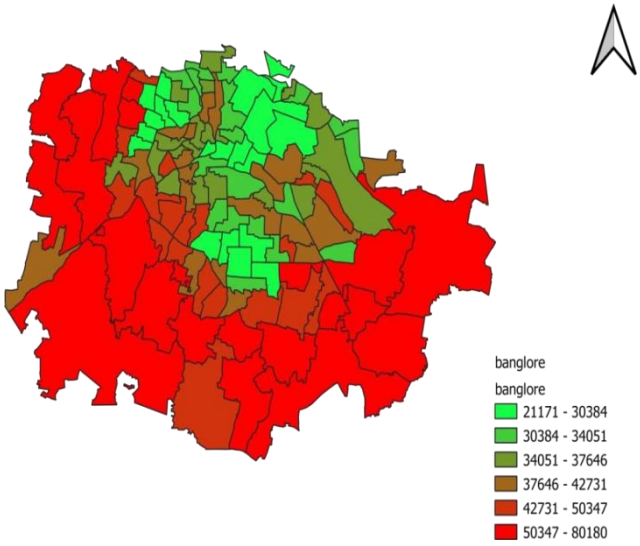

Fig6. POPULATION DENSITY MAP

6.3 ROAD NETWORK ANALYSIS

The mathematical sub disciplines of graph theory and topology serve as the theoretical bedrock for the network

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analysis in GIS. The implementations of network models that are used to depict the networks with which a large portion of the public interacts on a daily basis—the transportation and communications networks—are the most popular and well-known. The process of choosing a route to take is known as routing, and it is probably the most basic logistical function in network analysis.

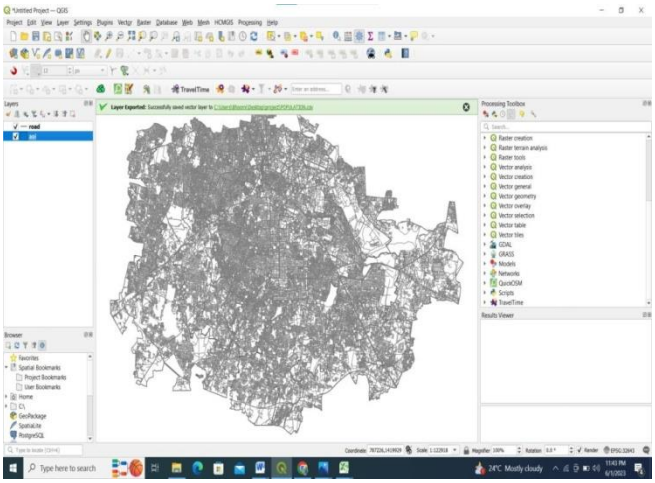

Fig7. ROAD NETWORK ANALYSIS

The simplest routing operations have historically constituted the majority of network analysis in GIS. the capacity to create multimodal networks and the use of simulation techniques to the generation of network problem-solving strategies. Of fact, there are other significant network design issues whose combinatorial complexity makes them very challenging to handle optimally. A determination of the trips created and attracted from the facility to the concerned area is required in order to allocate and supply urban facilities in a region with a complicated road network. Different map services and commercial navigation products can help with the challenge of generating the quickest route between two points in the road network.

6.4 THEMATIC MAPS OF FACILITIES IN STUDY AREA

Geographic information systems (GIS) thematic maps are maps that graphically express certain topics or qualities of geographical data. Thematic maps concentrate on illustrating the distribution or patterns of a certain trait or characteristic throughout a geographic region, as opposed to normal maps, which primarily illustrate the physical elements of an area (such as roads, rivers, and boundaries).A single theme or issue is the focus of thematic maps, which are created to transmit and analyse data. They aid in comprehending spatial patterns, spotting trends, and drawing parallels between various geographical areas. Within GIS, thematic maps are essential for data processing and visualisation. They support the discovery of correlations, trends, and patterns in space that may not be readily obvious from data. Thematic maps help with decision-making based on spatial data by graphically depicting particular features or topics.

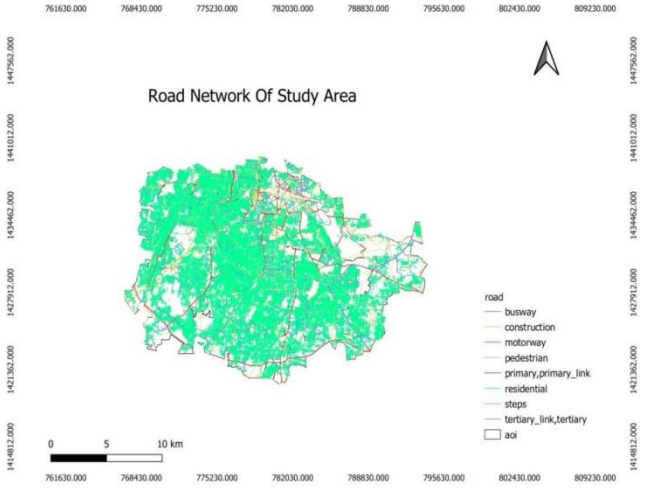

Fig8. ROAD NETWORK

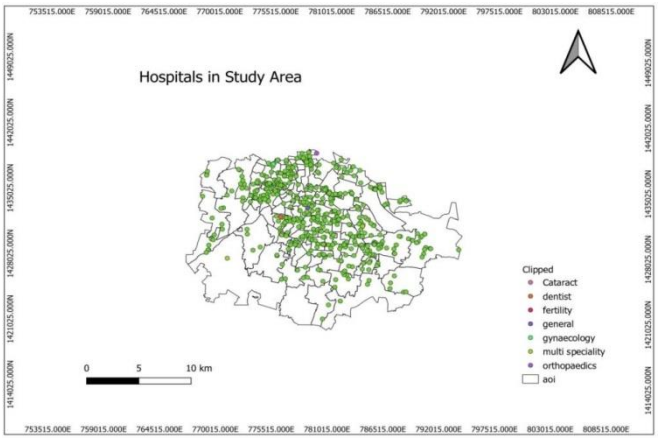

Fig9. HOSPITALS

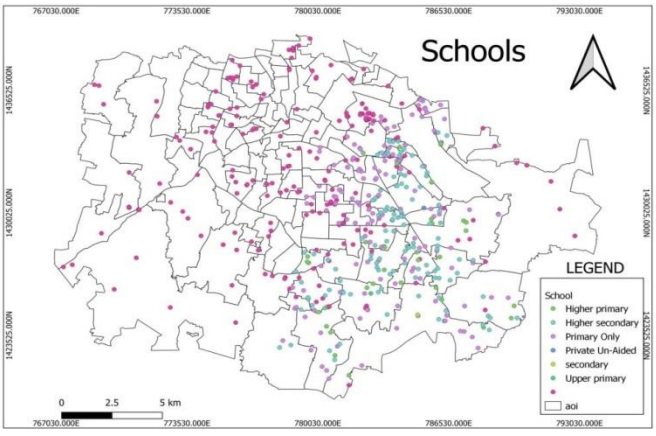

Fig10. SCHOOLS

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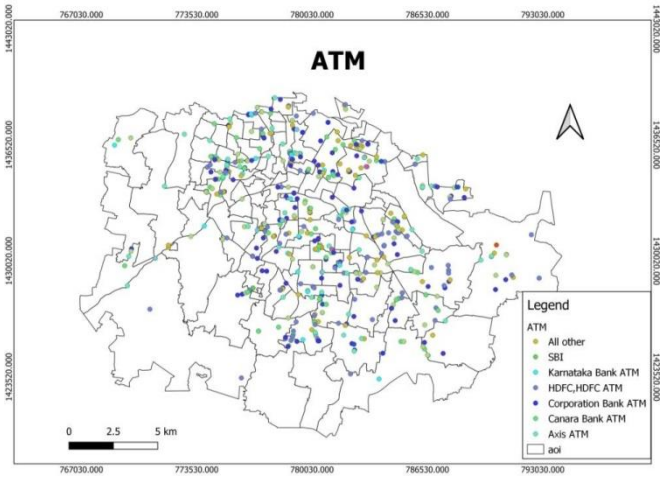

Fig11. AUTOMATED TELLER MACHINE

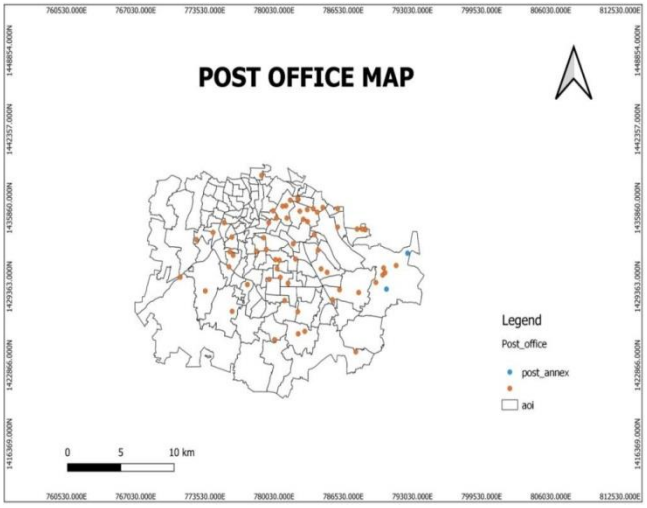

Fig12. POST OFFICE

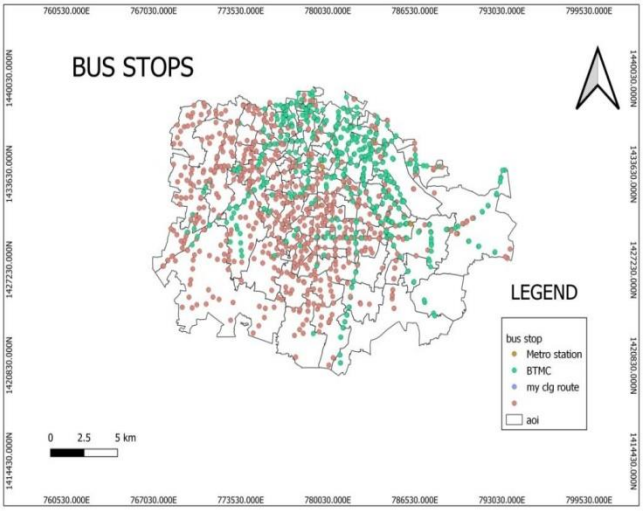

Fig13. BUS STOPS

6.5 ATTRIBUTE TABLE

	full_id	osm_id	addr:full	name
1	n2247460571	2247460571	NULL	BBMP hospital
2	n3714125744	3714125744	Queens Road	Shifa Hospital, Bengaluru Urban
3	n4446289881	4446289881	NULL	Hsis Gosha Hospital
4	n4446341278	4446341278	NULL	H B S Hospital
5	n5174903787	5174903787	NULL	Bangalore Diabetes Hospital
6	n8188038706	8188038706	79/10, Nandi D...	Appllo Diagnostic
7	n9573432800	9573432800	NULL	NULL
8	n625856709	625856709	71, 11Th Main R...	Manipal Northside Hospital
9	n1290125198	1290125198	NULL	NULL
10	n1474820321	1474820321	NULL	Baptist
11	n2026076836	2026076836	No 3367,5Th Cr...	Nayak Hospital, Gayathri Nagar
12	n3400223539	3400223539	# 133, Margosa ...	Leela Hospital and Diagnostic Center
13	n3781792271	3781792271	NULL	Neuro Center
14	n4445430292	4445430292	NULL	Sri Sanjeevini Cold Laser Therapy
15	n6937892396	6937892396	53, 7Th Cross , 4...	Dr. B. Venkatasubbarao Memorial Hospital
16	n6938414183	6938414183	28, 7Th Main 9T...	Jupiter Hospital And Institute Of Vascular Surgery
17	n6938717990	6938717990	24/1 5Th Cross ...	Malleswaram Eye Day Care Hospital - Bengalore
18	n8188038683	8188038683	5/19, 1st Main, ...	Ramani Orthopaedic Hospital
19	n8188038691	8188038691	11th Cross Rd, ...	RICH CARE HOMEOPATHY
20	n8188038712	8188038712	Sangeetha Apts...	Supra Diagnostics Spine Care And Ortho Care Hospital
21	n4518518893	4518518893	NULL	Anupama Hospital
22	n6944895084	6944895084	116/2, Herohalli...	S.S.G. Hospital
23	n7202935821	7202935821	Sir M Vishwesh...	Ullalu Government Hospital
24	n7572526764	7572526764	Vishweshwaraia...	Abivrud Cancer Care & Research Centre

TABLE 1.DATA OF HOSPITALS

	full_id	osm_id	name:kn	name
1	n1469249201	1469249201	NULL	HKBK Degree College
2	n1837634263	1837634263	NULL	NULL
3	n9996923717	9996923717	NULL	NULL
4	n573333532	573333532	ಸ್ಟೆಲ್ಲಾ... ಮಾರಿಸ್ ಶಾಲೆ	Stella Maris School
5	n598212615	598212615	NULL	B. P. Indian
6	n1176722324	1176722324	ಉಭಯ ವೇದಾಂತ ...	Ubhaya Vedanta Pravarthana Sabha
7	n1289835601	1289835601	ವಿದ್ಯಾ ಮಂದಿರ ಶಾಲೆ	Vidya Mandir School
8	n9786116678	9786116678	NULL	NULL
9	n9814354831	9814354831	NULL	NULL
10	n2026103149	2026103149	NULL	East West Institue of Technology
11	n4516825791	4516825791	NULL	Prajawal Nursing school
12	n4541383689	4541383689	ಸರ್ಕಾರಿ ಶಾಲೆ	Government school
13	n1463509629	1463509629	NULL	Jindal Government School
14	n7927569085	7927569085	NULL	Orchids The International School, Nagarbhavi
15	n7976322073	7976322073	NULL	St. Jhons high school
16	n3851642663	3851642663	NULL	NULL
17	n3851650973	3851650973	NULL	NULL
18	n4512052990	4512052990	NULL	Dr Ambedkar Nursery Primary & High School
19	n4782936622	4782936622	ಪರಿಶಿಷ್ಟರ ಸರ್ಕಾರಿ ...	Government Higher Primary School
20	n7299776434	7299776434	NULL	Kiara Music Academy
21	n1543969345	1543969345	NULL	Ankur Nursery School
22	n6348823859	6348823859	ಸರ್ಕಾರಿ ಹಿರಿಯ ಪ್ರಾ...	GHPS (K) Jogupalya
23	n6348827978	6348827978	ಸರ್ಕಾರಿ ಉರ್ದು ಹಿರಿ...	GUHPS Jogupalya
24	n6348833682	6348833682	ಶ್ರೀ ರಾಮಕೃಷ್ಣ ಹಿರಿ...	Sri Ramakrishna HPS Ulsoor

TABLE 2.DATA OF SCHOOLS

	full_id	osm_id	addr:street	operator	name	brand:wikidata	brand
1	n661983058	661983058	Cunningham Ro...	ING	ING	Q645708	ING
2	n665871309	665871309	Nandi Durg Road	Syndicate Bank	Syndicate Bank	Q2004088	Syndicate Bank
3	n1067192719	1067192719	Nandi Durg Road	ICICI Bank	ICICI Bank	Q1653258	ICICI Bank
4	n1290044474	1290044474	NULL	NULL	NULL	NULL	NULL
5	n5174704944	5174704944	NULL	HDFC Bank	HDFC Bank	Q631047	HDFC Bank
6	n428549527	428549527	NULL	State Bank of In...	State Bank of In...	Q1340361	State Bank of In...
7	n428549736	428549736	NULL	Axis Bank	Axis Bank	Q2003549	Axis Bank
8	n598211204	598211204	Margosa Road	Bank of India	Bank of India	Q2004439	Bank of India
9	n619348715	619348715	Margosa Road	ING Vysya	NULL	NULL	NULL
10	n8255015074	8255015074	NULL	State Bank of In...	State Bank of In...	Q1340361	State Bank of In...
11	n4519115594	4519115594	NULL	Canara Bank ATM	NULL	NULL	NULL
12	n4519115595	4519115595	NULL	Karnataka Bank ...	NULL	NULL	NULL
13	n5001385822	5001385822	NULL	ICICI Bank ATM	NULL	NULL	NULL
14	n2509175425	2509175425	NULL	HDFC Bank	HDFC Bank	Q631047	HDFC Bank
15	n4558031091	4558031091	NULL	Axis Bank	Axis Bank	Q2003549	Axis Bank
16	n5335214814	5335214814	NULL	Canara Bank	Canara Bank	Q2003777	Canara Bank
17	n9424636020	9424636020	NULL	Axis Bank	Axis Bank	Q2003549	Axis Bank
18	n519549739	519549739	WOC Road	ICICI Bank	ICICI Bank	Q1653258	ICICI Bank
19	n519549759	519549759	NULL	State Bank of In...	State Bank of In...	Q1340361	State Bank of In...
20	n4221615261	4221615261	NULL	Canara bank ATM	NULL	NULL	NULL
21	n5846722872	5846722872	NULL	Axis Bank ATM	NULL	NULL	NULL
22	n5175027880	5175027880	NULL	Axis Bank	Axis Bank	Q2003549	Axis Bank
23	n5175027881	5175027881	NULL	ICICI Bank	ICICI Bank	Q1653258	ICICI Bank
24	n10183518534	10183518534	NULL	Canara Bank	NULL	NULL	Canara Bank

TABLE 3. DATA OF AUTOMATED TELLER MACHINES

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	full_id	osm_id	amenity	addr:street	operator	name:kn	name
1	n1290203354	1290203354	post_office	NULL	NULL	NULL	NULL
2	n1760618743	1760618743	post_office	Old Airport Road	NULL	ಎಚ್ ಎ ಎಲ್ ಉಪ ...	NAL Sub Office
3	n1761893916	1761893916	post_office	NULL	NULL	ಎಚ್ ಎ ಎಲ್ ಉಪ ...	NAL Sub Office
4	n3756794098	3756794098	post_office	NULL	Postal Departm...	ಇಂದಿರಾನಗರ ಅಂಚೆ ಕ...	Indiranagar Post Office
5	n3851909916	3851909916	post_office	12th Main Road	Blue Dart - DHL	NULL	Blue Dart- DHL
6	n3891289957	3891289957	post_office	NULL	NULL	NULL	Blue Dart / DHL
7	n3846349182	3846349182	post_office	NULL	Shree Maruti Co...	NULL	Shree Maruti Courier
8	n6454509103	6454509103	post_office	NULL	NULL	NULL	Halasuru Bazaar
9	n4172589889	4172589889	post_office	Raj Bhavan Road	NULL	NULL	Bangalore Foriegn Sub Post Office
10	n4337898954	4337898954	post_office	Kempegowda r...	India Post	ಕೆಂಪೇಗೌಡ ರಸ್ತೆ	Kempegowda Road
11	n1492519137	1492519137	post_office	NULL	India Post	NULL	India Post Museum Road
12	n2120456509	2120456509	post_office	NULL	indiapost	NULL	4th street
13	n2722800863	2722800863	post_office	NULL	India Post	ಹೈ ಕೋರ್ಟ್ ಅಂಚೆ ...	High Court Post Office
14	n2872076318	2872076318	post_office	NULL	India Post	ಸಂಪಂಗಿರಾಮ ನಗರ ...	Sampangi Rama Nagar Post Office
15	n3761261084	3761261084	post_office	NULL	India Post	ಅಂಚೆ ಕಛೇರಿ	India Post
16	n4294819100	4294819100	post_office	NULL	UPS	NULL	UPS Express
17	n4299314864	4299314864	post_office	NULL	DHL	NULL	Blue Dart - DHL
18	n4307589728	4307589728	post_office	NULL	DTDC	NULL	DTDC
19	n4368861593	4368861593	post_office	NULL	NULL	NULL	SME Express Courier
20	n9230655242	9230655242	post_office	NULL	India Post	NULL	India Post
21	n3805426547	3805426547	post_office	NULL	Professional Co...	NULL	Professional Couriers
22	n312599850	312599850	post_office	NULL	NULL	ಡೊಮ್ಲೂರು ಅಂಚೆ ...	Domlur Post office
23	n3761490986	3761490986	post_office	NULL	DHL	NULL	Blue Dart
24	n3853996383	3853996383	post_office	NULL	DTDC Couriers	NULL	DTDC Couriers

TABLE 4.POST OFFICES

	full_id	osm_id	highway	operator	local_ref	name:kn	name
1	n249082830	249082830	bus_stop	BMTC	NULL	ಕಂಟೋನ್ಮೆಂಟ್ ರೈ...	Cantonment Railway Station
2	n469614003	469614003	bus_stop	BMTC	Forties Hospital	ಕನ್ನಿಂಗ್ಹಮ್ ರಸ್ತೆ	Cunningham Road
3	n573433441	573433441	bus_stop	BMTC	NULL	ಸಿ ಎಸ್ ಐ ಆಸ್ಪತ್ರೆ	CSI Hospital
4	n1749470458	1749470458	bus_stop	BMTC	BENSON TOWN	NULL	Canara Bank Millers Road
5	n2398471620	2398471620	bus_stop	BMTC	BALEKUNDRI CI...	ವಾಸಂತ ನಗರ	Indian Express
6	n2398501442	2398501442	bus_stop	BMTC	MV Jayaram Ro...	ಗಣೇಶ ದೇವಸ್ಥಾನ	Ganesha Temple Vasanthanagara
7	n2405834457	2405834457	bus_stop	BMTC	BENSON TOWN	ನಂದಿದುರ್ಗ ರಸ್ತೆ	Nandidurga Road
8	n4058224470	4058224470	bus_stop	BMTC	NULL	ವಾಸಂತ ನಗರ	Vasanth Nagar
9	n4371078995	4371078995	bus_stop	BMTC	NULL	ಜಯಮಹಲ್	Jayamahal Bus Stop
10	n4905837941	4905837941	bus_stop	BMTC	NULL	ಇಂಡಿಯನ್ ಎಕ್ಸ್‌ಪ್ರೆಸ್	Indian Express
11	n5174903786	5174903786	bus_stop	BMTC	NULL	ಬಂಬೂ ಬಜಾರ್	Bamboo Bazar
12	n6390283409	6390283409	bus_stop	BMTC	NULL	NULL	NULL
13	n7106320859	7106320859	bus_stop	BMTC	NULL	ಇಂಡಿಯನ್ ಎಕ್ಸ್‌ಪ್ರೆಸ್	Indian Express
14	n7108477361	7108477361	bus_stop	BMTC	NULL	ಇಂಡಿಯನ್ ಎಕ್ಸ್‌ಪ್ರೆಸ್	Indian Express
15	n7142097530	7142097530	bus_stop	BMTC	NULL	ಬಂಬೂ ಬಜಾರ್	Bamboo Bazar
16	n7156971598	7156971598	bus_stop	BMTC	MV Jayaram Ro...	ಗಣೇಶ ದೇವಸ್ಥಾನ	Ganesha Temple Vasanthanagara
17	n7255929405	7255929405	bus_stop	BMTC	NULL	ವಾಸಂತ ನಗರ	Vasanth Nagar
18	n10761493347	10761493347	bus_stop	BMTC	NULL	NULL	NULL
19	n446941382	446941382	bus_stop	BMTC	NULL	ಮಲ್ಲೇಶ್ವರಂ 15ನೇ...	Malleshwaram 15th Cross
20	n446995800	446995800	bus_stop	NULL	MALLESHWARA...	8ನೇ ಅಡ್ಡ ರಸ್ತೆ	8th Cross Malleshwaram
21	n446995829	446995829	bus_stop	BMTC	NULL	ಮಲ್ಲೇಶ್ವರಂ ವೃತ್ತ	Malleshwaram Circle
22	n446995834	446995834	bus_stop	NULL	NULL	ಮಲ್ಲೇಶ್ವರಂ ವೃತ್ತ	Malleshwaram Circle
23	n577021934	577021934	bus_stop	BMTC	NULL	ಮಲ್ಲೇಶ್ವರಂ ವೃತ್ತ	Malleswaram Circle
24	n1176722296	1176722296	bus_stop	NULL	NULL	ಮಲ್ಲೇಶ್ವರಂ 8ನೇ ...	Malleshwaram 8th Cross

TABLE 5.BUS STOPS

7. TRAFFIC ANALYSIS

7.1 OVER VIEW

The link between cars, drivers, and the infrastructure such as roads, motorways, signals, and devices—that is installed to govern traffic flow is the basis for the idea of traffic flow. Understanding the traffic network is essential for assisting in the reduction of traffic congestion. We need to apply some new technologies, which are discussed in this research, to minimise traffic because population and transit needs are growing daily. The most crucial factor when assessing traffic flow and capacity is traffic volume. The design and planning of the road system must account for traffic volume. Basically, growing cities like Bangalore have crowded traffic. The type of traffic is the primary cause of traffic in India. In India, traffic is diverse in kind. Vehicles in this traffic do not adhere to the lane regulations that are set forth for each kind of vehicle.

7.2 MODEL OF HETEROGENEOUS TRAFFIC FLOW

In growing cities, the mix of traffic includes both rapid and slow moving vehicles travelling in the same direction or having the same right of way. This heterogeneous traffic flow, which includes both fast-moving vehicles like taxis, buses, trucks, motorcycles, auto rickshaws, etc. and slow-moving vehicles like bicycles, cycle rickshaws, etc., increases traffic. To create traffic flow models for the roads and motorways, mainly for fast moving vehicles, much research has been done. Also evident in industrial centres like Bangalore is heterogeneous traffic. Due to the lack of designated lanes, this is the issue in Bangalore that affects the whole traffic bottleneck.

7.3 TRAFFIC DUE TO ROAD CONDITION

Because to the state of the roads, traffic has also increased. If we are referring to Indian highways, the excessive rain in the autumn will clog every drainage system. The entire road sustains damage as a result of standing water from heavy rain. Because of this harm, there are more accidents and more traffic jams. This occasionally results in a significant collision on that route. road accidents are caused by inadequate or bad upkeep. A fatal vehicle accident will occur 13 times out of every 100 because of poor maintenance. Due to the high speed, it occurs on the motorways and national routes. Any scenario that might lead to an accident, such as a pothole or puddle of water on the road, must be avoided by drivers.

7.4 TRAFFIC FLOW DATA

The below map represents traffic flow data with respect to roads.

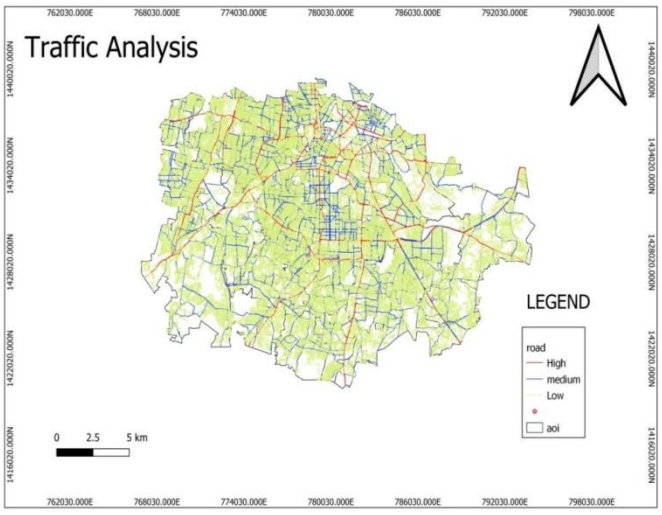

Fig14. TRAFFIC FLOW DATA

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8. RESULT AND DISCUSSION

8.1 SHORTEST PATH ANALYSIS

Shortest route issues come in a variety of forms. The quickest, most efficient or least fuel-consuming route between two specified nodes in a network, for instance. The goal of this study's network analysis was to identify the best path between two or more locations given a particular trip cost. For the objectives of this study, travel expenditures would be calculated based on the time needed to go from an origin point to any destination point while stopping at certain sites. In order to find the optimum routes, analysis was carried out utilising the Q GIS software's Network Analyst extension over the whole research region.

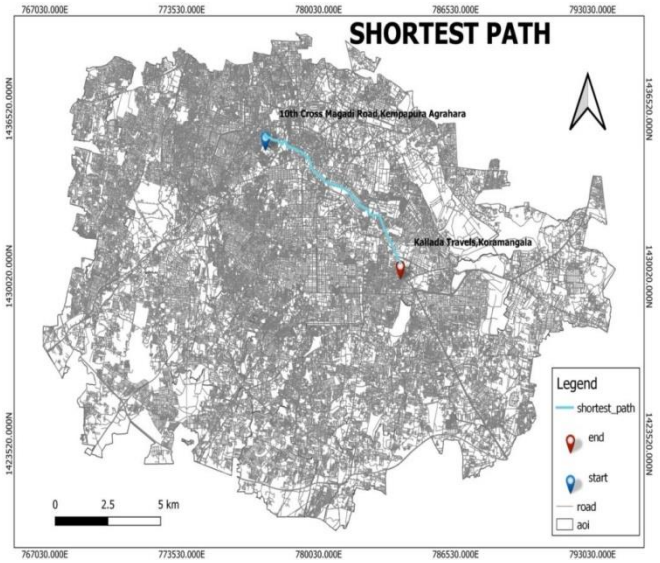

Fig15. SHORTEST PATH ANALYSIS

The optimal route between two points is determined by the shortest route analysis based on journey time, which relies on the network's traffic circumstances at a specific time of day. The network analyst extension makes it simple to set the optimal route analysis parameters, including the travel time that will be used as an impedance factor, the start time of travelling that produces different results depending on the day profile selected, the restrictions on the analysis, such as the road directions (unidirectional or bidirectional), and the capability to ignore invalid network locations that may lead to the analysis failing. After modifying the best route analysis parameters, we decided on the start and finish points and used the best route solver tool to create the shortest path between them.

The length of the road segments added together over the length of the route determined by the shortest route analysis is the distance that the agents will travel. Similar to this, the total route time determined by the shortest route analysis reflects the entire amount of time, measured in minutes, that agents will spend travelling over each route segment.

8.2 CLOSEST FACILITY ANALYSIS

Based on available travel time and traffic statistics, the nearest facilities analysis determines the closest facilities that can be reached in a certain amount of time from an incident location. Knowing the closest facilities that can be accessed from the scene of the occurrence is helpful in an emergency since it saves time, effort, and resources while also potentially saving lives. Setting the analysis parameters for the closet facilities analysis, such as the impedance factor in the analysis, the start time, the travel time to the closet facilities, the number of facilities to locate, and the travel directions (from the incident to the facility or from the facility to the incident), is made simple by the network analysis extension.The nearest facilities to the incident's location may then be identified using the network analyst extension solution.

Here, we offer the best path between the two destinations with the nearest facilities. According to the buffer analysis of the current infrastructure in the research region, the highest number of habitations are covered by institutions including hospitals, schools, ATMs, bus stations, and post offices within a 200-meter radius.It demonstrates how well these amenities are available in the research region.

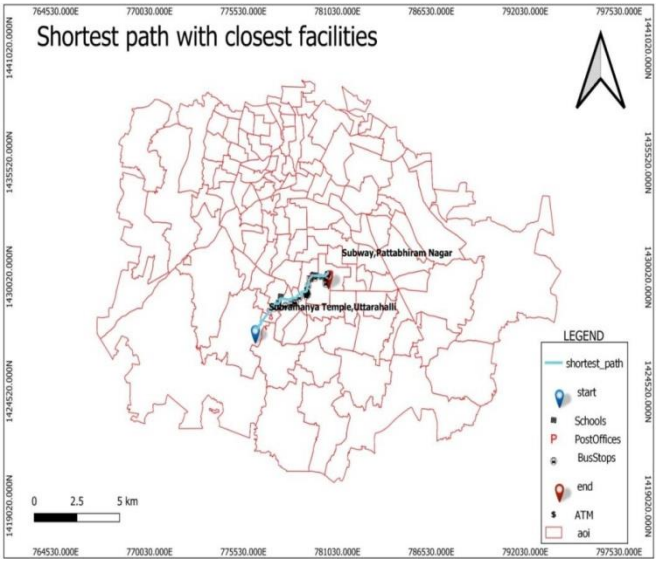

Fig16. CLOSEST FACILITY ANALYSIS

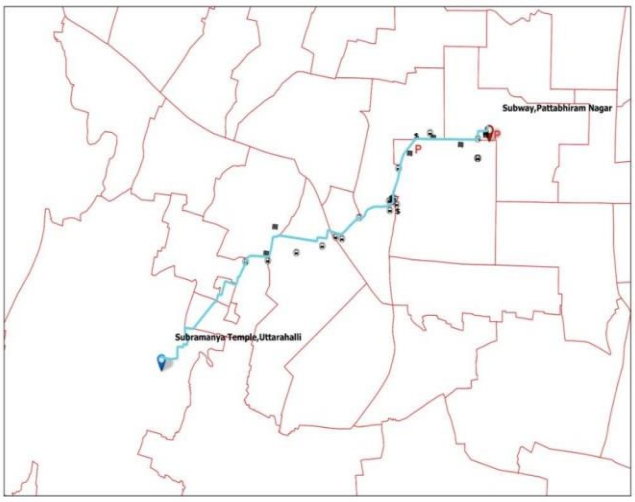

Fig17. CLOSEST FACILITY ANALYSIS

9. CONCLUSION

We analyse the road networks of new roads, existing roads, and the shortest route between two locations. The road network was subjected to an improved GIS-based network analysis in this project. It focuses on determining the most efficient path between two points on the road network and determining the facilities and service providers closest to a location of an incident based on the journey time. The suggested approach also incorporates historical traffic secondary data into the study, which leads in more accurate outcomes appropriate for practical road networks. To reduce travel time and costs, route optimisation using GIS may be utilised efficiently for network design and road planning.

FUTURE WORK

In order to obtain accurate results, we advise using current traffic data wherever it is available in place of historical traffic data and taking into account other elements like road width, road status, road type, and time delay on the road. For the growth of a city, it would be better to increase traffic flow and reduce congestion. We recommend using the most effective planning tools to create a network dataset that will be much more useful for urban planning. Today's urban expansion proliferation need policy directions that not only restrain the political inclinations of metropolitan growth but also include the rise of lower order settlements with the development of metropolitan regions. Future studies will face difficulties in maintaining the current highways and constructing new ones.

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