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"MEASURES TO REDUCE ACCIDENTS AND CONTROL TRAFFIC CONGESTION AT THE INTERSECTION"

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Abstract—Whether in a developed or developing country, traffic congestion has been getting worse over the years and is a clear there at to the quality of urban life. This research assesses problems related to traffic flow on urban roads at intersections. In urban areas such as Wagholi,Pune where traffic congestion is a common occurrence and causes delays, frequent disruption in traffic flow, time loss, increased fuel consumption.

The Wageshwar temple and Kesnand phata due to the significant rise in motor vehicles, Roads are to blame for traffic issues like a accident, jams, delays etc. particularly at intersections. The traffic survey at the particular intersection is the methodology used to archive stated goal of relieving congestion and promoting smooth traffic flow. It is needed to develop road infrastructure and redesign the traffic signal system. A particularly challenging issue in developing countries like India , is the collection of traffic data. In general, developing countries do not often have well established infrastructure such as installation of small traffic signals, they lack new road construction and public transportation, etc. One of Pune's main transportation issues is traffic congestion. Poor traffic management might lead to accidents because of traffic bottlenecks. Pune is a developed, heavily inhabited city, as we all know. However, Pune has certain fundamental traffic issues that require immediate attention and resolution in order to sustain the city's real progress in terms of fundamental development. In a city like Pune, the traffic issue gets worse every day. We hear adjectives like nasty, chaotic, dangerous, notorious, etc. whenever we discuss Pune's traffic. One person dies every day, or ten to fifteen per week, which is an extremely high death rate. Because of the city's incredibly disorganized and careless traffic, which lacks any feeling of traffic. Accident on due to unawareness of rule and regulation of road network.

I. INTRODUCTION

Due to the fact that everyone has started purchasing a car these days, India's population is expanding exponentially, which is creating traffic problems. This is a citywide effect of traffic congestion on the roads and at intersectionsThe traffic at the Wagholi Temple to Kesanad Phata.

There is a clear threat to the quality of urban life posed by traffic congestion, which is primarily manifested as a progressive reduction in traffic speeds that results in higher travel times, fuel consumption, other operating costs, and environmental pollution when compared to an uninterrupted flow of traffic. The rapid growth of transportation activities is causing acute traffic problems, particularly at intersections due to mix complex flow pattern. For this reason, it is important to design.

Undoubtedly, traffic congestion poses a serious threat to the standard of living in urban areas worldwide, as it has been becoming worse in most industrialized and developing countries alike.

Shower speeds and longer trip times are two characteristics of traffic congestion, a phenomenon that develops on road networks as use increases. When demand for road space exceeds availability, it is called congestion.

There is some congestion when there is enough traffic demand such that the time it takes for a vehicle to stop reflects the flow of traffic.

AI use in traffic congestion:

The use of artificial intelligence in traffic management in traffic is relatively new, with a focus on the collecting and subsequent analysis of real time data. AI technologies provide traffic planners with tools for analyzing, detecting, and predicting traffic patterns, as well as assisting in the development of a traffic network in which everything runs well.In this post we'll look at the various ways AI can help with traffic management, its overall influence, benefits and problems, and what to expect in the future

OBJECTIVE:

1. Collection and analysis of accident data.
2. Carryout traffic volume studies.
3. To study factor affecting to design intersection.
4. To analyse the traffic volume and redesign signal system using AI.
5. To reduce accident and traffic control at intersection by develop infrastructure road.

II. METHODOLOGY

1. PROBLEM STATEMENT:

Traffic in Wagholi, Pune, is a major problem, as everyone knows. Every day, a little road issue that causes a traffic bottleneck arises. Because the route is narrower, there is typically only one side block of traffic. When traveling from Pune to Ahmednagar, those who wish to avoid stopping at Wagholi proceed straight there. People on signals not following the regulations is one more issue that exist..

2. LOCATION OF STUDY INTERSECTION:

In certain areas wagholi, there is traffic congestion on certain roads. This study covers the area from wageshwar temple stop to kesnand phata . wageshwar temple stop is located 1.9 km away from kesnand phata. The village of wagholi has seen rapid urban growth in Pune over the last few decades. Because more vehicles are being added, wagholi is experiencing more traffic congestion. In certain area Wagholis, there is traffic congestion on certain roads. This study covers the area from wageshwar 768emple stop to kesnand phata. Wagehswar temple stop is located 1.9 KM away from kesnand phata. The village of wagholi has seen rapid urban growth in pune over the last few decades. Because more vehicles are begin added, wagholi is experiencing more traffic congestion.

3. NEED OF STUDY:

Reduced rates of congestion in the area are a natural result of improved traffic flow, which is made by smart intersection . because they have fever wait period at signals depending on the flow of traffic, smart intersection provide for overall smoother traffic flow.

4. SELECTION OF STUDY INTERSECTION:

1) Kesnand Phata intersection:

Fig No 1. KESNAND PHATA GOOGLE MAP

Kesnand phata is the T intersection and this intersection lead to the main road. This intersection has a moderate width. This crossroad is next to the bus depo. So proceed down this crowded lane. There are accidents that occurs while crossing the road . this road is toward the bus depo is single lane . width is 3.75m and Pune-Nagar is six lane. For pedestrian timer is 15 sec and 180 sec timer for Pune-Naagar signal.

2) Bhaji Mandaiintersection:

There are staggered intersection at Bhaji Mandai. Tuesday are a busy day for traffic at this crossroads. On other days, there is also traffic. There are lengthy lines of vehicles as result. This crossroad has parked vehicles all around it. Making it difficult to manage traffic. Bhaji mandai is minor road that connects to the Pune-Nagar main road. Signal timer for pedestrian is 15 sec and 180 for vehicles.

Fig No 2. BHAJI MANDAI GOOGLE MAP

5. TRAFFIC VOLUME STUDY:

Using manual counters: We have used most traditional method in this method. Data is gathered by monitoring traffic, and automated counts are not an efficient way too collect this data

Table No .1 Toward Pune Station Day 1Traffic volume Survey Data 2024(Friday)

TIME	TWO WHEELER	FOUR WHEER	HEAVY	THREE WHEELER	TOTAL
8-10 AM	808	380	280	188	1656
10-12AM	1590	995	816	206	3607
12-3 PM	612	210	390	140	1352
3-5 PM	946	280	290	220	1736
5-7PM	1240	998	905	417	3560
7-9 PM	1260	1001	915	415	3591
TOTAL VEHICLE	6456	3864	3596	1586	15502

Table No 2 Toward Nagar Day 1 Traffic volume Survey Data 2024 (Friday)

TIME	TWO WHEELER	FOUR WHEELER	HEAVY	THREE WHEELER	TOTAL
8-10 AM	576	328	128	176	1208
10-12 AM	1403	885	606	190	3084
12-3 PM	418	365	390	260	1433
3-5 PM	660	398	310	268	1636
5-7 PM	1415	889	940	436	3680
7-9 PM	1410	902	965	472	3749
TOTAL VEHICLE	5882	3767	3339	1802	14790

Table No 3 Kesanand Phata Day 1 Traffic volume Survey Data 2024 (Saturday

z	TWO WHEELER	FOUR WHEELER	HEAVY	THREE WHEELER	TOTAL
8-10 AM	130	110	189	108	537
10-12 AM	151	120	200	102	573
12-3 PM	135	126	197	102	560
3-5 PM	137	110	172	114	539
5-9 PM	211	134	188	120	653
7-9 PM	221	145	194	224	784
TOTAL VEHICLE	985	745	1140	770	3646

Table No 4 Toward Pune Station Day 2 Traffic volume Survey Data 2024 (Saturday)

TIME	TWO WHEELER	FOUR WHEER	HEAVY	THREE WHEELER	TOTAL
8-10 AM	922	460	277	190	1849
10-12AM	1402	875	947	324	3548
12-3 PM	708	320	419	216	1663
3-5 PM	896	345	237	317	1795
5-7PM	1420	880	940	515	3755
7-9 PM	1430	895	945	519	3789
TOTAL VEHICLE	6778	3775	3765	2081	16399

Table No 5 Toward Nagar Day 2 Traffic Volume Survey Data 2024 (Saturday)

TIME	TWO WHEELER	FOUR WHEELER	HEAVY	THREE WHEELER	TOTAL
8-10 AM	1006	496	326	185	2013
10-12 AM	1417	840	710	350	3317
12-3 PM	556	338	518	288	1700
3-5 PM	716	574	311	345	1946
5-9 PM	1349	849	730	550	3478
7-9 PM	1355	898	790	530	3573
TOTAL VEHICLE	6399	3995	3385	2248	16027

Table No 6 Kesanand Phata Day 2 Traffic volume Survey Data 2024 (Saturday)

TIME	TWO WHEELER	FOUR WHEELER	HEAVY	THREE WHEELER	TOTAL
8-10 AM	131	111	191	101	534
10-12 AM	152	121	201	103	577
12-3 PM	136	125	197	102	560
3-5 PM	138	112	177	114	541
5-9 PM	210	139	184	121	654
7-9 PM	225	147	198	226	796
TOTAL VEHICLE	992	755	1148	767	3662

Table No 7.Toward Pune station Day 3 Traffic volume Survey Data 2024 (Sunday)

TIME	TWO WHEELER	FOUR WHEER	HEAVY	THREE WHEER	TOTAL
8-10 AM	716	412	275	167	1570
10-12 AM	1325	945	730	188	3188
12-3 PM	426	312	402	171	1311
3-5 PM	592	246	241	284	1363
5-7 PM	1204	985	740	450	3379
7-9 PM	1504	998	752	498	3752
TOTAL VEHICLE	5767	3898	3140	1758	14563

Table No 8.Toward Nagar Day 3 Traffic volume Survey Data 2024 (Sunday)

TIME	TWO WHEELER	FOUR WHEELER	HEAVY	THREE WHEELER	TOTAL
8-10 AM	568	297	134	217	1216
10-12 AM	1307	786	687	201	2981
12-3 PM	502	287	402	196	1387
3-5 PM	676	340	268	234	1518
5-7PM	1005	890	785	402	3082
7-9 PM	1025	992	898	410	3325
TOTAL VEHICLE	5083	3592	3174	1660	13509

Table No 9. Kesanand Phata Day 3 Traffic volume Survey Data 2024 (Sunday)

TIME	TWO WHEELER	FOUR WHEELER	HEAVY	THREE WHEELER	TOTAL
8-10 AM	130	111	190	100	531
10-12 AM	150	120	200	102	572
12-3 PM	136	125	198	109	568
3-5 PM	140	110	178	114	542
5-7 PM	210	138	180	120	648
7-9 PM	220	142	190	225	777
TOTAL VEHICLE	986	746	1136	770	3638

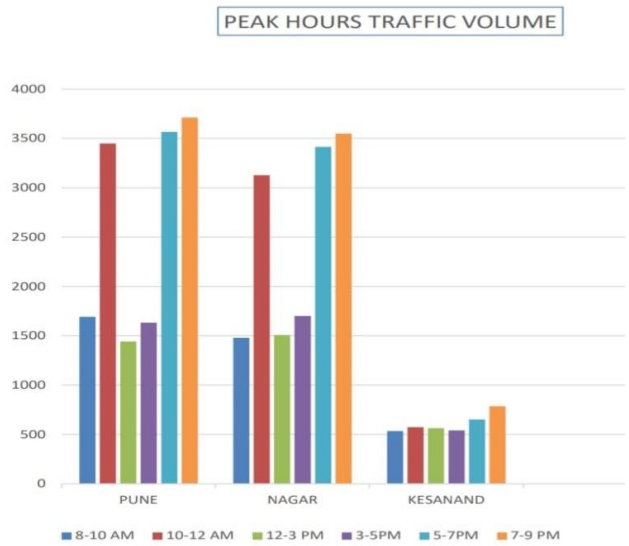

Fig No 3 Traffic volume of peak hours graph

6. CAUSES OF TRAFFIC CONGESTION:

1. Poor Traffic Discipline: Drivers frequently disregard traffic law ,which causes tense situation on the road.

2. Illegal Parking: The primary reason for illegal parking that leads to traffic congestion is a back of parking spaces. Pune city's traffic jams are mostly caused by illegal parking. The majority of illegal parking occurs in front of shops or stores.

3. Too Many Cars: Traffic is also caused due to the presence of too many cars on the road. Population growing, and traffic jams happen when there are more cars on the roadways thanthere are spaces for them to travel . for those who use an identical congested route to and from work every day, it is infrastructure.

4. Heavy Vehicle on Narrow Roads: Longer delays are caused by heavy vehicles blocking the entire road when they travel narrow area.

5. Not Enough Public Transportation: People are encouraged to look for and spend in private transport due to the due lack of adequate public transport. The majority of people purchase a personal vehicle, further clogging the road.

6. Roadside Seller: Road side seller frequently erect their businesses alongside the road, limiting room for cars and clogging up traffic.

7. Encroaching of Footpath: The primary function of the footpaths in pune is parking; they are not being used for their intended purpose. As a result, pedestrians use the road, which has an impact on traffic m management and causes congestion.

8. Ineffective Traffic Management: At important traffic signals, traffic police are stationed, and their primary task is no issue challans to violators. Their mishandling of the situation is applying.

9. Poor Construction and Inadequate Management: Not a single high-quality construction exists, The contractors profit from their poor construction, which results in traffic

bottlenecks and mishaps. The relevant authority has no master plan or road maintenance.

10. Ineffective Public Transportation: The quantity and frequency of public transportation are restricted, but the number of passenger is unrestricted. As a result, there is a significant disparity between the necessary and available public transportation.

11. Lack of Infrastructural Needs: No flyovers , ROBs, and subways, which contributes to heavy traffic in several areas.

6. MEASURES OF CONTROL OF TRAFFIC

1. System for Intelligent Transport: We need to replace the outdated manual signalization with intelligent signalization systems in the megacities the primary causes of traffic congestion are intersections, which this strategy may significancy lessen.

2. Strict Lane Management: The roads should be marked with various lanes for different types of vehicles, and the types of vehicles, and the legislation, i.e. a financial penalty , should be applied to force drivers to keep the lane discipline.

3. Expansion of Road Network : To help lessen traffic congestion, expand the capacity of road network by building new roads and expanding those that already exist.

4. Implement Traffic Management :Use traffic management strategies . some example of traffic management strategies that can assist control traffic flow and reduce congestion include roundabouts, traffic signals, and congestion pricing.

5. Traffic Analysis: Start by carefully examining the junction's traffic patterns. Gather information about peak times, volume of traffic, kinds of vehicles, movement of pedestrians, and any spots of current congestion.

6. Solutions for Traffic Engineering:

- Roundabouts: Where appropriate, think about erecting roundabouts in place of conventional signal-controlled intersections. The necessity for stops is decreased and continuous traffic flow is encouraged via roundabouts.
- Lane markings: To improve traffic flow, clearly identify lanes and offer designated turning lanes.
- Traffic Signal Optimization: To modify signal timings in response to current traffic circumstances, use sophisticated traffic signal optimization software. This can lessen traffic and cut down on wait times.
- Priority Lanes: To promote the usage of public transportation, emergency vehicles, and bicycles while easing traffic for other vehicles, priority lanes should be implemented.
- Pedestrian Crossings: To guarantee pedestrian safety without obstructing traffic movement, pedestrian crossings should be designed with clear markings, signalization, and sufficient crossing periods.

7. Other Modes of Transportation:

- Public Transportation: To encourage people to use buses, trains, or other mass transit choices rather than driving, improve the infrastructure and services provided by public transportation.
- Cycling Infrastructure: To promote cycling as a means of transportation, create bike lanes specifically for it and offer safe places to park bikes.
- Walking Infrastructure: To encourage walking as a practical choice for short trips, improve sidewalks, pedestrian walkways, and pedestrian-friendly crossings.

8.Astute Integration of Technology:

- Traffic Monitoring Systems: To collect data on traffic flow and congestion levels in real-time, install cameras, sensors, and other monitoring equipment.
- Dynamic Traffic Management: Put in place intelligent systems for managing traffic that may modify signals on the fly.

7. ARTIFICIAL INTELLIGENCE USE IN TRAFFIC:

1. Need of smart control of traffic signals:

Due to an increase in both the population and the number of cars in cities, traffic congestion is becoming one of the major problems. Traffic bottlenecks raise fuel consumption, transportation expenses, and carbon dioxide air pollution in addition to adding to delays and stress for drivers. Many factors, such as inadequate capacity, unchecked demand, lengthy delays at red lights, etc., can contribute to traffic congestion. One important component influencing traffic flow is the traffic signals.

2. Proposed System :

There is no set pattern to the flow of traffic, and the presence of static signal timers exacerbates the already serious issue of congestion.

Consequently, putting in place a system that attempts to lessen the likelihood of such situations by automatically calculating the ideal green signal time based on the volume of traffic at the signal will guarantee that the direction with more traffic is given a green signal for a longer period of time than the direction with less traffic.

This technology has the ability to override the outdated hard-coded light system that causes unneeded delays, lowering traffic and waiting times, which in turn lowers the number of accidents and fuel consumption, all of which contribute to the reduction of air pollution.

The primary goal of this project is to create a computer vision-based traffic signal controller that can adjust to the existing traffic conditions. Our suggested method would detect vehicles at the signal and adjust the green signal time based on the real-time traffic density estimate using the live video feed from the CCTV cameras at traffic intersections. To estimate the green signal time more precisely, the vehicles are categorized as cars, bikes, buses/trucks, or rickshaws.

8. PROJECT DEMONSTRATION:

Fig No 4 Project Demonstration

9. DEVELOPMENT OF ROAD INFRASTRUCTURE:

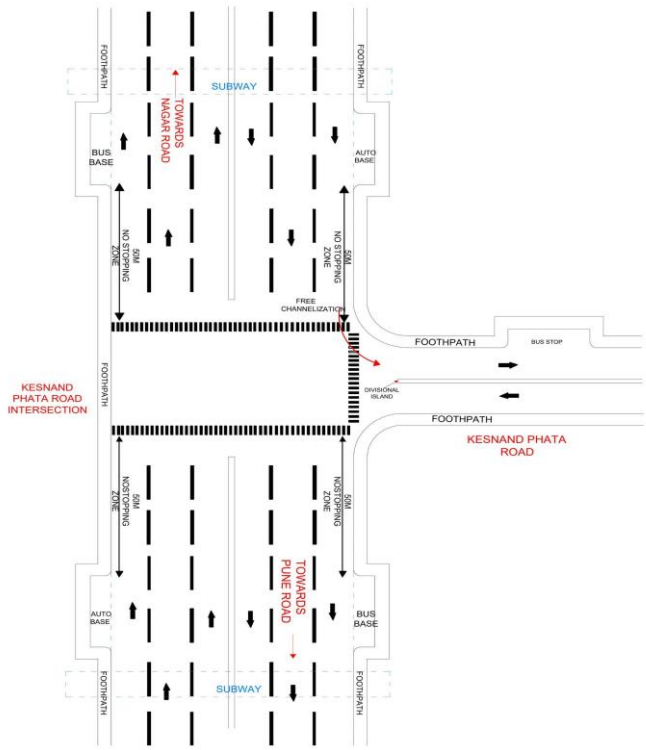

Fig No 5 Development of Road infrastructure

1. Finally, complete content and organizational editing before formatting. Please take note of the following items when proofreading spelling and grammar: For pedestrian, zebra crossing markings are required.
2. To provide for central island and divisional island without cresting conflict point.
3. To ensure efficient traffic flow and designate a specific location for bus and auto stops.
4. Further more offer subway service for public safety.

III. RESULT AND DISCUSSION:

- For actuated signal system we considered 50m length of road stretch from the intersection.
- Now considering average speed of vehicles at intersection is 10kmph.
- For three lane one way traffic, determining the number of vehicles can be accumulated and passes through the intersection for 180 sec.
- Considering average length of vehicles 6m

Table No 10. Current signal system (1 hour)

Simulation	Toward Pune (180 sec)	Toward Nagar (180 sec)	Total
1	127	108	236
2	135	126	263
3	107	102	212
4	109	112	225
5	145	117	267
6	139	109	254
7	116	115	238
8	134	108	250
9	117	119	245
10	152	116	278
11	135	110	256
12	160	112	284
Total	1576	1,354	3008
Mean	**131**	**112**	**243**

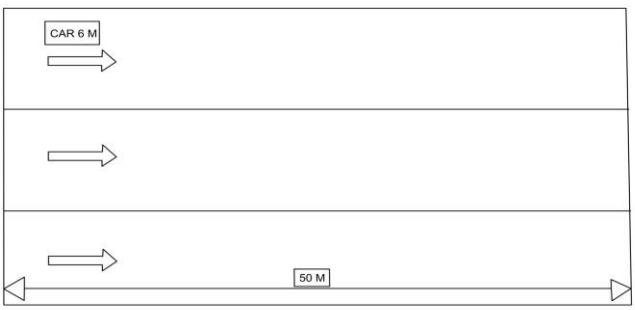

Fig No 6 Actuated signal system vehicle counting area

- We assume a 50m area at the focal range of the sensor that provides the actuated signal system, as well as the vehicles 6m length.
- V= D/T where, V=Speed, D= Distance , T=Time
- T= D/V
  50/6=8
  Now for three lane 8*3=24
  Now T= D/V
  where, V=10kmph =2.7mps
  T= 50/2.7=18sec

In 18 sec 24 vehicles passed through intersection then in 180 sec 240 vehicles passes in each direction, then in both directions total 480 vehicles passes through the intersection.
Existing signal system can pass 243 avg vehicles in 1 signal cycle.
And actuated signal system can pass 480 that means 237 more vehicles than existing signal system.

IV. CONCLUSION

- Accidents at the intersection can be reduced by several measures as per data analysis, following measures:-

1. Proper road markings
2. Provide adequate setback distance at intersection
3. Controlling the speed limit of vehicles
4. Developing road infrastructure (lighting, sign, signal, pedestrian facilities)

- From the traffic volume studies it is observed that the peak traffic flow is from 7pm to 9pm time interval and this traffic volume considered for redesigning the signal system.

1. Traffic volume passing through the intersection as per existing fixed signal system in one single cycle is 243 average vehicles and whereas traffic volume passing through the intersection as per actuated signal system for the same period of time is 480 vehicles.
2. There is an increase in percentage of traffic crossing the intersection by actuated signal system is 97%.

- To reduce accidents and control traffic congestion at the intersection by improving the road infrastructure

1. By providing no stopping zone to a length of 50m from intersection and by designing road furniture as per IRC guidelines
2. Providing pedestrian facilities and channelizing island.

FUTURE SCOPE:

AI in traffic management plays a significant influence in future traffic flow. The actuated signal system regulates traffic without disrupting motorists. Is is also reduces future accidents due to traffic and over speeding during congestion. Is plays a crucial role in developing future infrastructure. Also, the breadth of artificial intelligence in the future is expanding and will have a significant impact on traffic management.

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