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TO STUDY CURRENT TRAFFIC SCENARIO IN METROCITY AND FINDING TECHNICALLY & ECONOMICALLY FEASIBLE SOLUTION ON IT

R. P. Wade[1], P. N. Dange[2], S. D. Gadganje[3], H. S. Nikam[4], R. S. Thakare[5]

[1] *Professor, Department of Civil Engineering, ABMSP's APCOER, Pune, Maharashtra, India*
[2,3,4,5,] *Student of B.E., Department of Civil Engineering , ABMSP's APCOER, Pune, Maharashtra, India*

Abstract - *Vehicular Traffic is a matter of growing concern in cities. Growing population, urbanization and higher standards of living has led to vehicles that are more private on road and lesser use of public transport. This in turn has led to an increase in road traffic. Pollution, accidents etc. are a direct effect of increase in road traffic. Intelligent Transportation Systems (ITS) aims at providing prompt, safe and comfortable traffic service for drivers. There is need for smart traffic management system, which is suitable for Indian traffic situation. For this, we are going to maintain speed range and from this make green signal timing in coordinated manner. So one can pass each intersection without stoppage and also one should follow the speed range which is going to be provided on that route. In this era of artificial intelligence, an intelligent traffic signal is necessary. This can be achieved if signals can predict the traffic flow, since traffic flow can be dependent on a number of factors such as seasons, day of week, time of day, occasions, accidents, direction of flow, type of road, region, weather conditions etc. In this paper, an attempt has been made to use historical data as one of the important parameters to predict the traffic flow at an intersection. The historical data and live traffic data at an intersection is fuzzified to predict the traffic flow at a particular junction, which then, is fed to provide optimum green, signaling in all directions of the intersection by maintaining a constant speed range. The optimum green timing when set at all the intersection reduces the delay at the intersection and offers better results than pre-timed and actuated method of traffic timing control.*

Key Words: **Intelligent Transportation Systems (ITS)[1], Traffic flow[2], optimum green signaling[3], intersection[4], Actuated method[5].**

1. INTRODUCTION

Traffic congestion is a global issue. It is a growing matter of concern as it leads to a number of economic and environmental problems. In many countries like Australia, Bangladesh, Brazil, China traffic during peak hours is usually very congested. Australians rely mainly on radio and television to obtain current traffic information. GPS, webcams, and online resources are increasingly being used to monitor and relay traffic conditions to motorists. Traffic jams have become intolerable in Dhaka. People lose valuable working hours as well as the automobiles' costly fuel every day. São Paulo in Brazil has the world's worst daily traffic jams. According to reports from the Companhia de Engenharia de Tráfego, the city's traffic management agency, the historical congestion record was set on June 1, 2012, with 295 kilometers (183 mi) of cumulative queues around the city during the evening rush hour. The worst affected are the developing countries wherein the sudden rise in launching of low budget vehicles in addition to newer banking reforms for providing easy installments for purchase of vehicles has increased the number of car buyers multifold which has outpaced the highway construction. India too has seen a rise in vehicles on road. The traffic in cities like Delhi, Hyderabad, Mumbai, Bangalore & Pune are getting worst day by day. India has become the new favorite of global automakers like Nissan, Renault, Toyota and Ford, with each of them planning to launch newer models in the near future. This rise in vehicles with no equivalent planning or automation of roads has made India one of the countries with the worst traffic jams. Research in Traffic Engineering has attracted engineers from different fields like Civil, Electronics & Computer Science. The planning of roads to using electronic devices like sensors, detectors and feeding intelligence to the systems have been areas of wide research for engineers to address this major issue of the society. Intelligent Transportation System (ITS) is a set of applications aimed at providing innovative services relating to different modes of transport and traffic management and enables various users to be better informed and make safer, more coordinated, and smarter use of transport networks. ITS brings significant improvement in transportation system performance, including reduced I-2 congestion and increased safety and traveler convenience. Japan, Singapore, and South Korea are the global leaders in ITS deployment. The Advanced Traffic Management System (ATMS) is a primary subfield within the ITS that integrates technology for improving the flow of traffic and safety. Some of ATMS functional area includes Real Time Traffic monitoring, Incident monitoring, Traffic signal monitoring and control, Arterial Management etc. Lack of awareness & implementation of ITS in developing countries have worsened the traffic scenario. The nature of traffic flow is dependent on a number of characteristics which includes density, speed and traffic volume and natural factors such as time of day, weekday, weekend, weather conditions and the area/location under consideration. The inherent stochastic nature of traffic flow makes it difficult to predict the traffic flow mathematically. However, a traffic policeman at an intersection can predict the flow easily. This is because of his

knowledge about the intersection and a variety of other natural factors that affect the flow of traffic. Historical data plays a significant role in determining the traffic flow. Traffic flow though random in nature does follow a pattern. The historical data helps to understand the traffic flow within the city, which is a variable, based on the time of day, weekday/weekend, holiday/working day/festivals, area, weather condition etc. This data if captured can be used to effectively determine the traffic flow.

1.1 STUDY AREA

We have selected site for our project, which is from Pune station to Wadia College of engineering which is 1.1 km, consist of 5 signal. Pune is second largest city in Maharashtra and ninth most populous city in the country.
As per census 2011, population was 3124458 and in 2016 it is estimated to be 5,926,606[5.9 million]
Vehicular/Road Statistics of Pune City is as follows [Reference: Express News Service 30 July 2015]

- 2-Wheelers : 2,152,911
- 3-Wheelers : 47,554
- 4-Wheelers :4,57,698
- The frequency 110-130 vehicles per minute have been observed on internal roads.

There is a need felt to improve the traffic control at junctions. PMC also plans to install sensors in city roads for Intelligent Traffic Control.
This project is an effort to provide better traffic control.

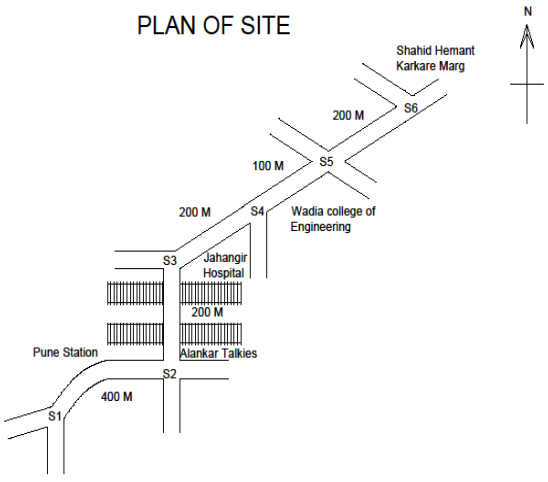

Fig -1 Plan of Site

2. METHODOLOGY

Our methodology of this project is to preliminary survey for obtaining various traffic data such as volume. The fieldwork and survey identify and notify the landslide. First, we are going to study basic parameters of traffic system. After we have selected site for our project, which is from Pune station to Wadia College of engineering which is 1.1 km, consist of 5 signal. Then calculating traffic flow of selected route by using video photography for five days, 12 hr. per day. After calculating traffic flow, calculate traffic parameters like density, speed, headway etc. For our pre decided route the average speed calculation by observation. We are going to design signal by Webster method by providing a speed range in between 35 km/hr. to 45km/hr. to reach the next signal. From this design, optimum green signal and fix, the next signal timing.

3. RESEARCH PAPER

Study of Techniques for Intelligent Traffic Control System. Review paper by Nishant Bastian, Ayush Kanodia, Praveen Kumar Sharma, 2015. From the complete literature survey, it can be concluded that no matter whatever methodology is being employed by the author, the focus is to use a precise and correct segmentation technique many technique has been developed to make traffic light intelligent. Image processing has done a major contribution in this field by making the traffic light take decision on a real time basis. Even after so many techniques, problem is still faced when it comes to congestion and problem in image acquisition. Many times, there are certain noises, which can distort the images the images, leading to wrong decision by the traffic light.

Design of Intelligent Traffic Control System Based on ARM, Review paper by: Ashwini Dakhole, Mrunalini Moonet, 2013. In this paper, we have studied the optimization of traffic light controller in a city using ARM7 and micro controller. The ARM7 based traffic control system works on traffic related problems such as jams, unreasonable latency time of stoppage of vehicle emergency vehicle forcibly passing, etc. can be solved the system has several benefit such as simple structure, high reliability, low cost, good real –time, easy installation and maintenance so on. By using this system configuration, we try to reduce the possibilities of traffic jams caused by traffic light. The number of passing vehicle in the fix time slot on the road decide the density road range of traffic and on the basis of vehicle density calculation micro controller decide the traffic light delays.

4. EXPERIMENTAL WORK

In our selected route, we collected the various data regarding traffic. From this, we designing signal one-way

route such as to allow traffic flow without getting red signal.

For this, we have to maintain speed range in between 35 km/hr. to 45 km/hr. In our videography we come to know that morning, 9 am-10 am is peak hour and more traffic as compare to the evening 7 pm-8 pm peak hour, so in all signal design we concerned with morning peak hour.

- First, we are going to study basic parameters of traffic system.
- After we have selected site for our project, which is from Pune station to Wadia College of engineering which is 1.1 km, consist of five signals.
- Then calculated traffic flow of selected route by using video photography for five days, 12 hr. per day.
- We are going to design signal by arithmetic means by providing a speed range in between 35 km/hr to 45km/hr to reach the next signal.
- From this design optimum green signal and fix the next signal timing.

Time interval(min)	Flow(q) (veh/hr)	Speed (v) (km/hr)	Density(k) (veh/km)	Space mean speed(VS) (m/s)	Space headway(HS) (m)	Time headway(HT) (sec)
0-5	1400	16.37	86	4.52	11.62	2.57
5-10	1110	16.37	68	4.53	14.70	3.24
10-15	1130	16.37	69	4.55	14.50	2.19
15-20	1246	16.37	76	4.55	13.15	2.89
20-25	1310	16.37	80	4.55	12.5	2.75
25-30	1120	16.37	68	4.57	14.70	3.22
30-35	920	16.37	56	4.56	17.85	3.85
35-40	810	16.37	49	4.49	20.40	4.54
40-45	1112	16.37	68	4.54	14.70	3.24
45-50	825	16.37	50	4.58	20	3.37
50-55	925	16.37	57	4.51	17.54	3.89
55-60	724	16.37	44	4.57	22.72	4.97

Table -1. Calculation Of Traffic Parameter

- After calculating traffic flow, calculate traffic parameters like density, speed, headway etc.
- For our pre decided route the average speed calculation by observation.

4.1 Fuel Consumption

Fuel consumption have been calculated by considering only one side traffic volume i.e. S1-A, S2-A, S3-A, S4-A, S5-A. This is only because of we are designing signal for this route only.

Table No-2 Fuel Consumption

Sr no	Types of vehicle	Fuel consumption ml/sec	Remark	No. of vehicles	Fuel consumption ml/sec	Fuel rate per lit	Consumption cost in Rs/sec	Consumption cost in Rs/min
1.	Two wheelers	0.056	Petrol	520	29.12	76	2.21	132
2.	Car	0.163	Diesel	179	29.18	62	1.80	108
3.	Bus/truck	0.891	Diesel	58	51.69	62	3.20	192
4.	Auto/six seater	0.145 gm/sec	CNG	295	42.77	42	1.79	109
							Total = 541	

From table 2 it has been observed that from peak hours, those no of vehicles stop over S1 (A) signal for an hour it will consume Rs 541 per minute and Rs 6492 for a day.

4.2 Fixing of signal timing for S2 signal

If group of vehicle pass from S1 signal at speed range in between 35 km/hour to 45 km/hour, it will reach the S2 signal in,

$= \frac{35*1000}{60*60}$ = 9.72 m/sec

$= \frac{45*1000}{60*60}$ = 12.5 m/sec

Distance from S1 to S2 is 400m,
At 35 km/hour, Time taken to cover distance = t = d/s = 400/9.72 = 41.15 sec
At 45 km/hour, Time taken to cover distance = t = d/s = 400/12.5 = 32sec
Therefore, average of time taken to reach the S2 signal at speed of 35 km/hour & 45 km/hour is 40 sec.
Therefore, from above it is concluded that, green timing of S2 (A) should fix after 40 sec of green signal S1 (A) so to pass the group of vehicle without stopping.
Therefore fixing of all signal timing in same manner.

Signal designed by Webster method and timing of signal fixed so as vehicle can pass without stoppage. The developed timing of signal is as shown in table 3:

Table No-3 Developed Signal Timing

		Green				Red				Yellow			
	Intersection name	WE A	NS B	EW C	SN D	WE A	NS B	EW C	SN D	WE A	NS B	EW C	SN D
1	S1 Gadital	30	40	40		45		50	50	3		3	3
2	S2 Alankar talkies	110	100	125	130	80	95	115	105	4	4	4	4
3	S3 Jahangir hospital	50	55	60		60		80	130	4		4	4
4	S4 Wadia college	60		60	55	60		60	140	4		4	4
5	S5 Petrol pump	40	40	40	40	60	150	110	140	4	4	4	4

5. CONCLUSIONS

Due to revise signal arrangement once get green signal at any crossing it will get green signal for processing signal which will helps to save time and petrol. Traffic Flow Prediction and Signal timing optimization method proposed in this project has proved to reduce delays at an intersection. A traffic sensor was developed for predicting the traffic flow and optimizing the green timing. Coordinated Signal Timings along an arterial can reduce delays further. Future work will be to create a system that can control and coordinate the signal timings along an arterial. To make such arrangement be generally spends a money on infrastructure such as flyovers and under ways its cost near about 225 to 250Cr. This development signal system its development and installment cost is very cheap as compare to infrastructure and under ways project cost. It will be beneficial for environment pollution control. In this, develop system chances of accident are reduce.

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