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Traffic Volume Study And Congestion Solution Using VisSim Software

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Abstract – *Transportation system is an infrastructural system that transfers people and goods. Traffic congestion is one of major problems faced by the modern society nowadays. It has to be treated properly so as to make efficient plight of people as well as goods from one place to another. This paper deals with the traffic congestion analysis of an Unsignalized junction Mattoor where heavy traffic causes delay daily. Based on videos taken on peak hours, volume of vehicles (vehicle count) were extracted. This data is used to determine the optimum cycle length by Webster's method. The obtained values are used to simulate using VisSim software. The simulated data can be utilized to determine the changes in delay after the installation of traffic signal system.*

Key Words: **Congestion, Signalized Junction, Webster Method, VisSim, Delay, Vehicle Count.**

1. INTRODUCTION

According to the latest Kerala economic review 2021 Ernakulum recorded a 26.84% increase in number of vehicle on the road in last 5 years, but when we compare with the accident data provided from Kerala police dept. ,we came to know that accidents is decreased from 39000 to 33000 from 2016-21. So we came to know that this decrease is due to proper implementation of various congestion solutions like Traffic signals, over bridges, roundabouts etc.

So we conducted survey for determining the congestion on roads by calculating traffic volume at Ernakulum rural area which are blackspot enlisted an Unsignalized intersections this journal focus on one such area which have high congestion and traffic volume and is Unsignalized.

2. STUDY AREA SELECTION

Different locations were taken for the study from the road accident data / blackspot details provided by the Kerala Public Work Department. From that scrutiny was done for the road accidents in Ernakulam district. First order blackspots, second order blackspots and third order blackspots were identified.

2.1 Field Visit

Places like Thankalam, Kurupampaddy , Mattoor. Then a field visit is made and the traffic volume is taken using video graphic method. Peak hour calculations were done on this data and peak hour was determined. The variations in the traffic was identified. It was identified in a generalized manner in such a way that traffic counts were taken for different peak hours in 3 different locations above mentioned. From those chosen data we generalized morning peak and evening peak hours. Morning peak hour (8.45am -9.45am) & Evening peak hour (4.30pm-5.30pm) was determined and the study area is selected as Mattoor Jn.

Figure-1 : Mattoor Junction

3. DATA COLLECTION

For the calculation of traffic volume at our location video camera and manual counting method was used. A smart phone camera was used to record the traffic volume at the specified location during the peak hour traffic. We had done our survey on one such Wednesday 20/04/2022. As specified earlier the videos were taken during the peak hour.

Figure-2a: Smartphone used for videography

Figure-2b: Data collection

4. DATA EXTRACTION

The recorded data is being extracted by four of us and they are classified accordingly. In this the traffic count at Kalady–Mattor junction is identified. Thus the different types of vehicles were identified and their numbers were taken separately for both morning peak as well as evening peak.

5. SIGNAL DESIGN (WEBSTER'S METHOD)

5.1 Calculations

Optimum cycle length (C_o)

C_o = 1.5L+5 /1–Y

Were,

L = Total lost time per cycle second

2n+Rn = Number of phases

R = All red time

Y = y1 + y2 +y3

y1 = q1/s1 , y2 = q2/s2 , y3 = q3/s3

q = Normal flow in each approach during the design hour

s = Saturation time per unit time

As we have 3 phases, total lost time =3*4=12 Sec

Table-1 Peak hour phase calculation

FROM	ANGAMALY		AIRPORT RD.		KALADY	
TO	AIRPORT RD	KALADY	ANG.	KALADY	ANG.	AIRPORT RD.
PCU/hr (q)	120	1223	197	556	1434	528
q	q_1=1343		q_2=153		q_3=1962	
Width ,w (m)	11		11		11	
=525w	5775		5775		5775	
y = q/S	0.232		0.130		0.339	

ANG – Angamaly, S- Saturation Flow, q- Normal Flow

Co = [(1.5*L)+ S] / (1-Y) = [1.5*12 + 5] / (1-0.948) = 77 sec

CALCULATION OF EFFECTIVE GREEN PERIOD

G1= Y1 * (Co – L) / Y = 0.232 * (77-12) / 0.701 = 22 Sec

G2 = Y2 * (Co – L) / Y = 0.130 * (77-12) / 0.701 =12 sec

G3 = Y3 * (Co – L) / Y = 0.339 * (77-12) / 0.701 = 32 sec

6. ANALYSIS AND SIMULATION USING VISSIM

PTV Vissim is the standard traffic simulation software used in over 2,500 cities worldwide. It gives you a realistic and detailed overview about the status quo of the traffic flow & impacts, with the possibilities to define multiple what – if scenarios.

The collected data (vehicle composition, relative flow, vehicle count), optimum cycle length and effective green time of each phases are given as input to the software and simulation followed by analysis is done.

Figure-3: simulation run

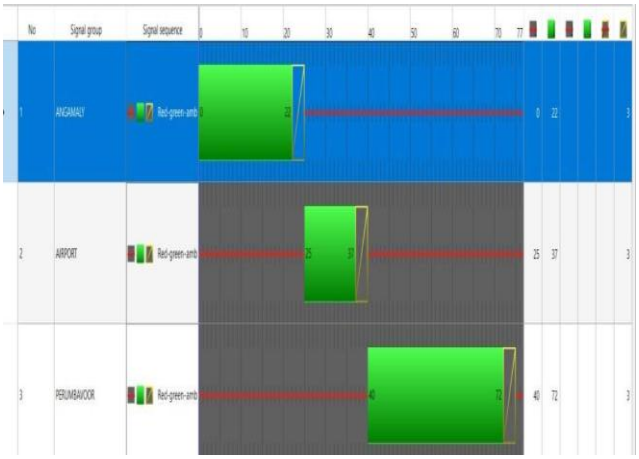

Figure-4: signal time

5.VARIATION IN DELAY BEFORE AND AFTER SIGNAL INSTALLATION

Table-2 Variation in delay

LINK	Average Delay(sec/veh)	
	Before	After
Airport	8.14	1.95
Angamaly	54.52	24.81
Perumbavoor	57.85	35.78

6. CONCLUSIONS

The increasing of traffic volume at our intersection has been arise a problems like road accidents, conflicts and congestions. Hence the aim of our study was to find a suitable solution for these problems. Traffic volume studies are to be made to determine the number, movement and classification of vehicles at the given location. For that first of all, a video graphic survey was conducted. The data needed were extracted, like traffic volume for each movement of vehicle, time at which minor road vehicle reach at entry point, time at which minor road vehicle start to move, time at which minor road vehicle cross the exit line, etc. Then a suitable three phase signal design that may mitigate the congestion was formulated manually. PTV VISSIM software was used to analyze the network. Intersection was created on the software and input regarding various data extracted was given. Thus the actual intersection performance could be viewed by the software. After this, simulation was done to get the results. Then as a solution, traffic signal was inputted. Then as a solution, traffic signal was inputted. Again, simulation was done in order to identify the change in traffic conditions comparing the previous. Considerable change can be identified. By providing signals, there will be reduction in the conflicts. And also, there will be an orderly movement of traffic. But as a permanent solution, a flyover can be suggested.

7. REFERENCES

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