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Designing of Traffic Signal at Sathagalli Junction

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Abstract - Signal timing is the strategy which traffic engineers use to figure out who has the option to proceed at a convergence. Signal timing includes concluding how much green time the traffic signals will give at a convergence approach, how long the person on foot walk sign ought to be, and numerous various other factors. Traffic volume review are directed to decide the number, developments, and characterizations of street vehicles at a given area. This information can assist with recognizing basic stream time spans, decide the impact of huge vehicles or people on foot on vehicular traffic stream, or report traffic volume patterns. The length of the testing time frame relies upon the kind of count being taken and the planned utilization of the information recorded. For instance, a crossing point count might be directed during the pinnacle stream period. Assuming this is the case, manual count with 15-minute spans could be utilized to acquire the traffic volume information. Webster's technique is a level-headed methodology for signal plan. The plan is straightforward and is completely founded on formulae's set somewhere around Webster. In this technique, the complete pattern of the sign is resolved which shapes an all out least postponement happening at signal (least deferral of street client).

***Key Words*:** vehicular flow, signal design, Intersection

1. INTRODUCTION

Intersection is a junction where two or more roads converge, diverge, meet or cross at the same height, as opposed to an interchange which uses bridges or tunnels to separate different roads. Unsignalized intersections are those at grade junctions of two or more public roads where the control of right of way is determined by the presence of a yield or stop sign or no sign at all (uncontrolled). Signalized intersection with fully controlled cross-traffic light phases indicate to drivers when to enter the intersection, thus removing the problem for them of selecting safe gaps in the traffic flow. This reduces crashes between turning vehicles and oncoming through traffic. Level of Service is a quality measure describing operational conditions within a traffic stream, generally in terms of of such service measures as speed and travel time, freedom to maneuver traffic interruptions and comfort and convenience.

2. OBJECTIVES

We can conclude that the problems facing in our selected area are:

- Traffic congestion due to heavy vehicular flow.
- Vehicle to vehicle accident due to traffic congestion.
- Actual speed of vehicle with respect to speed design by HCM.

3. METHODOLOGY

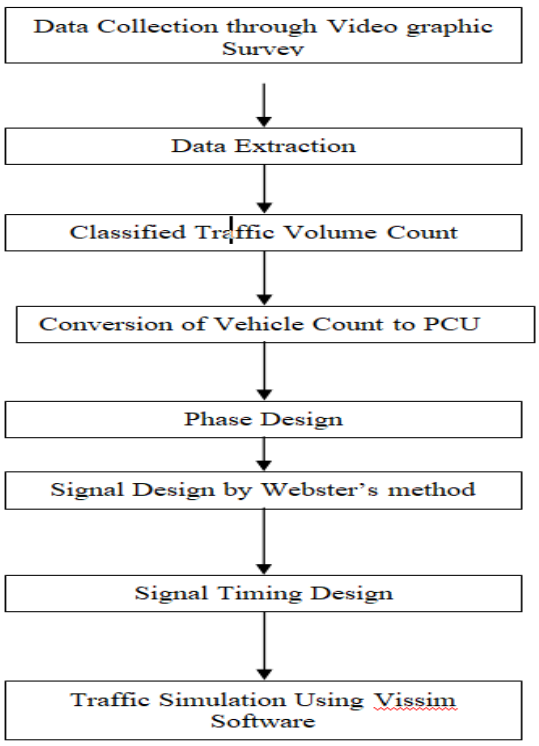


Fig.1: Showing the working methodology to design the traffic signal.

Site Selection: We have selected Sathagalli intersection as study area to assign the traffic signal design.

Data collection through video graphic survey: We collected the data by fixing a camera on the top of a building and recorded the movement of vehicles at Sathagalli intersection. We did video graphic survey during peak hours and non peak hours on weekdays and weekdays.

Data extraction: The number of vehicles moving from VTU regional to Columbia Asia, Columbia Asia to VTU regional, Mahadevapura to Udaygiri to Mahadevapura is noted from the video graphic survey during peak hours and non peak hours on weekdays and weekends.

Direction	straight							right							left							
	HMV			LMV		HCV	LCV	HMV			LMV			HCV	LCV	HMV			LMV		HCV	LCV
MINUTES	TRUCK	BUS	CAR	3 WHEELER	2 WHEELER	CYCLE		TRUCK	BUS	CAR	3 WHEELER	2 WHEELER	CYCLE			TRUCK	BUS	CAR	3 WHEELER	2 WHEELER	CYCLE		
5	6	18	1	1	42		5	4	1	1	2		9			1		2		1	4			
10	6	19	2	2	48		6	3			1	1	10			1		1	1	1	4			1
15	5	21			71		9	3		1	1	1	9						1		5			
20	4	20	3	3	75		7	4	1				11			1			2		3			1
25	6	25	2	2	68		9	5			2		13			1		1	1	1	2			1
30	5	23	2	2	64		6	2	2			1	8			1		1			4			
35	5	22			52		6	2	1		3	2	7					2	2	1	4			
40	6	22			60		5	1				2	11					2	2		2			1
45	5	20	1	1	58		2	3		1	1		15			1		1	1	2	2			1
50	6	17	3	3	55		3	4	1		2	1	13						1		3			
55	4	18			63		6	3			1	1	10			1		1		1	5			1
60		20	2	2	69		8	4			3		12			2			2		3			
Total	58	245	16	16	725		73	38	6	3	16	9	128			0	9	0	11	13	7	41	0	0	6

Classified traffic volume count: The data is extracted based on the type of vehicle moving at the interval of 5 minutes for the duration of 1 hour.

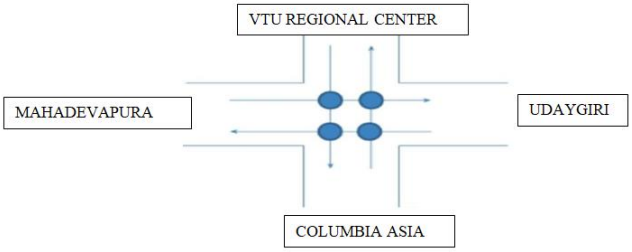
Conversion of vehicle count to PCU: The data extracted is then converted to PCU based on the Indian Standard specification.

DIRECTION	straight							right							left							
	HMV			LMV		HCV	LCV	HMV			LMV			HCV	LCV	HMV			LMV		HCV	LCV
	TRUCK	BUS	CAR	3 WHEELER	2 WHEELER	CYCLE		TRUCK	BUS	CAR	3 WHEELER	2 WHEELER	CYCLE			TRUCK	BUS	CAR	3 WHEELER	2 WHEELER	CYCLE		
COLOMBIA ASIA TO VTU	152	39	199	199	199	0	84	74.5	9	0	16	0	25.5	0	0	14.5	3	18	22	13	27	0	9	15
VTU TO COLUMBIA ASIA	39	26	174	12	155	0	69	67	0	22	26	10	25.5	0	0	14.5	0	0	7	0	17	0	6	6
UDAYAGIRI TO MAHADEVAPURA	0	3	26	72	264.5	0	0	27	9	27	19	13	26.5	0	6	12	0	0	3	2	2	0	0	4.5
MAHADEVAPURA TO UDAYAGIRI	15	26	41	98	264.5	0	0	21	12	6	16	3	26	0	6	14.5	9	9	9	6	22	0	0	9

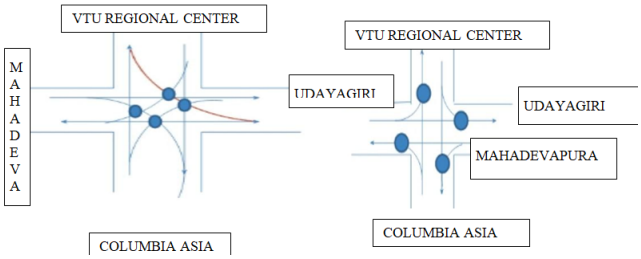
Conversion of vehicle count to PCU

Phase Design: The objects of phase design are to separate the conflicting movements in an intersection into various phases are,

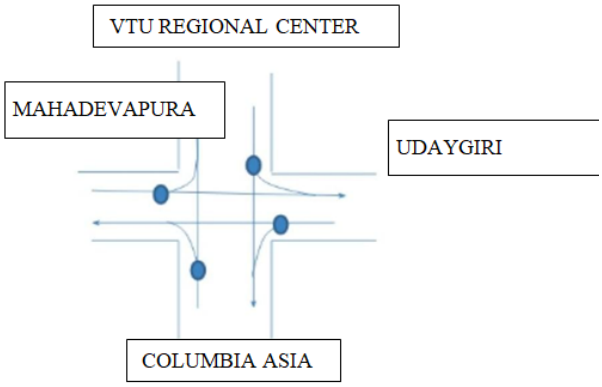
Cross Conflict: Cross conflict occurs when two vehicle paths collide with each other i.e., perpendicular to each other.



Merge Conflict: Merge conflict occurs when a vehicle from another lane or another route converges into a lane of another vehicle.



Diverge conflict: Diverge conflict occurs when a vehicle moves away from its lane to join another lane or to take another route.



Conflict Points at Intersection

RESULT AND ANALYSIS

Equation in Webster's Method

- $Y = y_a + y_b = \frac{q_a}{s_a} + \frac{q_b}{s_b}$
- $L = 2n + R$
- $C_O = \frac{1.5L + 5}{1 - Y}$
- $G_a = \frac{y_a}{y}(C_O - L)$

Where,

q = normal flow of traffic
s= saturation flow of traffic
L= total loss of time
Co = optimum cycle time
n = number of lanes
R = Red time
Ga = green road at time

Amber time for phases = $T_{min.} = t_r + V\ 2*d + W+L\ V$

Where,

t_r = perception reaction time = 1s.
V = design speed = 30kmph = 8.33m/s.
d = comfortable deceleration rate = 2m/s².
W = width of intersection = 10.5m.
L = length of vehicle = 4.5m.

$$= 1 + \frac{8.33}{2*2} + \frac{10.5+4.5}{8.33}$$

= 5 sec

SIGNAL TIME FOR FOUR PHASES:

- VTU regional center to Columbia Asia

R_A = 21.71sec
G_A = 18.9 sec
A_A = 5sec

- Columbia Asia to VTU regional center

R_B = 23.9 sec
G_B = 16.71 sec
A_B = 5 sec

- Udaygiri to Mahadevapura

R_A = 29.59sec
G_A = 25.3 sec
A_A = 5sec

- Mahadevapura to Udaygiri

R_B = 30.3sec
G_B = 24.59 sec
A_B = 5 sec

4. CONCLUSIONS

In the selected study area the accident rates are more due to traffic congestion. To improve vehicular flow the traffic signal time is designed in this study. From the study, designing a four-phase traffic signal at Sathagalli intersection it reduces the conflict point,. The road's traffic characteristics can be changed. Accident rates can be reduced by taking the steps outlined above. The Webster's method is used for designing of traffic signal and summarized in the form of signal diagram.

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