To Determine Influence of Slow Moving Vehicle Composition on Traffic Density: A Case Study of Ahmedabad City

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Abstract

Ahmedabad an urban center is characterised with heterogeneous traffic flowing through its streets. It includes vehicles like three wheelers, bus/truck, non motorised which has comparatively lesser accelerating ability, causing impedance to the flow of other motorised vehicles with high acceleration like two wheeler, car etc. hence a study is conducted on selected three stretches to study the influence of such slow moving vehicles on change in density along the study stretch. Study reveals the change in density along the study stretch.

Keywords: SMVC: Slow Moving Vehicle Composition, Density

I. INTRODUCTION

The traffic stream in developed countries mainly consists of cars and heavy vehicles (buses and trucks). On the other hand, in developing countries like India, road traffic in general and urban roads traffic in particular, is highly heterogeneous comprising vehicles of widely varying static and dynamic characteristics and the vehicles share the same road space without any segregation.

A. Need of Study:

It has been observed that there is wide variation in travel speed and density with different vehicular composition along the stretch indicating the concentration of vehicles near bottlenecks like intersection or slow moving vehicle and dispersion of vehicles at mid block or due to availability of fast moving vehicles along the stretch . Hence it is needed to study the effect of SMV composition on change in density along the stretch.

B. Objective:

To quantify the change in density for different slow moving vehicle composition along the stretch.

C. Scope of Work:

In order to perform this study, traffic volume count survey, spot speed study, with an aim to quantify the change in density along stretch length with different SMV composition are done.

D. Survey Methodology:

Five video cameras are mounted on the roadside, which covered the length about 20m to 30m chalk line. Cameras were mounted on the tripod on side of the road for capturing the moving vehicle in one direction with proper time synchronization.

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E. Methodology Chart:

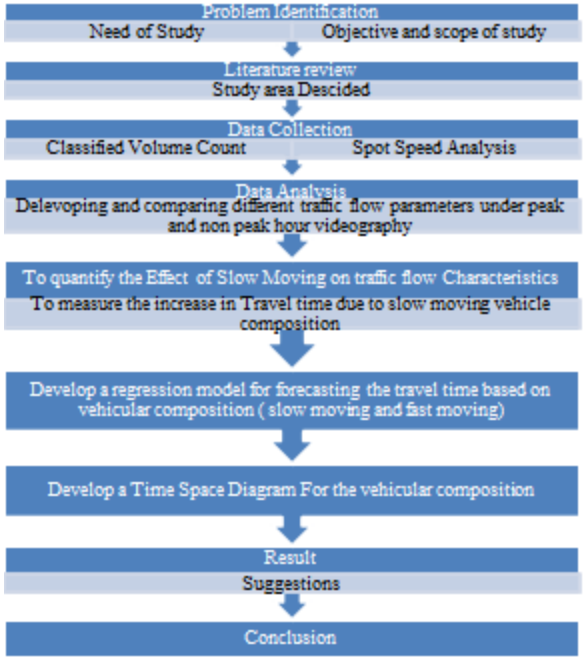

Fig. 1: Methodology Chart

Data collected from the videography their frequency in number of vehicle, their average velocity, percentage composition of different six categories of vehicles as Motorised Two-Wheelers (M2W), which includes Motorcycles, Scooters and Mopeds, Motorised Three-Wheelers (M3W.), which includes Auto-Rickshaws and three wheeled goods vehicles, Motorised four wheelers (M4W), Buses, Trucks, Tempo (B/T), Bicycles and Tricycles, and Hand Cart in non motorised vehicles (NMV).

Data collection for the following stretches during Nonpeak and Peak hour are done;

1) For the stretch Kalupur to Sarangpur having length 550m.
2) For the stretch Sarangpur to Raipur gate having length 450m.
3) For the stretch Relief cinema to J C PrakashHigh school having length 750m.

II. DATA ANALYSIS

Considering the accelerating characteristics of vehicles, M2W and M4W are taken as Fast moving vehicle and rest four category is taken as SMV. Data collected through videography with composition of slow moving vehicle in the range 0-25%, 25-50%, 50-75%, 75-100% are segregated out to develop relation between travel time and stretch length for different range of (composition of) slow moving vehicles.

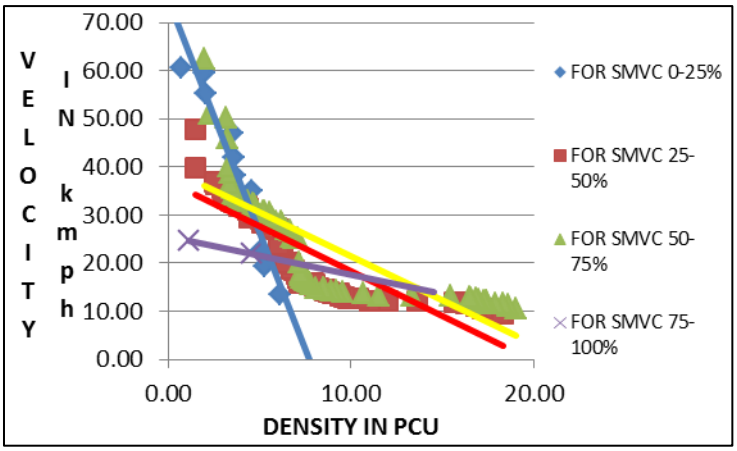

Fig. 1: Speed Density Relation for CAMERA 1

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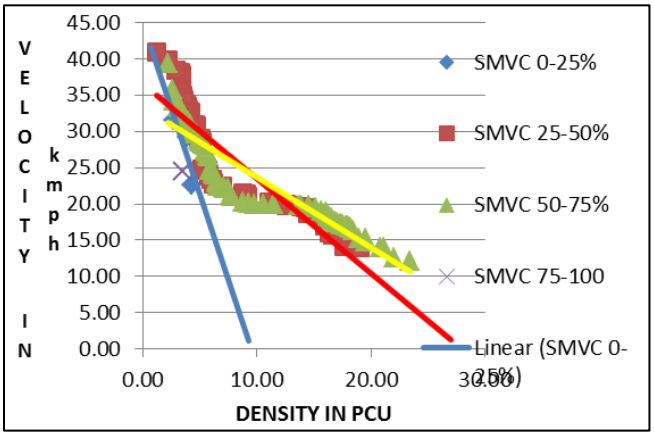

Fig. 2: Speed Density Relation for CAMERA 2

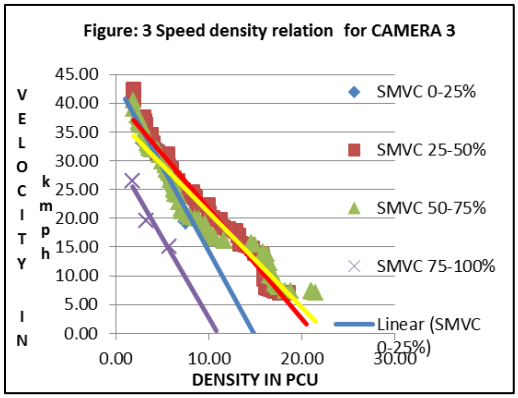

Fig. 3: Speed Density Relation for CAMERA 3

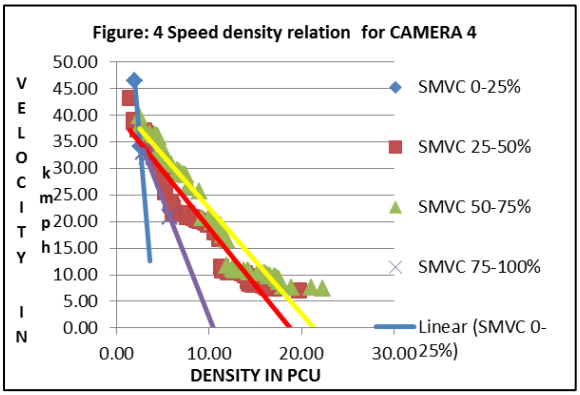

Fig. 4: Speed Density Relation for CAMERA 4

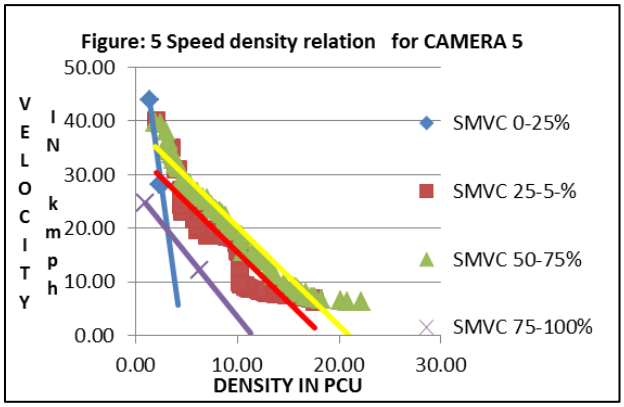

Fig. 5: Speed Density Relation for CAMERA 5

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Table – 1
Observation for Camera 1

SMVC	*CAMERA 1*					
	Velocity			*Density at Velocity*		
	Min	*Avg*	*Max*	*Min*	*Avg*	*Max*
0-25%	*13.55*	*39.29*	*60.50*	*6.13*	*3.66*	*0.75*
25-50%	*9.52*	*23.30*	*47.90*	*18.32*	*7.35*	*1.50*
50-75%	*10.51*	*24.10*	*62.48*	*18.98*	*8.56*	*2.00*
75-100%	*22.02*	*23.36*	*24.71*	*4.55*	*2.84*	*1.13*

Table – 2
Observation for Camera 2

SMVC	*CAMERA 2*					
	Velocity			*Density at Velocity*		
	Min	*Avg*	*Max*	*Min*	*Avg*	*Max*
0-25%	*22.67*	*27.76*	*31.52*	*2.72*	*3.64*	*4.28*
25-50%	*13.93*	*25.62*	*40.92*	*18.97*	*8.32*	*1.19*
50-75%	*12.10*	*23.24*	*39.35*	*23.38*	*10.41*	*2.17*
75-100%			*24.54*	*3.50*		

Table – 3
Observation for Camera 3

SMVC	*CAMERA 3*					
	Velocity			*Density at Velocity*		
	Min	*Avg*	*Max*	*Min*	*Avg*	*Max*
0-25%	*19.43*	*31.18*	*43.16*	*2.57*	*4.71*	*7.52*
25-50%	*7.09*	*21.61*	*42.33*	*18.47*	*10.01*	*1.92*
50-75%	*7.07*	*22.47*	*40.52*	*21.43*	*9.11*	*1.94*
75-100%	*15.02*	*20.34*	*26.45*	*5.75*	*3.60*	*1.75*

Table - 4
Observation for Camera 4

SMVC	*CAMERA 4*					
	Velocity			*Density at Velocity*		
	Min	*Avg*	*Max*	*Min*	*Avg*	*Max*
0-25%	*34.14*	*40.28*	*46.41*	*2.57*	*2.29*	*2.00*
25-50%	*7.00*	*21.13*	*43.25*	*19.72*	*8.85*	*1.42*
50-75%	*7.41*	*22.54*	*39.72*	*22.35*	*10.01*	*2.50*
75-100%	*20.87*	*28.69*	*32.99*	*5.75*	*3.99*	*2.90*

Table – 5
Observation for Camera 5

SMVC	*CAMERA 5*					
	Velocity			*Density at Velocity*		
	Min	*Avg*	*Max*	*Min*	*Avg*	*Max*
0-25%	*28.20*	*33.44*	*43.93*	*2.65*	*2.16*	*1.44*
25-50%	*6.36*	*15.33*	*40.05*	*17.55*	*10.09*	*2.00*
50-75%	*6.32*	*21.37*	*39.71*	*22.21*	*9.46*	*1.94*
75-100%	*12.19*	*18.45*	*24.71*	*1.00*	*3.65*	*6.31*

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III. CONCLUSION

1) Density goes on increasing with increase in SMV Composition due to change in velocity along the stretch.
2) Variation in density is observed along the stretch which indicates the process of the convergence and subsequent dispersion of Traffic due to bottleneck situations created by SMV Composition indicative of overtaking and lane changing manoeuvres along the stretch.

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