A Literature Review On Traffic Characteristics Of Non-Motorized Vehicles In Mixed Traffic

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ABSTRACT: *In present day scenario, in countries like India we can find mixed traffic conditions, i.e. traffic flow constituting of all sorts of vehicles like cycles, rickshaws, auto and so on. During the peak hours, the flow of NMVs is high. The presence of NMV in the traffic stream affects the traffic characteristics like speed, density and flow of the stream. In order to design a traffic facility, the traffic behavior has to be understood. For the mixed traffic conditions, it is difficult to understand the behavior of the stream. In this thesis, an endeavor is kept to study the traffic characteristics of NMVs in mixed stream. The entire project work is consists of two parts. The former is the experimental part and the latter is the statistical testing part. The former part of study includes the study of the fundamental diagrams, finding the capacity of the section and the lateral occupancy of the section for the data obtained from the various parts of the Rourkela City. It was seen that with the change in the NMV percentage an adversity is found in the parameters like speed, density and flow. In the study of lateral occupancy, it is observed that in one way divided traffic flow, the maximum number of NMVs are occupying the left two strips and the MVs are occupying the right most strips as our Indian traffic behavior is left handed and it is easy for the MVs to overtake the slow moving vehicles. In the case of undivided two way traffic, the maximum number of traffic is found in the middle portions but a minimum on the right and left strips in the light of fact that the vehicles are present in the opposite directions.*

1. INTRODUCTION

In the present day scenario almost all the road traffic consists of mixed traffic, i.e. the combination of both Non-Motorized and Motorized traffic. The mixed traffic affects the characteristics of the traffic stream to a great extent. Non-Motorized Vehicles are the vehicles which will run with the power of human beings or animals. The non-motorized vehicles include bicycles, rickshaws, and hand drawn vehicles, pull carts and so forth. Motorized vehicles are those vehicles which run with the power of the engines. The motorized vehicles are divided into light motorized vehicles and heavy motorized vehicles. Light motorized vehicles consist of auto rickshaws, jeeps, taxis, motorcars, three-wheeler conveyance vans and so forth. Motorcycles do not come under this category. Heavy motorized vehicles consists of vehicles with number of wheels more than six.

This Heavy Motorized Vehicles consists of Buses, Lorries, and Trucks etc. As per the World Bank survey about 50 percent of the non-motorized vehicles are present in the south Asian nations like India, Bangladesh. In Bangladesh, the maximum number of trips generated during peak hours is due to non-motorized vehicles like bicycles, rickshaws. The presence of non-motorized vehicles affects the capacity of the section. With the increase in the Non-Motorized vehicle capacity, the total capacity of the section will be reduced, affects the safety of the total stream and the declining of energy resources (petrol, diesel etc.). In order to minimize the consequences of Non-Motorized vehicles there should be a separate track for Non-Motorized.

2. LITERATURE REVIEW

Rahman et al (2005) conducted research on "The Effect of Rickshaws and Auto Rickshaws at Signalized Intersections" in Dhaka city. He collected data from four signalized intersections where there is minimum proportion of turning vehicles, no parking, and high traffic volume. Later he developed a model for finding passenger car equivalents of rickshaws and auto rickshaws at signalized intersections do not affect the PCE of rickshaws and auto rickshaws, the vicinity of rickshaws and particles. He concluded the outcome as the green light time, the width of

the signalized intersection and auto rickshaws in the mixed traffic lane affects the traffic stream a lot. The number of rickshaws is more the effect is less and vice versa.

Rahman et al (2003) conducted a study on the "Effect of Non-Motorized Vehicles on Urban Road Traffic Characteristics." The target of this paper is to present analytical procedure of traffic flow and to create models of passing, surpassing and lane utilization for heterogeneous traffic flow. All the data were collected at the mid-block sections located in Dhaka. The vehicle movements were recorded using a portable video camera and the data was decoded using a time code reader software. The data were recorded in five minute interval. The results are shown in the speed-density, speed-flow, and flow-density diagrams. With the increase of non-motorized vehicles the speed, density and flow reduces significantly at a certain rate.

Rahman of Bangladesh and Fumihiko of japan (2004) conducted a study on "Passing Overtaking Characteristics and Level of Service of Heterogeneous Traffic Flow. This study was conducted in the city of Dhaka, Bangladesh. In this study he developed a passing-overtaking model on heterogeneous traffic flow in urban cities with undivided lanes having more proportion of rickshaws. He attempted to provide level of service (LOS) for this type of roads. He categorized level of service into six categories (A, B, C, D, E and F). Based on the traffic characteristics of the road, he classified into four groups,

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LOS 1 indicates a free flow condition, LOS 2 shows that it is a partial flow condition where as LOS 3 and LOS 4 represents constraint flow and congested flow conditions respectively. The traffic characteristics considered in this study are average speed of the passenger car and the number of passing and surpassing vehicles in the stream along the section. The results showed that the presence of the rickshaws has an adverse effect on the passing-overtaking characteristics.

T. Oketch (2003) developed a model on the "Performance Characteristics of Heterogeneous Traffic Streams Containing Non-Motorized Vehicles." In this paper he classified the vehicles into two sorts in particular, standard vehicles and non-standard vehicles. He built up the model to investigate the impact of various non-conventional vehicles in stream performance including lane capacity and saturation flow. The presence of heavy and non-standard vehicles affect the traffic stream performance because of speed capabilities, poor acceleration, etc., this paper says that for heterogeneous traffic streams has the reduced link capacities and saturation flows for traffic stream containing relationships of the stream and the saturation flows in the traffic stream containing non-motorized vehicles. It was found that the presence of these vehicles results in traffic density and scattered volume. He concluded that the heterogeneous streams have different flows that may not conform fully to the basic theories. In addition, heterogeneous flows are generally associated with higher number of lateral movements as the faster vehicles try to overtake the slower ones.

Hemant Kumar Sharma, Mansha Swami, Bajrang Lal Swami conducted research on

"Speed Flow Analysis" for interrupted oversaturated traffic flow with heterogeneous structures for urban roads and developed a model for heterogeneous traffic under constraints of vehicle characteristics, road geometry, traffic control and driving behavior. The developed model will give the speed, delay, maximum and average queue estimate for the urban traffic and quantify congestion for oversaturated condition. The flows in this paper are classified into the interrupted and uninterrupted flows. Location for data collection is selected so that it consists of two signalized intersections and one un-signalized intersection in between. They developed curves by drawing graphs between travel capacities, travel time, speed versus flow rate so that speed drop due to traffic delay, free flow time and traffic delay are obtained respectively. The capacity can be determined from delay flow curve as the point where oversaturated flow starts. The obtained speed vs. flow rate curve is compared with the BPR, Akcelik speed-flow curves and it resembles the same shape.

However, curve obtained in this paper predicts more realistically the performance of an urban network with heterogeneous traffic and interrupted flow.

3. OBJECTIVE:

The objective of the work is to find traffic characteristics of Non-Motorized vehicles in mixed stream and its effect on traffic stream.

The entire work is divided into two categories.

  a. Experimental part

  b. Statistical Analysis part

4. EXPERIMENTAL PART:

The experimental part consists of the following objectives

To study the fundamental diagrams of traffic flow obtained from various locations

To find the capacity of the sections from fundamental diagrams

To find the lateral occupancy of the section

To study the behavior of Non-Motorized vehicles in the stream.

2.2.2 STATISTICAL ANALYSIS PART:

To compare the traffic parameters of the past data with reference to the present data To find the variation of capacity with respect to percentage change in Non-Motorized vehicles.

RESULTS OF THE EXPERIMENTAL PART:

The results of the experiments conducted were discussed below. The result for each section is presented below with the graphs where ever required.

Fundamental diagrams:

Note: for the following graphs, speed is represented in m/Sec, flow in PCU/Sec and density in PCU/meter.
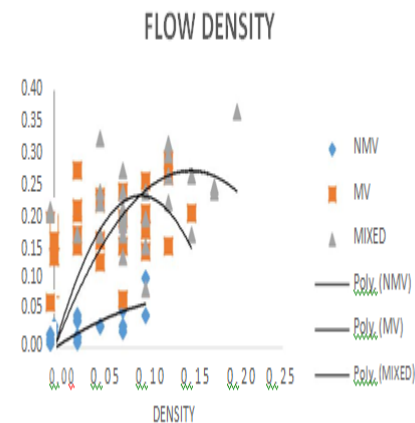

Fig.1 Flow density curve for upstream flow near Ambagan

From here onwards, Non-Motorized Vehicles are indicated by NMV and Motorized vehicles are indicated by MV.

In the above graph, the maximum flow of NMV is 0.05 PCU/Sec and the density of NMV in this section is 0.1 PCU/meter. In the case of MV, the maximum flow is 0.23 PCU/Sec and the density of MV is 0.09 PCU/meter. It indicates that in this section the flow of MV is more as compared to that of NMV while the density is decreased for MV. For the total traffic the maximum flow is 0.28 PCU/Sec and the corresponding density is 0.15 PCU/meter.

5. CONCLUSION:

From the basic diagrams, it is ascertained that the traffic parameters within the section area unit affected for the most part by the share of non-motorized vehicles within the section. For each the divided and undivided lanes the pattern remains same, i.e., because the share non-motorized vehicles increasing the parameters like density, flow and speed of the full section faded. In divided lanes the result is a smaller amount as compared to the undivided lanes as there exist the result of vehicles returning within the wrong way. It is ascertained from the lateral occupancy graph that the NMVs area unit occupying the mitt facet of the road. As we tend to follow mitt facet drive in Republic of India and therefore the MVs try and overtake them from the proper hand facet of the road. additionally within the left initial strip or one m from the left edge no vehicles area unit gift because the vehicles try and prevent from road

edges as way as attainable and it's the psychological behavior of drivers, they struggle to avoid moving at the sting once there aren't any shoulders or raised kerbs. Roads during which there are a unit shoulders the vehicles area unit found within the initial strip from left facet additionally.

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