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A Study Carried Out for Observing Traffic Behaviour on Undisciplined Intersections/Junctions in Mixed Traffic Conditions

Prem Singh Meena[1] and Ajit Singh[2]

[1]M. Tech. Scholar, Department of Civil Engineering,
CBS Group of Institutions, Jhajjar, Haryana (India)
[2]Assistant Professor, Department of Civil Engineering,
CBS Group of Institutions, Jhajjar, Haryana (India)

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Abstract

At present, traffic at most of the Major at grade intersection / junctions are controlled by traffic police with the help of signalled traffic lights. In the last few years, Gurgaon has witnessed sudden boom of population. With the growth of MNC and IT companies in large numbers, the city has experienced an unprecedented growth in population as well as traffic. The study has making focussed on traffic plying through HUDA City Centre. According to world resource Institute estimate, around 1.5 lac people use the Metro from HUDA City Centre Metro station each day, of which 30% users reach the station by car, 30% by Auto Rickshaws, and 30% by Buses. Apart from this, nearly two lakh vehicles cross the intersection every day to reach IFFCO Chowk, Signature Tower, Subhash Chowk, Sohna Road, Faridabad Road etc. Not just the vehicles but even the pedestrians hamper traffic movement. Due to Lack of space for horizontal growth of roads, it is essential to find ways and means to reduce frequent jams at this intersection. For the safety of pedestrians, proper footpath, Zebra crossing, Foot over bridge are required to be developed. Traffic needs to be diverted to alternate routes ahead and after the intersections. Some of the roads should be exclusively reserved for one way traffic between 8 A.M. to 9 P.M. For this purpose, it is necessary to conduct traffic survey to know the present volume of traffic category of vehicles and turning movements. A well designed roundabout achieves a balance of safety and efficiency. Traffic rotaries reduce the complexity of crossing traffic by forcing them into weaving operations. The shape and size of the rotary are determined by the traffic volume and share of turning movements. Capacity assessment of a rotary is done by analyzing the section having the greatest proportion of weaving traffic. In the past years various models have been developed for analyzing the traffic flow on this intersection. These methods are classified in two groups. The first group consists of methods which are purely empirical and based on geometry of intersection. The second group consists of methods which are based on Gap acceptance process.

Keywords: *Traffic Behaviour, Undisciplined Intersections, Harder's Method.*

Introduction

The rapid development in India has brought an increase to the cost of living of the citizen. It influenced the travel pattern of the community from their origin to any destination. The development also affects the transportation system as shown by the annual increase in the No. of vehicles on Roads.

Everybody travels whether it is to be work, play shop or do business. All raw materials must be conveyed from the land to the place of manufacturing or usage, and all goods must be moved from factory to the market place and from the staff to the customer. Transport is the means by which those activities occur; it is the cement that binds the together the communities and their activities. Meeting these needs has been, and continues to be, the transport task. How people live and work has changed as a consequence of improvements in life style and in transport capabilities. What can be said with certainty about the future is that these interactive changes will continue, and that it will be the task of the transport planner and traffic engineer to cope with them.

In India carry different types of vehicles like high speed automobiles, low speed cycles, cycle rickshaws and animal drawn carts. This will lead to complex interaction between the vehicles and study of such traffic behaviour needs special attention. This

will result in increased interactions between vehicles; then they tend to move in clusters rather than one after the other. Traffic consists on Indian roads of bi-directional freedom traffic such as two or three wheeled vehicles and uni-directional vehicles such as four wheelers while the above tends to overtake or turning or crossing or turn right even if a small gap is available. Hence, to determine the intersection capacity traffic engineer requires a clear understanding of gaps being accepted or rejected by various modes of traffic. Besides, in these mixed traffic conditions, users do not usually follow lane discipline and can occupy any lateral position on the road. To prevent traffic accidents, conflicting traffic streams are separated either in space or in time.

Results and Discussions

The value of accepted gap is not constant. It differs from driver to driver and vehicle to vehicle at every particular situation. The critical gap as per various definitions will change with the values of accepted and rejected gap. Hence determining the critical gap itself is a point of concern. Various methodologies and concept have been put up in recent past by various researchers worldwide for determining the critical gap. However, the condition in which they have been derived and used so far is different from the Indian traffic condition since we have heterogeneous traffic condition. Few of those methods have been used for the study area and the results are observed as under.

Harder's Method

This is a simple method based on the values of Gap. The drivers are assumed to be consistent so as to simplify the method. A consistent driver is assumed to behave or react in the same way in different situations. For determining the critical gap using this method, all Gaps were measured using the frames generated by the videos recorded for the study area. The acceptance and rejection of the gaps has been noted and the time scale is divided into segments of 1 second. The number of observed and accepted Gaps at every interval of 1 second is observed. The ratio of observed and accepted gap for the particular segment is estimated as a_i. If the assumption is made that the proportion of drivers who accept a gap of size t seconds is identical to the probability that a driver has critical gap value smaller than t [22], then,

Pa, Gap= $F_c(t)$
And if t_i is the time at the centre of interval i, then
$F_c(t_i) = a_i$
This is an approximation of the cumulative distribution function of critical gaps. The mean critical gap is then given as
$tc=\sum^{W} ti.[Fc(ti)-Fc(ti-1)$

Where, W is the number of intervals of 1 second.

The data for the accepted and rejected Gaps for the study area was utilised to determine the value of critical gap by dividing the segments at an interval of 1 second. The number of observed and rejected Gaps and the calculation of critical gap is shown as under.

Table 1: Calculation for Harder's Method for Critical Gap

Time (Sec)	Accepted Gaps	Rejected Gaps	Observed Gaps	a_i	Fc(ti)-Fc(ti-1)
0-1	23	61	84	3.65	---
1-2	103	35	138	1.33	2.32
2-3	86	5	91	1.06	0.27
3-4	55	0	55	1	0.06
4-5	13	0	13	1	0

Conclusion

The traffic situation in India has few exclusive features when compared with the traffic in developed countries. Out of various points, one significant basis is the share of categories of vehicles. Indian traffic has almost 60 to 80 percent of vehicles in traffic flow is two-wheeler. From the classified volume count also it can be observed that the proportion of two wheeler in total traffic using the intersection, ranges from 65% to 70%. Since the traffic condition in India is heterogeneous, a well-defined methodology for data extraction was required. The study presents various methodologies for extracting the data for Gap (Accepted and Rejected), Lag time and Follow up time. These methodologies take into account the condition of typical Indian traffic and decision making by the driver. However for the analysis of data, the driver is assumed to be regular and homogenous. The traffic is found not observing the Lane discipline and the proportion of forced gap is found to be higher than the accepted gap.

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