

Study of Heterogeneous Traffic and Modelling using VISSIM at Pakwan Crossing

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Abstract- The traffic of an urban area increases rapidly due to the growth in population and vehicle ownership. With the advancement in transportation and urbanisation, traffic congestion has become the main socio-economic problem in urban as well as rural areas in developing countries. Careful and balanced management is required for this increased traffic problems. The urban road of India generally carries the heterogeneous traffic which is the combination of various types of vehicles like cars, buses, motor cycles, trucks, auto rickshaws, carts, etc. These all vehicles have different size, speed, load carrying capacities or passenger capacities, etc. which affect the traffic flow. The variation in carriageway width is common especially in developing countries. Due to change in carriageway width, the traffic stream speed also encounters more congestion level along the length of link. In case of homogeneous traffic the characteristics of traffic does not change abruptly, as the traffic mainly consisting of same type of vehicles. While in case of heterogeneous traffic, there is a combination of different type of vehicles which have a remarkable variation in the traffic stream characteristics. Traffic congestion is managed conventionally by signalisation, widening the roads, interchanges and intersections. Intersections provided sometimes prove the best but growth of population leading to continuous increase in traffic brings with it a deadlock condition. Intersections are the junction (at same level) of two or more roads either meeting or crossing.

This study deals with cross intersection provided at Pakwan cross road, connecting Sarkhej-Gandhinagar Highway and Bodakdev-Sindhubhavan Road. The study works for three main parameters: Capacity of Intersection, Heterogeneous traffic flow simulation using VISSIM and suitable measures to be taken for reducing traffic congestion and reconfigure the intersection. The main objective is to survey the study area and to prepare a model of the same. By comparison of the actual data obtained by survey and the data obtained from model, find out the actual

reason for the traffic congestion and to give necessary suggestions for solving the problem.

Index Terms- Urban roads, Traffic Composition, Heterogeneous traffic, VISSIM Simulation

I. INTRODUCTION

Transportation Infrastructure play a lead role in economic growth and development of the country. The traffic of an urban roads increases rapidly due to the growth in prosperity and vehicle ownership of urban population. The problems occurred due to this increased traffic have also become more and more complex. Intersections are categorized based on the grade and division of movements (at-grade, grade-separated and interchanges). Grade separated intersections may be as simple as bridges and tunnels that separate through traffic streams or as complex as interchanges that incorporate separate dedicated roadways for turning traffic. At-grade intersections are the junction (at same level) of two or more roads either meeting or crossing viz: 3-way (T, Y) intersection, 4-way (Rotary, Regular, Skewed) intersection, 5-way (Roundabouts, Uncommon) intersection, 6-way (having various streets joining more than 5 or 6) intersection.

Rotary intersections or roundabouts are special form of at-grade intersections laid out for the movement of traffic in one direction around a central traffic island. The vehicles entering the rotary are gently forced to move in a clockwise direction in orderly fashion and weave out of the rotary to the desired direction.

II. NEED OF STUDY

With the advent in the growth of population causing the boom in the traffic problems has led to the study.

Research and development is needed to document the existence situation over the heavy loaded roads and highway networks so as to substantially reduce the fatal and injury crashes. So it is required to reassess the design and traffic flow so as to have a much safer way of travel.

- i. Deadlock conditions due to heavy trucks and trailers, light vehicles with local traffic from nearby areas at the Pakwan Crossing.
- ii. Improper planning of signals.
- iii. Obstruction to the straight moving vehicles of right turning vehicles from opposite direction.
- iv. Lack of space for increasing of the width of road network.

III. OBJECTIVES

The study involves the assessment of the crossing through traffic volume count and codal provisions. Later to perform the comparative evaluation of the existing situation and adopting the mitigation measures to improve the situation through simulation analysis in VISSIM. So, the study has brief objectives as follow:

- i. Study of traffic composition and various road widths.
- ii. Evaluating the capacity of intersection.
- iii. Simulating the traffic flow using VISSIM software to develop model.
- iv. To propose the suitable alternatives and recommendations.

IV. SCOPE OF STUDY

Scope of the study includes the following:

- i. Data Collection of the existing facility.
- ii. Evaluating the capacity of the intersection.
- iii. Simulating the traffic flow using VISSIM software.
- iv. To propose the suitable alternatives and recommendations.

V. STUDY AREA

This study deals with cross intersection provided at Pakwan cross road, connecting National Highway-8C (Sarkhej-Gandhinagar Highway) and Bodakdev-Sindhuhavan Road. The study works for three main parameters: Capacity of Intersection, Heterogeneous traffic flow simulation using VISSIM and suitable

measures to be taken for reducing traffic congestion and reconfigure the intersection.

The following study aims at evaluating and reconfiguring the heterogeneous traffic at the intersection at Pakwan Crossing using the manual data collection and later alternatives and recommendations based on the VISSIM Simulation. The main objective is to survey the study area and to prepare a model of the same. By comparison of the actual data obtained by survey and the data obtained from model, find out the actual reason for the traffic congestion and to give necessary suggestions for solving the problem.

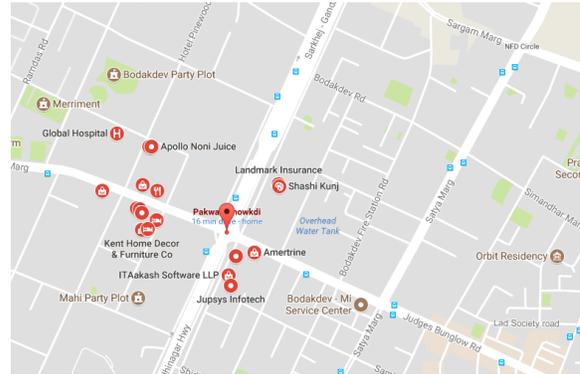


Fig. Map of Pakwan Crossing

VI. DATA COLLECTION

In the present study, the video graphic method and manual methods were adopted for collection of traffic data and measuring the flow. At the junction, the video camera was placed on the top of the adjacent building (Pakwan Restaurant building). A continuous video graphic survey was carried out for 3 hours in the morning and in the evening. After collecting the data the analysis has been done by replaying the video.

Sr. No.	Name of Stretch	No. of Lanes	Width of Each Lanes	Total Width (1-D)
1	Pakwan to Sarkhej	6	3.5	11
2	Pakwan to Gandhinagar	6	3.5	11
3	Pakwan to Sindhuhavan	6	3	11
4	Pakwan to Judges Bungalow	4	3	7.5

The above table gives the details of different stretches including name of the stretch, no. of lanes, width of each lane and total width of road. All the signals provided are fixed time signals, having green

interval of 60 seconds on both directions on S.G.Highway, 30 seconds on Sindhubhavan to Judges Bunglow Road and 40 seconds on Judges Bunglow to Sindhubhavan Road.

VII. DATA ANALYSIS

From the analysis of the data collected by videography, we found the results as mentioned in the table above. From the table, it can be seen that the average no. of vehicles passing every 5 min. intervals is around 650 vehicles. Similarly, approximately 7500 vehicles are passing per hour from the junction. Total 24473 vehicles passed from the junction between 8:00 a.m. to 11:00 a.m.

VIII. DATA ANALYSIS BY VISSIM

VISSIM analysis is an important part of this study. It involves numbers of tasks to be performed accurately before achieving the final simulation results. Data collection and its analysis are prior requirements before the VISSIM analysis. While developing a VISSIM model for existing traffic scenario of selected road stretches, it involves network coding, data input, model verification, calibration and validation. Validation is followed by simulation test run and according to the simulation results, conclusions are drawn.



IX. CONCLUSION

By comparing the data collected and the model generated in VISSIM, we can suggest that by providing the simultaneous traffic movement on parallel sides, and by updating the signal timing, we can improve the capacity of crossing. More vehicles can be passed in the same time.

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