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Implement A Monte Carlo Simulation For Traffic Load Effect Based On Weigh In Motion Recordings

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ABSTRACT: In developing country like India, transportation play a vital role in its development since there is a need to analyse traffic volume and develop alternative to minimize its intensity. In this project, traffic flow in Nagercoil city is analysed and suggestion of fly over throughout the respective town and connecting that with the proposed four lane network. Thus, this project will be helpful in making decisions for the improvement of road transport in achieving its standard equal to a metropolitan city. Monte Carlo simulation is a technique used to simulate the random sampling to obtain numerical results considering the future flaws using MATLAB software. When the traffic size increases to infinity this method helps in improving the distribution of traffic so that the statistical interaction between the vehicles vanishes.

This project enables the use of various prediction techniques including the fluctuations and helps in making decision to the improvement of highways considering various constraints in its applicability. This also ensures the use of proposed four lane network with the new alternative for its effectiveness. Use of sensors or video cameras minimizes the human errors in data collection by manual method. This act as an advancement of similar research done in Bangladesh and also as an evidence for the need for construction of Flyover Bridge in considering the welfare of future generation. It also helps in reducing the delay of many construction projects due to late delivery of resources. Through the effectiveness of this project future delay of about four times more than the current delay can be reduced to some extent.

I. INTRODUCTION

1.1 GENERAL

As Nagercoil is the town that connects a state capital (Thiruvananthapuram) with the fifth major city of TamilNadu(Tirunelveli) during peak hours, the existing NH 47 becomes inadequate to fulfil the present traffic volume needs. Thus, this project serves as an alternative to reduce the congestion in and around the town and is attractive option for government organisation, local residents and may be enough to prevent traffic accidents both temporary and permanently. When these infrastructure project demand large scale changes to our existing highway there may be a benefit of thinking outside the box to improve the standard line and bring convenience to the world moving again. The traffic volume model based on Monte Carlo method has been used on traffic analysis for an urban road network. This method improves the stability of flow ratio adopted as the important parameter of these model. Considering the data available about the local area road network and its flow characters a new model for traffic assignment has been developed based on result obtained from this method. The results obtained by this method helps in determining the possibility and applicability of this advanced project. The highway construction development involves huge investment and requires careful analysis on changes in political, social and environmental conditions. Proposed method also select the optimal design alternative in a timely manner in addition to expansion acquisition and rehabilitation during the

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operation phase of the extended network of road. This paper addresses the sustainable development of highway facility with the increase of demand and to benefit the users throughout its service life of the highway.

1.2 SCOPE OF THE PROJECT

- The study is related to National Highway Department since it involves NH 47, NH 44, and NH7.
- This study helps in identifying the possibilities to remove future traffic volume.
- It removes the delay in construction project due to late delivery of resources.

II. REVIEW OF LITERATURE

In accordance with the topic there are limited studies and the related literatures were studied to gain information useful for the development of this topic. Some of those relevant literatures are as follows;

2.1 Traffic volume study Bangladesh.

This work emphasis on traffic volume and the analysis was carried out through primary traffic flow surveys at AUST-Flyover junction to Shatrasta Junction in Dhaka city. The current work studies traffic characteristics in the city of Dhaka at one selected priority junction. Traffic flow is studied by manual methods. Also the present status of traffic flow at the junction, traffic survey is conducted. The results from the present study are helpful in controlling the traffic at the intersection and also in suggesting some of the remedial measures such as changing 4-lane to 6-lane or by providing more public transport can be recommended based on the outcomes of the work.

2.2 Estimating Annual Average Daily Traffic Using Daily Adjustment Factor

This study dealt with estimating AADT which serves the important basic data in transportation sector. AADT estimation is fundamental to the analysis of transportation data sets and the management of transportation systems. This model uses monthly or weekly adjustment factors to estimate AADT. So this study used daily factor to estimate AADT and compared with advanced research. Daily factor is produced 365 factors on one permanent traffic count. It predicts the future service level of the road based on the planned traffic volume and determines the geometry of new roads.

2.3 Real Traffic data based Evaluation of Vehicular Traffic Environment and State-of-the-art with Future Issues in Location Centric Data Dissemination for VANETs

This study has been carried out with three main objectives: (i) to analyze the impact of dynamic traffic environment on the design of data dissemination techniques. (ii) To characterize location centric data dissemination in terms of functional and qualitative behavior of protocols, properties, and strengths and weaknesses, and (iii) to find some future research directions in information dissemination based on location..

2.4 Traffic Data Collection and Analysis

This paper facilitate the assessment of present and future traffic demands, for the development of need-based infrastructure accurate information and continuous monitoring of traffic by appropriate method. planning, design, construction and maintenance of roads in Botswana that take full account of local conditions.

2.5 Traffic Forecasting Model for a Road Section

In this paper traffic forecasting model for a road section based on a computer model of the transportation system of a traffic gravity section has been analyzed. This approach allows the structure of the road network.

III. DATA COLLECTION

Based on the sequence of steps the project is carried out;

- i. Selection of junction to collect traffic data to be used
- ii. Conduct reconnaissance survey or feasibility study followed by real time data collection is done using the sensors or video cameras

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- iii. From the obtained data, distribution of future data prediction is done considering the flaws and fluctuations by implementing Monte Carlo simulation
- iv. Analyzing the current system of network for the calculated future traffic volume and the delays.
- v. According to the results obtained suitable solution for the prototype is formulated.
- vi. Suggestions were given for the improvement of existing national highways based on the result
- vii. Conclude the result and discuss its advantages and applicability in real time practices considering the delay.

Table 3.1 Volume of traffic in Nagercoil in 1 hour

PLACES	FROM THE TOWN			TOWARDS THE TOWN		
	TWO WHEEL- ELE R	FOUR WHEEL- ELE R	HEAVY	TWO WHEEL- ELER	FOUR WHEEL- ELER	HEAVY
KOTTAR	1759	193	163	631	499	286
CHETTIK ULAM	421	133	55	565	121	68
MATHIYA S WARD	901	493	108	991	4923	108
VADASER Y	361	319	188	505	259	36
OZHUGIN ASERY	241	145	149	379	186	79

S.No.	Junction	CVPD	PCU
1	Veppamoodu	33730	77764
2	Mathiyasward	17720	28911
3	Chettikulam	43270	26725
4	Kottar	21270	22671
5	Vadasery	15550	18079

Table3.2 Volume of vehicles per week

3.1 Delay Time Calculation

Delay in travel time defined as time difference between actual time travelled and the free time during travel. It is the additional time travelled by a driver or a passenger during their travel.

$$Dz = L [(1/Vz) - (1/Vf)]$$

where

Dz = Delay

L = Length of traffic congested area

Vz = Speed in the traffic congested area

Vf = Freeway speed

Site 1: L = 0.7, Vz = 1, Vf = 40, Therefore, Dz = 40.95

Site 2: L = 0.6, Vz = 1, Vf = 35, Therefore, Dz = 34.971

Site 3: L = 0.5, Vz = 1, Vf = 45, Therefore, Dz = 29.33

Site 4: L = 0.3, Vz = 1, Vf = 30, Therefore, Dz = 17.4

Site 5: L = 0.4, Vz = 1, Vf = 35, Therefore, Dz = 23.314

$$\text{Average delay time} = (40.95 + 34.971 + 29.33 + 17.4 + 23.314)/5 = 29.53 \text{ minutes}$$

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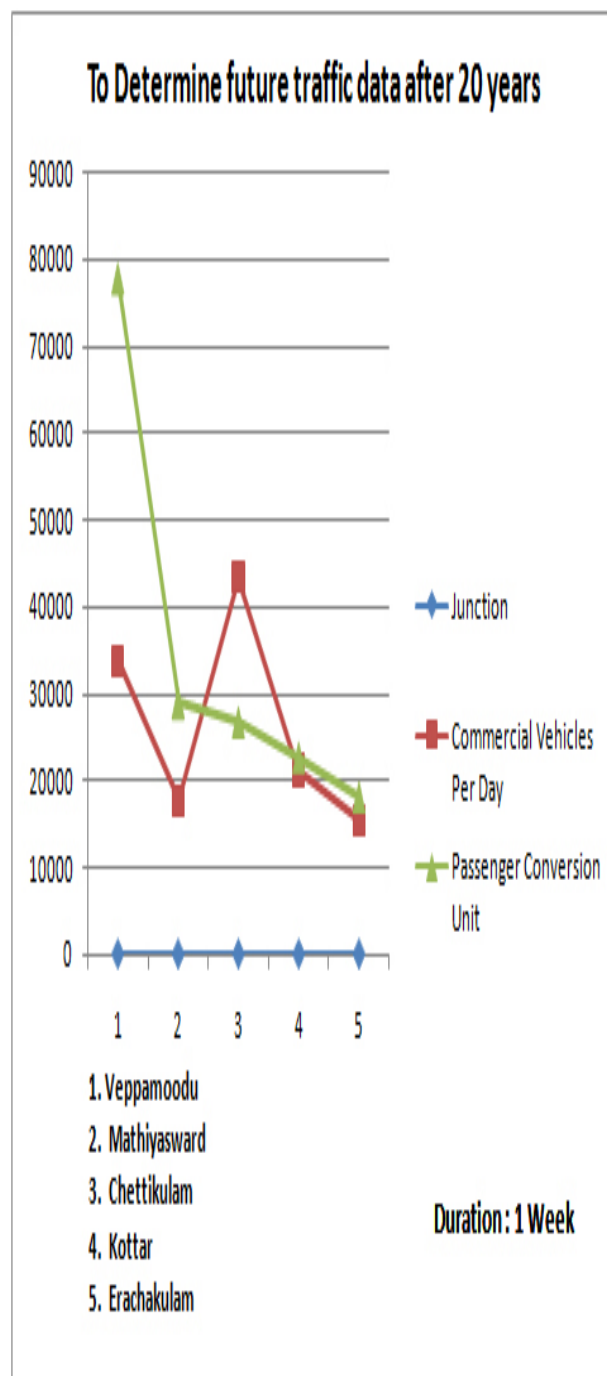
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IV. FUTURE DATA PREDICTION

After 5 and 20 years the traffic growth is predicted and is represented as graph using MATLAB as follows;

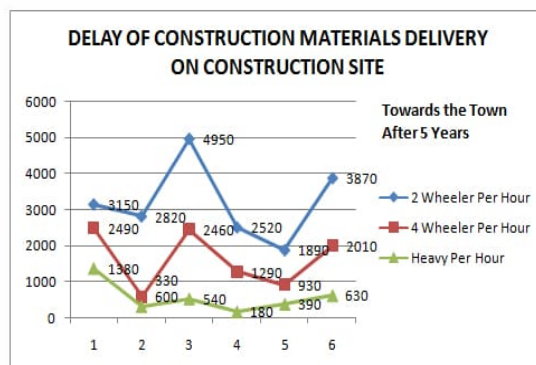
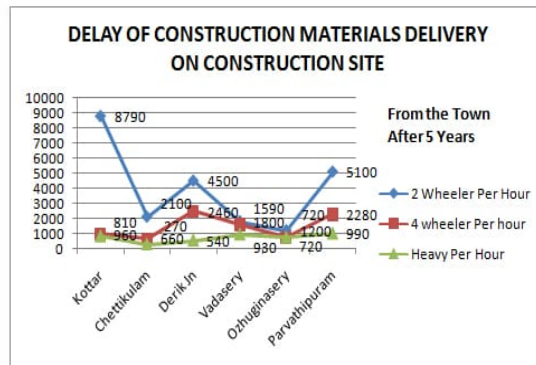


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Average of present traffic volume = 13770

Average number of future traffic volume = 68850

Delay time in material delivery with respect to present traffic volume = 29.53 min

Therefore delay time in material delivery with respect to future traffic volume = $(29.53/13770) \times 68850$

=145.900 minutes

V. ALTERNATIVE SUGGESTION

Since the future traffic volume and the delay related to it is vast which results in innumerable problems in the development of city also the successful of construction project it is necessary an urge to develop an alternative in this period itself. Thus the suggested alternative which suits best to the demand as follows;

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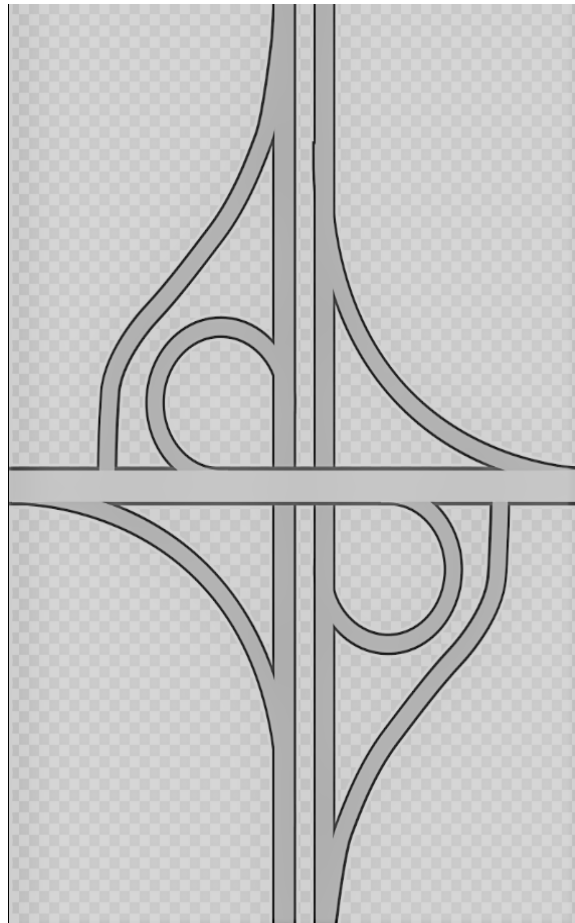


Fig 5.1 Design of Fly over as solution

5.1 Advantages of alternative

- This reduces the delay time upto five times the predicted delay.
- It also improves the traffic flow and congestion in the upcoming years after its implementation.

VI. CONCLUSION

In this project proper collection of data includes the peak hour and normal hour is distributed for the future. The collection of data includes two wheelers, LCV, Public transports, and Heavy load vehicles. It is collected for continuous weekday and weekends. This calculated data helps in identifying and suggesting a proper alternative to the highway construction. Based on this suitable alternative is also suggested for its application. A new construction increases the efficiency of the road traffic and reduces delay upto 5 times the existence. To determine if a community is employing appropriate transportation options, monetary costs, comfort, safety, and Environmental impacts should be assessed as future study, an extension of the project.

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