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Implement a Monte Carlo Simulation for Traffic Load Effect Based on Weigh in Motion Recordings: A Review

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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 town 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. 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. In this project, probability distribution function, in particular, psi square distribution function is used to determine future traffic for short period in research area. Due to urbanization, the life standard of people increase which mainly contributes the use of motor vehicles. Thus the traffic in town increases along with these the proposal of smart city also contributes a greater percentage increase of traffic in the upcoming years. 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.

1. 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 fulfill 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 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 MONTE CARLO SIMULATION

Monte Carlo technique was developed and used by scientist who were working on atom bomb research in World War II. Monte Carlo simulation is a method which provide possible outcomes of decisions and allowing as to make better decision under uncertainty. It is a software based mathematical technique which allows people for taking decision based on quantitative analysis. This technique is used widely by professionals in various field such as engineering, research and development, project management, transportation and environment. It furnishes the decision maker with wide range of possible outcomes that will occur for their course of action. Monte Carlo simulation provides numerous advantages over certain similar estimation techniques. The results from this techniques shows how likely each outcome is rather than not only show the results what could happen and is important for communicating the findings to other related responsibilities. In Monte Carlo simulation it is possible to create relationships between input variables for its accuracy to represent different scenarios in reality.

Traffic engineering uses engineering methods and techniques to achieve the safe and time efficient movement of people and goods on roadways. The safe and time efficient movement of the people and goods is dependent on Traffic flow, which is directly connected to the traffic characteristics. The three main parameters of a traffic flow are volume, speed and density. In the absence of effective planning and traffic management of the city, the current road infrastructure cannot cater the future needs of the city. Pedestrian and vehicle volumes have increased significantly in the last decade due to the change of the economics of the middle-class families. The annual average daily traffic (AADT) is utilized as an important basic data in transportation and road sector. It predicts the future service level of the road based on the planned traffic volume and determines the geometry of new roads. The planned traffic volume serves as the basis of road planning, when AADT is used. In this regard, accurate calculation of AADT is required to construct the roads economically and facilitate traffic flow, while maintaining an appropriate level of traffic service. The permanent traffic count (hereafter referred to as PTC) can be used to collect traffic volume 365 days a year, which makes it possible to identify time-series properties, including monthly and seasonal characteristics with respect to traffic variations. However, permanent traffic counters have been installed only in some points, and most of traffic surveys have been carried out using portable devices. The short-term traffic count (hereafter referred to as STC) collects traffic data using portable devices, and it surveys 1 to 5 times a year. Therefore, since it is impossible to calculate accurate AADT, AADT estimation is utilized in this case. There are many ways to estimate AADT of the STC points in which traffic survey is conducted 1 to 5 times a year. Among them, the most widely-known method is to estimate AADT by applying adjustment factors of PTC points with similar traffic patterns to 24 hour volume.

1.3 HISTORY OF DEVELOPMENT

In the past, routine collection of traffic data in this country was not considered important for the development and management of the road network. In the early 1970's it was realised that a wide variety of information is required in respect of traffic characteristics for proper maintenance, planning, design, maintenance and management of the national road network. This realisation emanated from concerns raised with regard to the amount of traffic

(volume), the composition of the different types of vehicles, their speed, total gross weight, number of axles, axle loads and origin and destination of the journeys. Most of this information result in assessment of progressive or rapid deterioration of the road network towards estimating additional cost required to sustain it. As a result, attempts are now being made to adopt suitable road traffic methodologies for conducting road traffic surveys, which are both technically and scientifically sound, and operationally convenient to execute under the country's prevailing conditions. This includes the use of both manual and automatic traffic counters, together with computer analysis of the collected traffic data. During the planning, design, construction and maintenance period of the road network, traffic data becomes an essential element in decision-making, and therefore the format and the accuracy of data collection and analysis is critical. It is with this view that this guideline on traffic data collection and analysis has been prepared. For a growing number of developing cities, the capacities of streets cannot meet the growing demand of cars, causing traffic congestion. Some cities have complex street structures that also cause traffic congestion. Congestion causes global concerns, such as increased commuting times and fuel usage as well as environmental deterioration. Urban congestion can be categorized into phenomena at the local and global scales. Local congestion, such as single interactions, only decreases the velocity of individual vehicles, whereas global congestion often decreases the velocity of the overall street network and requires additional traffic control. Therefore, understanding the process of traffic flow and detecting traffic congestion are important issues associated with developing urban policies to resolve congestion.

Traffic congestion is a complex spatial-temporal process. It is often triggered by recurring factors, such as inadequate capacity or recurrent weather, and unexpected factors, such as accidents, lane closures, and special events Understanding the factors that cause congestion has become an important issue in traffic management. The causes of traffic congestion can be measured by physical and psychological factors. Physical causes measure the traffic volume, speed, and street density. Psychological congestion is more difficult to measure. Some people are accepting of slight congestion, whereas others are not thus, fuzzy logic has been used for the evaluation of congestion. Some studies have focused on developing methods to detect congestion, whether it is psychological or physical. In early studies, researchers developed point-based detectors that examined the traffic volume over a unit distance. In recent studies, development of vehicle-to-vehicle systems has increased.

A vehicle-to-vehicle system is a dynamic, non-location-based set of detectors. A vehicle-to-vehicle system utilizes nodes on the sides of the street and vehicles and uses short-range communication equipment to inform closed nodes of the current state of movement. The vehicle is a moving node, and the street-side nodes are fixed and connected to a management centre. By analysing the dynamic characteristics of traffic movement, unexpected congestion can be detected, and the management centre can make better decisions for traffic control. Smart city services are becoming more wide spread than the veracities are growing and becoming increasingly crowded as a result of urbanization and world population growth. The term "smart city" in refers to the use of information and communication technologies to sense, analyse and integrate key information from core systems in operating cities. At the same

time, smart city services can make intelligent responses to different kinds of needs in terms of daily livelihood, environmental protection, and public safety, as well as the city's facilities and industrial and commercial activities.

1.4 NEED FOR STUDY

For Nagercoil which has its population increased by 25% in the past two decades and around 1500 new vehicles getting added on the city roads each passing month, the road infrastructure remains disappointing. Since the town has not any major proposals for building flyovers to decongest the arterial roads, particularly the Chettikulam intersection. A Road over bridge connecting Vadaseri, Parvathipuram, Asaripallam, Kottar and Chettikulam is the need of the hour. As Chettikulam has a dozen major commercial stores including schools, hospitals, showrooms, hotels and retail outlets, the flyover connecting the road with Nagercoil bus stand could is the traffic at intersection of Nagercoil bus stand, Vadasery, Parvathipuram and Kottar. However no such proposals was suggested by the Nagercoil municipality. Nagercoil desperately needs new flyovers to be connected with existing four lane roads where there is a demand.

1.5 OBJECTIVES

- To analyse the current traffic volume by using sensors or video recorders.
- To predict the future traffic growth using probability distribution function and Monte Carlo Simulation.
- To analyse the alternatives and its possibilities for the reduction of congestion in road traffic which improves accessibility.
- To suggest the better solution based on its application feasibility along with the proposed highway construction.
- To improve the life standard of people in the study area which in turn leads to enhancement of town with standards equal to a metropolitan city.
- To provide more equipped way in implementation of the smart city and also helps in achieving a great success.

1.6 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 improves the accessibility of town.
- It enhances the life standard of people and helps in successful implementation and operation of smart city.

2. LITERATURE REVIEW

2.1 INTRODUCTION

Many methods have been used to collect traffic data and to predict future fluctuations according to the need numerous literatures were collected and from the studied literature reviews, various methods and type of data to be collected have been studied and also it is found that traffic volume study is essential for suggestion of new

infrastructure construction in highway to reduce congestion during peak hours of traffic and also to improve the standards of transportation traffic towards city Centre. Also a new construction increases the efficiency of the road and improves industrialization of the town which in turn improves the life standard of people.

2.2 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;

1. Traffic volume study, Md. Ridwan Bin Alam, Sanchari Halder, et al., (2015) 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. For better understanding of 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 widening the road, changing 4-lane to 6-lane or by providing more public transport can be recommended based on the outcomes of the work. The problem of measuring volume of such heterogeneous traffic has been addressed by converting the different types of vehicles into equivalent passenger cars and expressing the volume in terms of Passenger Car Unit (PCU) per hour. The interaction between moving vehicles under such heterogeneous traffic condition is highly complex. Again volume is not constant. It increases with time. So a continuous method of calculating volume is a matter of great importance for smooth functioning of transportation system. If volume data is not found on a continuous basis then the transportation system may fail and the economy of the country may face a great difficulty.

2. Estimating Annual Average Daily Traffic Using Daily Adjustment Factor Jung-Ah Ha, Ju-Sam Oh e al., (2014) Korea.

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. Additionally, grouping with monthly factor, weekly factor and hourly volume pattern was proposed, but these methods don't reflect characteristics of daily pattern. 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. Accuracy of AADT was enhanced using daily factor because it reflects daily characteristics as compared to monthly or weekly factors. It is most important to assign a site to its similar site, because similar assignment carries the greatest potential for significant estimation error. Assigning a short term traffic count to permanent traffic counts to apply adjustment factor will be investigated as a future study. The annual average daily traffic (AADT) is utilized as an important basic data in transportation and road sector. It predicts the future service level of the road based on the planned traffic volume and determines the geometry of new roads. The planned traffic volume serves as the basis of road planning, when AADT is used. In

this regard, accurate calculation of AADT is required to construct the roads economically and facilitate traffic flow, while maintaining an appropriate level of traffic service.To calculate accurate AADT, it is desirable to install permanent traffic counters in all traffic count points. However, due to the limitations such as budget constraints, permanent traffic counters have been installed only in some points, and portable devices have been used in the rest of the point. The permanent traffic count (hereafter referred to as PTC) can be used to collect traffic volume 365 days a year, which makes it possible to identify time-series properties, including monthly and seasonal characteristics with respect to traffic variations. However, permanent traffic counters have been installed only in some points. The short-term traffic count (hereafter referred to as STC) collects traffic data using portable devices, and it surveys 1 to 5 times a year. Therefore, since it is impossible to calculate accurate AADT, AADT estimation is utilized in this case.

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, Abdul Hafidz Abdul Hanan, and Mohd. Yazid Idris et al., (2017) Malaysia.

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. Design issues are identified in incorporating physical parameters and weather conditions into data dissemination. Functional and qualitative characteristics of location centric techniques are explored considering urban and highway environment. Comparative analysis of location centric techniques is carried out for both urban and highway environment individually based on some unique and common characteristics of the environments. Finally, some future research directions are identified in the area based on the detailed investigation of traffic environment and location centric data dissemination techniques. A number of experiments were performed by IETF to integrate GPS into the Internet Protocols. Based on these experiments, a family of protocols and addressing methods has been suggested to integrate GPS in communication protocols in its Internet Draft. The Internet Draft also provides future visualization of various location based services such as emergency message multicasting in specific geographical region, server-client based services inside a geographic range, and service advertisement in restricted range, location based continuous information service for mobile users and traffic management. Adhoc networks, wireless Local Area Network (LAN) and cellular telephony coevolved into a new research area known as VANETs. The Solutions for most of the traffic related problems can be provided by using VANETs as a potential platform for various Intelligent Transport Systems (ITS) applications. Due to its potentiality in solving traffic problems, researchers from industries and academia are considering VANETs as a prominent theme towards transportation research. Traffic safety is one of the major goals of VANETs. Possibilities of comfort application are also being explored. Green computing is also an important goal of VANETs. Distinguishing features of VANETs from other kinds of adhoc networks are hybrid architecture of vehicular network, high mobility of vehicles, freedom from limitation of battery life and processor's computational power and platform for various infotainment applications

4. Traffic Data Collection and Analysis, ministry of works and transport roads department private bag 0026, (2004) Botswana.

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 methods is necessary. Provision of improved roads to areas of administrative and district centers with regard to the resulting economic or social development of the area of population. This task is facilitated by the publication of a series of Technical Guidelines dealing with standards, general procedures and best practice on a variety of aspects of the planning, design, construction and maintenance of roads in Botswana that take full account of local conditions. The concept of forecasting the future use of the road network in terms of traffic loading and flow, is generally an accepted approach world-wide. The techniques used have become almost standard in both developing and developed countries. The accuracy of traffic data collection and the subsequent predictions are of paramount importance in the fulfilment of an appropriate planning, design, maintenance monitoring and management of the road network. As a result, attempts are now being made to adopt suitable road traffic methodologies for conducting road traffic surveys, which are both technically and scientifically sound, and operationally convenient to execute under the country's prevailing conditions. This includes the use of both manual and automatic traffic counters, together with computer analysis of the collected traffic data. During the planning, design, construction and maintenance period of the road network, traffic data becomes an essential element in decision-making, and therefore the format and the accuracy of data collection and analysis is critical. It is with this view that this guideline on traffic data collection and analysis has been prepared.

5. Traffic Forecasting Model for a Road Section Anzhelika Dombalyan, Viktor Kocherga, et al., (2016) Russia.

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. Traffic forecasting is an integral part of the process of designing of road facilities, starting from investment feasibility study to developing of working documentation. This approach allows taking into account not only the structure of the road network and distances of different routes, but delays associated with traffic intensity. Determination of transportation and distribution of cars in sections are performed under a set of interrelated factors. Complete and valid consideration of these factors for complex road networks is possible only by means of mathematical models and corresponding software applications. Accuracy and consistency of the forecast determines validity of almost all the main characteristics of the designed object starting from direction of the route and location of connection points to the existing elements of the road network, ending with specific planning solutions for road facilities. Traffic forecasting is an essential element of efficient development of road networks of cities, districts and regions at the national level [Naumova and Zyryanov (2015)]. Development and implementation of a computer model of a transportation system of traffic gravity areas is the basis of traffic forecasting. Simulation of traffic distribution is based on internationally accepted principles of "user equilibrium model". This principle implies that the time spent on a trip depends on traffic at different sections of the road network, and the driver chooses trip routes considering the time to be spent. Such approach allows taking into

account not only the structure of the road network and distances of different routes, but delays associated with traffic intensity [Federal Road Agency (Rosavtodor) of the Ministry of Transport of the Russian Federation (2003)]. This scheme of work with model complexes, implementing forecasting of transport and passenger flows, is the most common and widely accepted in the world practice. AIMSUN application is used for simulation of traffic; it can interact with different types of road networks. This tool is designed and intended for analysis of traffic during design of new concepts and assessment of existing ones. AIMSUN is an advanced integrated microscopic simulator of urban and non-urban road networks. The program is based on a microscopic approach of simulation. This means that behavior of each vehicle in the network is continuously simulated during the entire simulation period. Simulation is based on several behavioral models (Jibbs model (a model of the leader following), a model of lane change, a two-lane model of the leader following, a model of overtaking, models of lane entering and exiting). The model of the leader following, used in AIMSUN application, is based on the Jibbs model. It can be considered as a special development of this empirical model where parameters are not global, but determined by the influence of local parameters, depending on the type of the driver, geometric parameters of the section, maximum speed possible at the section, speed on the plane curve, influence of vehicles in the adjacent lanes and others. It basically consists of two constituent components – acceleration and braking.

6. The effect of traffic growth on characteristic bridge load effect Cathal Leahya, Eugene OBriena, et al., (2016) Ireland.

This paper describes a method for considering this growth when assessing traffic loading on bridges and examines the effect of this growth on characteristic load effects. This is usually done by modelling the traffic loading on the bridge using site-specific weigh-in-motion data and calculating the factors in accordance with the results. In this paper, weigh-in-motion data from a site in the Netherlands is used to demonstrate the proposed approach. 40-year simulations of traffic loading are performed on various bridges. The simulations consider year-on-year growth in both the volume and weight of trucks. The results are then compared with the load effects generated by Load Model 1 in order to calculate the associated α-factors. It is found that an increase in truck weights has the most significant influence on the α-factors but that increased flow also has a significant effect. This paper describes work which was performed for Deliverable (Leahy et al., 2015) of the Re-Gen research project (www.re-gen.net) to examine the effect of traffic growth on Eurocode alpha factors. The traffic modelling approach proposed by OBrien et al. (2014) is used to predict the characteristic load effects on two-lane same-direction bridges while allowing for traffic growth. WIM data from a road in the Netherlands is used as the basis for the simulations. The results highlight the need to consider traffic growth when assessing site-specific traffic loading on an existing bridge. It also identifies the need for road owners to consider traffic growth when developing traffic load models for bridge design/assessment. The results show that growth significantly affects the α-factors for all bridge lengths and influence lines examined. Growth in weight has a much more significant effect than growth in flow, with a 1% annual growth in flow causing an average increase in α-factors of 6% over a 40-year service life. In comparison, a 1% annual growth in truck weight results in an increase in α-factors of 43%.

7. Dynamic Route Planning with Real-Time Traffic Predictions, Thomas Liebig1, Nico Piatkowski, et al., (2016) Germany.

This analysis provides a system for individual trip planning that incorporates future traffic hazards in routing. This paper presents a system for individual trip planning that incorporates future traffic hazards in routing. The incentive for the creation of smart cities is the improvement of living quality and performance of the city. This is often accompanied with various mobile phone apps or web services to bring new services to the people of Future traffic conditions are computed by a Spatio-Temporal Random Field based on a stream of sensor readings. This traffic model combines latest advances in traffic flow estimation. On the one hand, prediction of future sensor values is performed with a spatiotemporal random field, which is trained in advance. Based on these estimates, the traffic flow for unobserved locations is performed by a Gaussian Process Regression. The conditioning of spatial regression on intermediate predictions of a discrete probabilistic graphical model allows to incorporate historical data, streamed online data and a rich dependency structure at the same time. The result demonstrate the system with a real-world use-case from Dublin city, Ireland.

8. Understanding the topological characteristics and flow complexity of urban traffic congestion Tzai-Hung Wena, Wei-Chien-Benny, et al., (2016) Taiwan.

For a growing number of developing cities, the capacities of streets cannot meet the rapidly growing demand of cars, causing traffic congestion. The objective of this study is to propose a flow based ranking algorithm for investigating traffic demands in terms of the attractiveness of street segments and flow complexity of the street network based on turning probability. This results show that, by analysing the topological characteristics of streets and volume data for a small fraction of street segments in Taipei City, the most congested segments of the city were identified successfully. The identified congested segments also captured congestion-prone areas concentrated in the business districts and industrial areas of the city. Identifying the topological characteristics and flow complexity of traffic congestion provides network topological insights for sustainable urban planning, and these characteristics can be used to further understand congestion propagation.

9. Estimation of Annual Average Daily Truck Traffic Volume Riccardo Rossia, Massimiliano Gastaldia, et al., (2012) USA.

This paper presents an approach to estimating the Annual Average Daily Traffic (AADT) of trucks along a road section from short period traffic count (SPTC), improving the interpretability of results with the measures of non-specificity and discord. The approach was applied with data obtained in the Province of Venice, Italy, considering the characteristics of SPTCs such as duration and day of the week. The proposed method was found to produce accurate results, particularly for 72-hour SPTCs taken on weekdays. The measures of uncertainty also help to interpret the quality of estimates, and indicate the need for further data collection. The present paper extends the analysis of the predictive capability of the approach, presenting the results obtained from its implementation based on traffic patterns of trucks.

10. Monte Carlo Simulation of extreme traffic loading on short and medium span bridges, Bernard Enright and Eugene J. O'Brien, (2012) Ireland.

This paper presents a comprehensive model for Monte Carlo simulation of bridge loading for free-flowing traffic, and shows how the model matches results from measurements on five European highways. The results are highly sensitive to the assumptions made, not just with regard to vehicle weights but also to axle configurations and gaps between vehicles. This paper presents a comprehensive model for Monte Carlo simulation of bridge loading for free-flowing traffic, and shows how the model matches results from measurements on five European highways. The model has been optimized to allow the simulation of many years of traffic and this greatly reduces the variance in calculating estimates for lifetime loading from the model. The approach described here does not remove the uncertainty inherent in estimating lifetime maximum loading from data collected over relatively short time periods.

11. Survey on Traffic Prediction in Smart Cities, Attila M. Nagya, Vilmos Simona, (2018) Hungary.

The rapid development in machine learning and in the emergence of new data sources makes it possible to examine and predict traffic conditions in smart cities more accurately than ever. This can help to optimize the design and management of transport services in a future automated city. In this paper, a detailed presentation of the traffic prediction methods for such intelligent cities, also giving an overview of the existing data sources and prediction models. Among fixed position sensors, the sensors able to scan more lanes at the same time (e.g., video image processors or laser radar sensors) could be more cost effective than other fixed position solutions. With moving sensors, we can identify exact paths, speeds, and moving patterns of vehicles and pedestrians, which can reveal direct connections between adjacent road segments. Moving sensors have minimal infrastructure cost compared to fixed position sensors, and they are important data sources in 655 areas that are not covered by fixed position sensors. These 650 can be used to implement crowd surveillance tasks in cities. The final goal would be to develop an integrated management system that would merge predictions for vehicular and other urban traffic flows such as pedestrian or bike. This new generation of smart city management systems could reveal high-level correlations between vehicular, pedestrian and bike flows within metropolises.

12. Calculation of Traffic Capacity of Signaled Intersections, Alexandr Chubukov 1a, Valeriy Kapitanov, et al., (2016) Russia.

In order to calculate traffic capacity of signaled intersections, it was suggested to apply an approach based on the concept of congestions. The paper states examples of traffic capacity calculation. Congestion at a section of the road traffic network with traffic signals is a situation when the average duration of the vehicle delay exceeds the length of the traffic signaling cycle [Kapitanov and Khilazhev (1986), Federal Road Agency (Rosavtodor) (2012)]. In this case, the queue length can increase, reaching the length of the road intersection. Further development of the road blocking paralyzes larger parts of the road network and disorganizes the traffic in whole.

13. Annual Average Daily Traffic Forecasting Using Different Techniques, Tomas Sliupas,et al., (2006) Lithuania.

This paper describes annual average daily traffic (AADT) forecasting for the Lithuanian highways using a forecasting method used by Idaho Department for Transportation, growth factor, linear regression and multiple regression. AADT forecasts obtained using these methods are compared with the forecasts evaluated by traffic experts and given in references. The results show that the best Lithuanian traffic data are obtained using Idaho forecasting method. It is assumed that the curve of AADT change should be exponential in the future.

14. Methods of comparing extreme load effects based on weigh-in-motion data, Kien Doan,et al., (2016) Canada.

This paper shows the estimation of extreme load effects caused by vehicles is of critical importance in the evaluation and design of bridge structures. Two methods for estimating extreme load effects over the service life of bridges are commonly cited in literature: (1) the use of a fitted probability distribution based on statistical data to extrapolate the extreme load effects on a probability plot, or (2) the application of Monte Carlo simulation to generate representative truck data over a bridge's lifespan such that maximum load effect values can then be determined directly. In this paper, results obtained using the two aforementioned methods are presented including their advantages and disadvantages in the context of the analysis of rural bridges in Saskatchewan. For this purpose, estimated load effects are based on truck data recorded over a period of one year at several weigh-in-motion (WIM) stations located on Saskatchewan highways. The conducted analyses are based on a typical bridge type common to rural Saskatchewan. It was found that the Monte Carlo simulation approach resulted in more reliable extreme load effect estimations, along with providing other information that is of value in the development of new truck loading models.

15. Application of advanced sampling for efficient probabilistic traffic modelling, Simeon C. Calvert, et al., (2014) Netherlands.

In this model consideration of stochastic in the dynamics of traffic gives a closer representation of a traffic system in comparison to that of a deterministic approach. Mont Carlo simulation is analyzed using variance reduction techniques and sequencing for varied capacity and traffic demand values. The techniques used here are: Importance sampling, Latin Hypercube Sampling and Quasi Random Sequencing are compared in a dynamic macroscopic traffic model to demonstrate the effectives of these techniques foe reduction of the computation load when considering multiple input variations. Demonstration of their efficiency in traffic modelling is expected to lead to a wider application of the methods in practice.

16. Contrasting the direct use of data from traffic radars and video cameras with traffic simulation in the estimation of road emissions and PM hotspot analysis, Junshi Xu, et al., (2016) Canada.

This study investigates the effect of traffic volume and speed data on the simulation of vehicle emissions and hotspot analysis. Data from a microwave radar and video cameras were first used directly for emission modelling. They were then used as input to a traffic simulation model whereby vehicle drive cycles were extracted to estimate emissions. Traffic volumes were detected by a single radar and two video cameras operated by the Southern

Ontario Centre for Atmospheric Aerosol Research. Traffic volume and composition derived from the radar had lower accuracy than the video camera data and the radar performance varied by lane exhibiting poorer performance in the remote lanes. Radar speeds collected at a single point on the corridor had higher variability than simulated traffic speeds, and average speeds were closer after model calibration. The estimates based on radar speeds were at least three times lower than emissions derived from simulated vehicle trajectories. These findings are relevant for project level emission inventories and PM hot-spot analysis; caution must be exercised when using raw radar data for emission modeling purposes.

3. METHODOLOGY

3.1 OVERVIEW

From the studied literature reviews, various methods and type of data to be collected have been studied and also it is found that traffic volume study is essential for suggestion of new infrastructure construction in highway to reduce congestion during peak hours of traffic and also to improve the standards of transportation traffic towards city Centre.

Based on information gathered following methodology has been framed with sequence of steps;

i. Selection of junction to collect traffic data to be used
ii. Conduct reconnaissance survey or feasibility study to determine its possibility
iii. Based on the feasibility results thus obtained real time data collection is done using the sensors or video cameras
iv. From the obtained data, distribution of data for required period is done using probability distribution function
v. Using the data calculated from the distribution function future data prediction is done considering the flaws and fluctuations by implementing Monte Carlo simulation
vi. Analyzing the current system of network for the calculated future traffic volume.
vii. Formulate new alternatives according to the predicted volume
viii. According to the demand and the possibility of the various alternative models, suitable solution for the prototype is formulated
ix. Record the found results based on considered constraints
x. Give suggestions for the improvement of existing national highways based on the result
xi. Conclude the result and discuss its advantages and applicability in real time practices.

3.2 SELECTION OF JUNCTION

Four major junctions were selected to collect traffic details based on its frequent usage, congestions, connecting mains and accessibility. They are,

i. Parvathipuram junction
ii. Chettikulam junction

iii. Vadaseri junction
iv. Theraikaalputhoor

These junctions are selected for collecting traffic data since these were the congested areas and needs alternatives also collecting data from these areas provide the overall traffic flow inside the current town which is going to be the future city.

3.3 RECONNAISSANCE SURVEY

It is a type of survey.The reconnaissance survey is an extensive study of an entire area that might be used for a road ways. Its purpose is to eliminate those routes or sites which are impractical or unfeasible and to identify the more promising routes or sites. Data collected from reconnaissance survey is used for feasibility study of all different routes, preparation of approximate estimates of quantities and costs. This helps in selection of most suitable alternatives. It is done to find the optimum area on which sensors or video cameras to be fitted to collect the traffic data.

a) Study of topographical survey sheets, agricultural, soil, geological and meteorological maps and aerial photography.
b) Ground reconnaissance including another round of serial reconnaissance for inaccessible and difficult stretches, where required.

3.4 METHOD OF DATA COLLECTION

Data collection is the process of gathering and measuring information in an established systematic fashion that enables one to answer stated research questions and evaluate outcomes. For this project data is collected using appropriate sensors or video cameras to avoid human error using manual methods. Since the data gather should be quantitative or qualitative. The data is collected in four main junction which determines the overall traffic of the town.

Data Collection Techniques

- Interviews.
- Questionnaires and Surveys.
- Observations.
- Focus Groups.
- Ethnographies, Oral History, and Case Studies.
- Documents and Records.

3.5 PREDICTION OF FUTURE DATA

All the forecasted model fails in India. The following are the factor which were not taken into account. Role of IT and intervention in today life. Role of space technology, courier service creation of shopping complex, increased

life span of human being, change in life style due to electronic and mobile phone, change in agriculture produce and role of new robust statistical model .Simulation / 'Monte Carlo 'methods is an approach which builds on the formulas, in randomness to simulate the real world, and repeats a calculation a large number of times. For example, based on your example you can quite easily program a spreadsheet to simulate 100 days of different traffic volumes, and then use formulas to calculate your metrics over the simulated days.

To accurately estimate the probabilities of uncertain events. Monte Carlo simulation enables us to model situations that present uncertainty and then play them out on a computer thousands of times.

3.6 SUGGESTION OF ALTERNATIVE

The truth is that traffic congestion is caused by multiple causes and here they are not in the order of importance. 1- Too many cars for the roadway due to inadequate mass transit options or other reasons. 2- Obstacles in the road causing a blockage and merger, road narrowing down.

It is often suggested that congestion may be solved with one big idea, such as:

1. Widen roads.
2. Narrow roads.
3. Add bus lanes.
4. Remove bus lanes.
5. Build tunnels.
6. Build a new ring road.
7. Build a light rail network.
8. Switch off traffic lights.

These many parameters are analysed and best alternative is chosen to provide suggestion for its feasibility of execution. Building of new ring road becomes the best solution since it is possible to connect that with the proposed and developing project four lane construction.

3.7 DISCUSSION ON ITS APPLICABILITY

To determine if a community is employing appropriate transportation options, monetary costs, comfort, safety, and environmental impacts should be assessed. As of 2015, there were 1.15 billion automobiles worldwide. Road transport offers a complete freedom to road users to transfer the vehicle from one lane to the other and from one road to another according to the need and convenience.

This flexibility of changes in location, direction, speed, and timings of travel is not available to other modes of transport. It is possible to provide door to door service only by road transport.

3.8 GRAPHICAL REPRESENTATION OF METHODOLOGY

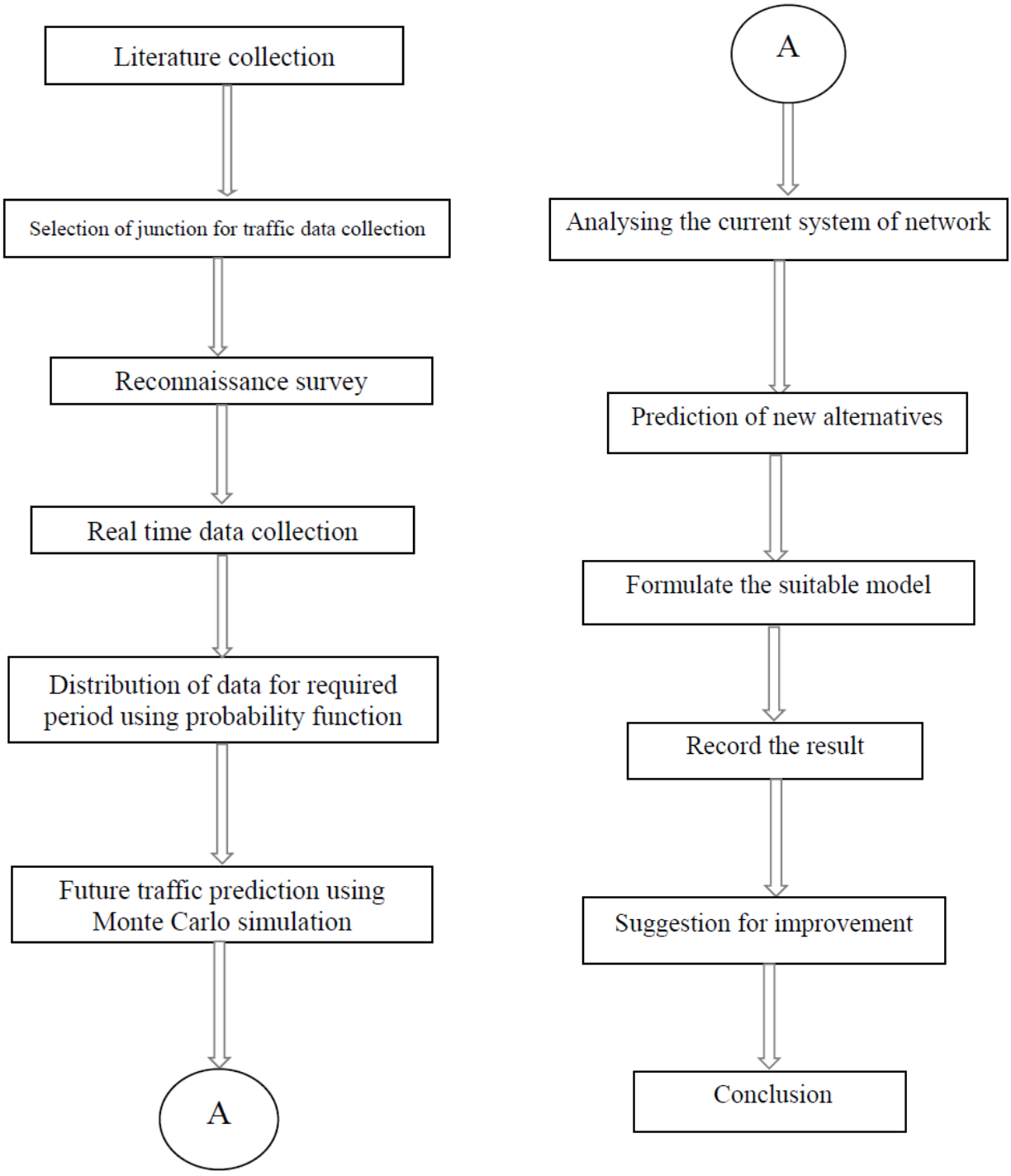

Fig: 3.8 Flowchart for methodology

4. CONCLUSION

From the studied literature reviews it is found that proper collection of data for certain period which includes the peak hour and normal hour is necessary to distribute for the future. Also analyzing the suitable alternative is also necessary for its application. A new construction increases the efficiency of the road and improves industrialization of the town which in turn improves the life standard of people. To determine if a community is employing

appropriate transportation options, monetary costs, comfort, safety, and environmental impacts should be assessed. The collection of data includes various categories such as two wheelers, LCV s, Public transports, and Heavy load vehicles. It is collected for continuous weekday and weekends which includes the peak hour and the normal duration along with festive period. This calculated data helps in identifying and suggesting a proper alternative to the highway construction.

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