JOURNAL OF INFORMATION, KNOWLEDGE AND RESEARCH IN CIVIL ENGINEERING

TECHNIQUE IDENTIFICATION FOR ROAD TRAFFIC CONGESTION SOLUTION IN TALEGAON DABHADE STATE HIGHWAY-55

[1]*SHEKHAR K. RAHANE,* [2]*PROF. U. R. SAHARKAR*

[1,] PG student in Civil Engineering (Construction and Management), Dr. D. Y. Patil Institute of Engineering and Technology Ambi, University of Pune, Maharashtra, India.
[2,] Assistant Professor and PG Coordinator, Department of Civil Engineering, Dr. D. Y. Patil Institute of Engineering and Technology Ambi, University of Pune, Maharashtra, India.

shekharkrahane@gmail.com, upendra_saharkar@yahoo.co.in

ABSTRACT : *Due to traffic congestion, there is possibility of accidents because of poor traffic management. To eliminate road accidents and to save precious human life it is essential to find proper solution for traffic congestion. In this paper traffic congestion problem in Talegaon Dabhade ,Tal-Maval. Dist-Pune is identified and studied for finding out the proper solution of it. There is tremendous increase in population and increase in traffic density of various types of vehicles found due to government policies for this particular area, proximity to the Mumbai- Pune expressway, proposed international cargo airport at a distance 20 km from this city.*
Last 10 years results gave average 15 serious accidents and an average 5 human loss per year in Talegaon Dabhade. Literature study related to road traffic congestion is done in this paper.

Keywords: Expressway, Traffic Congestion, Petrinet, Ecomove

1. INTRODUCTION

Talegaon Dabhade is a historical city, a municipal council in Pune district in state of Maharashtra, on State Highway-55, India. It is located 18.72^0N 73.68^0E & has elevation of 602m (1974ft.) from mean sea level. Population of this city in 2001was 42574, in 2011, Talegaon Dabhade had a population of 75854 & in 2021 it will be 125544. Today Males constitute 55% of the population and females 45%.Talegaon Dabhade has an average literacy rate of 83%, which is higher than national average of 59%; male literacy is 89% and female literacy 82%. In Talegaon Dabhade, 11%of population is under 6 years of age.

Maharashtra state government and Maharashtra Industrial Development Corporation (MIDC) have drawn up a plan to ensure that the State puts forth a total biotechnology revolution. Since Government wants to establish Pune as a technology hub, MIDC has started acquiring large areas of land to set up Biotechnology and InfoTech parks between Talegaon and Vadgaon as there is little space in Pune. MIDC is also developing over 250 acres of land in Talegaon as a floriculture park for production of flowers like tulips and orchids, which are demand in international market. The area is situated in the Agricultural Export Zone declared by Government of India. General Motors (GM),Audi, Volkswagen have already set up their roots and others planning to do so in Talegaon., INA Bearings India Ltd. have also set up their plants in Talegaon. Essar Group opened its steel service center facility here. It is also home to thriving poultry belt, largest in Asia in terms of broiler birds per square mile. Talegaon has very pleasant moderate climate it has many lakes and hence is called Talegaon.

Another aspect that gives Talegaon an edge is that it has regular schools of high standards in both Marathi and English medium. Talegaon also has an international standard school 'Heritage' & educational campus at Ambi. Maharashtra Institute of Medical Education and Research (MIMER) medical college was established in 1995 at Talegaon.The 500-bed multi-spatiality Talegaon General Hospital supplements all practical and internship requirements of the undergraduate program.Talegaon also is home to Tolani Maritime Institute campus. Organisations like Indrayani College, polytechnic, engineering college is based at Talegaon.

Talegaon is an important railway station on Pune-Lonavala local railway.Talegaon railway station is well connected to Mumbai and Pune via railway as well. By road Talegaon located at a distance 135 km from Mumbai, a couple of hours pleasant drive through the Bhor ghat along the Mumbai Pune express highway makes Talegaon Dabhade easily

accessible from Mumbai. From Pune, it is just 40 km away.

2. LITERATURE SURVEY

Haribandhu Panda [1] gives overall discussion of NH-08 in general and Vadodara – Ahmadabad section in particular in relation with problems associated with transportation and possible solution for better traffic management.

He [1] presented in six parts as below:

i) Methodology used & limitation faced.
ii) Presentation of traffic growth.
iii) Identification of factors hindering efficient traffic flow.
iv) Calculation of quantity of various economic & environmental losses.
v) Discussion of specific recommendation for better traffic management.
vi) Concluding remarks.

2.1 TRAFFIC MANAGEMENT BY WORKFLOW TECHNIQUE

Due to traffic jams there is wastage of fuel which results in increase in air pollution. Manuj Darbari [2] says that within five years, core area of Lucknow city gets congested and which do not permit smooth flow of traffic. He [2] suggested 'any one conclude the simplest solution could be to wider the existing road network but widening road network probably is not the only solution because there are many other factors too which we have to take into consideration before reaching to a conclusion'

He used Petri net as the work flow tool to model urban traffic system in two phases. First phase deals with orthogonal extension of Petri net to enhance the permutation of control and traffic flow simulation. The second phase discusses application of continuous Petri net with intelligent agents.

Calculation of quantity of economical loss there is a detail about loss due to higher fuel consumption, loss due to increased driving man hours.

2.2 INTELIGENT TRANSPORT SYSTEMS (ITS) FOR INDIAN CITIES

Road traffic congestion is a leading problem all over the world [3]. In India, a fast growing economy, the problem is generally felt in all cities. This is due to infrastructure is slow as compared to vehicles due to space and cost restrictions. For that, solution suggested which is related to ITS, for efficient traffic management. This technique cannot be used in India as it is. It needs innovation to suit the contrasting traffic characteristics of Indian roads. Rijurekha Sen [3] presented a comprehensive study of all available ITS systems, including both research prototype and deployed systems. Mrs. Sen presented a set of interesting open research problems in the context of Indian ITS and gave a list of public and private organizations, that play an important role in Indian traffic management and research.

The Government of India has committed Rs. 234000 cores in the urban infrastructure sector [3]. Bus Rapid Transit (BRT), metro rails and mono rails are being built in different cities to encourage the use of public transport .But still there is a steep growth of private vehicles. Some cities like Bengaluru, Pune, Hyderabad and Delhi, with their sudden growths in IT sector, also have a steep growth in population, further increase in transportation needs. ITS is an interdisciplinary research area. Building road sensors need embedded system background .Using mobile phones for sensing need mobile computing background. Analyzing sensed data needs signal processing or computer vision background. Communication among sensors and traffic control authorities need wired and wireless networking background. The traffic classification and prediction algorithms need machine learning or statistical background. Applications like signal management need transportation engineering background. So ITS literature is very wide-spread with papers appearing in seemingly unrelated venues.

It gives idea about ITS applications sensing, static sensing techniques especially for Indian questions, mobile sensing techniques: India specific questions, hybrid sensing techniques and ITS architecture [3].

2.3 INTELLIGENT BRT

P.Parvizi and S. Mohammadi [4] said an intelligent BRT system is necessary when communities looking for new ways to use high capacity rapid transit at a reduced cost. With the help of Global Positioning System (GPS) system, the data center can monitor the situation of each bus and bus station. Through Radio Frequency Identification (RFID) technology, the bus station and traffic light can transfer data with bus and by Wimax communication technology all of parts can talk tighter; data center learns all information about the location of bus, the arrival of bus in each station and the number of passengers in station and bus.

This cleared idea related to BRT i.e. what is BRT, details about BRT in Tehran, Automatic Passenger Count (APC) system that helps solution that transit improves. APC technology puts infrared sensor at the bus doors and bus station gates to count passengers as they board and leave. APC collects ridership data on every bus , per door per bus every station and per every gate basis. Counted passengers are sorted on the bus and bus station and downloaded into a data center where the information can readily correlated

to scheduled runs, routes, stops, time (arrive – leave),date and time.

2.4 eCoMove APPROACH:

The eCoMove Approach and Expected Benefits given by J.D Vreeswijk [5] for energy efficient traffic management and control. Author says an increasing demand for transport in urban areas has resulted in chronic congestion, with many adverse consequences such as delays and pollution. Urban traffic is responsible for 40% of CO_2 emission and 70% of emission of other pollutants.

eCoMove strategies: Many studies have been carried out to understand the factors which cause wastage in fuel consumption in road transport. 22% of all wasted fuel is caused by inefficient deceleration and / or a lack of anticipation. Congestion is responsible for another 15%, where as excessive speed, insufficient traffic light control and construction sites and/or traffic accidents each account for another 11% [5].

In eCoMove the emphasis is on three major inefficiencies: insufficient route choice, insufficient driving performance, and insufficient traffic management and control. The first strategy is to save unnecessary kilometers driven by optimizing routes. Despite in-vehicle navigation systems and roadside route information panels, many aspects like destination search, unavailability of parking areas, road works. Second strategy is to help drivers by optimizing their driving behavior to save fuel. The third strategy is to manage traffic more efficiently. The concepts of eco-driving and green-driving have been helpful for saving of fuel.

Total weight on eco approach to traffic management using eco traffic management, eco Adaptive Balancing and Control (eco ABC), eco Adaptive Traveler Support (ecoATS),eco Motorway Management (eco MM),eco Route Distribution, eco Network Prediction, eco Vehicle Trajectory Prediction, eco Emission Estimation and Prediction, eco Routing, eco Green Wave, eco Balanced Priority and eco Motorway Measures are described.

2.5 ROAD TRAFFIC CONGESTION IN DEVELOPING WORLD

Vipin Jain etc.[6] gave possible causes related to traffic congestion in the developing world .They says that road traffic congestion continue to remain a major problem in most of the big cities in the world. They presented a simple automated image processing mechanism for detecting the contestation levels in road traffic by processing CCTV camera image feeds. Their algorithm specially designed for noisy traffic feeds with poor image quality, based on live CCTV camera feeds from multiple traffic signals in Kenya and Brazil. They show evidence of this congestion collapse behavior lasting long time-periods across multiple locations. For partial solution of this problem, they present a local de-congestion protocol that coordinates traffic signal behavior within a small area and can locally prevent congestion collapse sustaining time variant traffic bursts. Based on a simulation based analysis on simple network topologies, they show that are local de-congestion protocol can enhance road capacity and prevent congestion collapse in localized settings.

Author said poor traffic management is the main reason for traffic jams all over the world. In Brazil, driving people experiences world's worst jams, where people are struck for two or three hours everyday in traffic jams. They found a common feature across road networks in many urban area in the developing world is the presence of critical congestion areas; they refer to a critical congestion as one where a network of roads converge and a large amount of traffic needs to traverse the common congestion area. As per free -flow traffic theory, a free flow traffic road segment can be associated with a traffic curve where the traffic exit rate is a function of the traffic density in the road segment. A free flow road segment is known to exhibit a critical density point where any traffic input that pushes the density beyond the critical value can trigger a 'spiraling effect' that results in the road segment operating at a low-capacity equilibrium point [6].

Many critical congestion areas in developing regions have poor traffic management systems that if any of these critical congestion collapse, the road network can result in a massive traffic jam for elongated time periods. They gave causes of poor traffic management e.g. unplanned cities, poor discipline, alternate traffic means, archaic management and tighter budgets..

2.6 BRT FEATURES

Before implementation of BRT in particular area, it is necessary to study characteristics of accessible Bus Rapid Transit in the way given below [7][8]

1. Study of system elements:
i) Running ways.
ii) Stations.
iii) Vehicles.
iv) Fare collection.
v) Intelligent Transportation System.
vi) Services and Operating Plans.
2. Study of system performance:
i) Travel Time savings.
ii) Reliability.
iii) Identity and Image.
iv) Safety and Security.
v) Capacity.
3. Study of system benefits:

i) Higher ridership.
ii) Cost effectiveness.
iii) Transit-supportive land development.
4. Characteristics of existing systems.
5. Strategies for implementing accessible BRT.

2.7 MULTI-AGENT SYSTEM

Another way to solve the traffic congestion with the help of software [9].This software is developed to aid in-depth research in this field. They present a test bed for multi-agent systems in road traffic management. The test bed establishes a connection between the traffic simulator and the multi-agent platform. Special Jess agents have been developed to accelerate the implementation of different agent-based traffic strategies.

Focus given on second type of control given below:
1. Vehicle-oriented traffic control.
2. Measure- oriented traffic control.

Second type assumes that traffic consists of entities with goal-oriented behavior. Control of this behavior is performed through external signals at fixed signals, like traffic lights and variable message signs.

2.8 QUANTITATIVE PROBLEM

Shulin He [10] defined Extension Traffic Simulation System (ETSS) and defined analysis method and data required for traffic congestion analysis which is helpful for finding out results related to 5CW (congestion when happened, where, how, why, change due to congestion?).Road traffic congestion has long been a complex issue and seems likely continue to be so. Traffic congestion is a major issue for many drivers; it results in journey delays, wasted time, and increased pressure and can make people late or cause loss of business. Congestion reduces the quality of life for many people and deserves to be talked to improve transport for everyone.

For establishment of extension information model in traffic congestion is the important content of ETSS. If we can quantitatively describe congestion information system, we may predict its development law. According to the nature of traffic congestion, mutation could happen. This mutational act makes congestion phenomena potentially uncertain. This potential uncertainty explains that road traffic system doesn't have obvious law. If we want to establish that, the key point is to set up the mutation model of traffic system.

3. CONCLUSION

The growing complexity of urban traffic requires the use of advanced tools and various types of analysis which could simulate the traffic in real time.

Although there are different type of tools and methods used to analyze the traffic problem for different kind of situations, with the help of study of available literature, it can be concluded that traffic congestion problem in Talegaon Dabhade will be effectively solved by eCoMove Approach. This suggested approach has significant advantage to detect and control various inefficiencies in traffic congestion.

REFERENCES

[1] Haribandhu Panda& RS Pundir, "Problems and possible solutions for better traffic management: A case study of Vadodara- Ahmadabad section of national highway eight", Research Paper 19, August 2002, Institute of Rural Management, Anand(IRMA).

[2] Manuj Darbari Sanjay Medhavi and Abhay Kumar Srivastava, "Development of effective Urban Road Traffic Management using workflow techniques for upcoming metro cities like Lucknow (India) ", International Journal of Hybrid Information Technology,Vol.1,No. 3, pp. 99-108, July, 2008 .

[3] Rijurekha Sen & Bhaskaran Raman, "Intelligent Transport System for Indian Cities".

[4] P. Parvizi, S. Mohammdi, "Intelligent BRT in Tehran", World Academy of Science, Engineering and Technology, pp. 1887-1890, 59 2011.

[5] J.D.Vreeswijk, M.K.M. Mahmod & B. van Arem "Energy Efficient Traffic Management and Control – the eCoMove Approach and Expected Benefits".

[6] Vipin Jain, Ashlesh Sharma & Lakshminarayanan, "Road Traffic Congestion in the Developing World".

[7] Discussion Paper: Characteristics of Accessible Bus Rapid Transit.

[8] Luis David Galicia, Ruey Long Cheu ,Randy B. Machemehl & Hongchao Liu,"Bus Rapid Transit Features and Development Phase for U.S.Cities", Journal of Public Transportation, 12(2), pp. 23-38,2009.

[9] Alexander Th. Van den Bosch et al., "Test Bed for Multi-Agent Systems and Road Traffic Management".

[10] Shulin He , "Quantitive Problem of Road Traffic Congestion Simulation and Extension Information Analysis", International Journal of Emerging Technology and Advanced Engineering ISSN 2250-2459, Volume 2, Issue 2,pp. 51-55, February 2012.

[11] S. K. Khanna & C. E. G. Justo, "Highway Engineering" ISBN 81-85240-43-4.