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Design and Development of Traffic Flow Prediction System for Efficient Traffic Movements in Amravati City: A Review

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Abstract – *In India number of vehicles are increasing day by day hence major cities in India like Amravati facing so many problems such as loss of time, increase in fuel consumption, increase in noise pollution and it caused long queues which produce inconvenience, frustration to drivers or road users. The city Amravati has too many intersections and too many traffic signals.*

It rely on pre timed control signal system or fixed cycle control signal system hence it is beneficial to optimize traffic signal and coordinated it by means of Intelligent transportation system. It is not yet adopted on Indian roads. This paper presents an intelligent transportation system for traffic flow prediction and controls it through traffic signal optimization and coordination.

***Key Words*: Optimized signal cycle time, Signal Timing Optimization, Traffic signal coordination, Traffic Flow Prediction, Traffic Simulation.**

1. INTRODUCTION

Urban traffic problem, an important factor that affects the development and restricts the economic construction of cities. It's a complex system in a random way so it was necessary to optimize traffic control signals to cope with so much urban traffic problems. Inappropriate signal timing. Plans can cause not only discomfort (extra delay) to drivers but also increased emissions and fuel consumption. Thus, it is important to investigate the practice of signal optimization methodology to ensure that newly developed timing plans will improve the system performance. Cross intersection is an important part of the urban road system [1]. Signal timing optimization is most important method that improves the intersection level. Intersection is an important part of the urban road system. It is very easy to cause the low efficiency in vehicle operating that vehicle have diverging, merging or intersecting repeatedly on the grade crossing. This case will cause the decline of the ability in traffic capacity, the increasing of vehicle delay, and thus the noise pollution and exhaust emission will increase. On the other hand, once the intersection is blocked, it is not only the roads near the intersection but also the roads which are far away will be affected.

Therefore, organizational optimization is needed for traffic operating on the intersection. Nowadays, traffic simulation techniques are increasingly being used to optimize the intersection condition. It becomes an essential tool in researching and solving the traffic problem. Traffic simulation investigates the characteristic of reappearing practical traffic system through modern computer technique for pursuing an optimum solution for practical traffic problem. Traffic simulation describes the complicated traffic property accurately and directly through reappear the order of traffic flow [4]. Currently, according to the level of detail traffic model can be divided into micro-model, meso model and macro-model. Among them, micro-simulation model can be at a high level of detail to describe the whole system and its internal relationship. In congested traffic conditions, the study of individual behavior and individual characteristics of the vehicle is often the factor of traffic congestion and traffic congestion analysis for those data to determine the rush hour flow. Moreover, researchers can make analysis and calculations for the rush hour traffic characteristic, the remaining capacity and the saturation through determining the nature and the quantity, and then investigate the vehicle correlation non-vehicle correlation and mixing problem by observing the video recording and surveying. Collection, problem analysis, program optimization, and program evaluation). Synchro system specially engages in signal timing. It sets the time delay, number of stop and queue length these three indices as the target function, and consider the maximum period, minimum period and phase minimum green light time as the limitation [8]. Synchro is an easily and excellent signal timing optimization software to make up for the trouble of manual calculations [7]. James Mulandi [9] and some other researchers make comparative experiments on various simulation software's under the same geometry and traffic conditions and carried out that in many simulation software's, VISSIM based genetic algorithm optimization of signal timing and Synchro programs produce signal timing of the highest quality and provide extremely similar performance.

2. TRAFFIC SIGNAL OPTIMIZATION PRACTICES

There are a variety of computer software programs to aid transportation engineers in the analysis and optimization of signal timing plans. Intersection analysis helps to improve traffic signal operation (reduce delays, queues, and travel times) and reduce vehicle-operating costs (reduce fuel consumption). Arterial signal synchronization is one of the most cost-effective methods for reducing vehicle operating

costs and improving traffic flow performance along urban arterials. Arterial signal optimization models, such as Synchro and TRANSYT-7F, have been developed to assist traffic engineers in coordinating traffic signal settings along urban arterials and around networks. Additionally, limited efforts have been made to use GAs for signal optimization. Paracha (1999) conducted a study optimizing five intersections using Synchro and TRANSYT-7F [5]. For each program, multiple simulation runs were made using CORSIM, a stochastic and microscopic simulation program. The simulations of the CORSIM simulation model were used to approximate how the timing plans would work in the real world. Results from the study showed that no single software package provided the best solution to all of the scenarios. The results indicated that both Synchro and TRANSYT-7F can be used effectively for optimization of signal timings at intersections with approximately equal effectiveness. This study was limited to isolated intersections, and distribution of variability was not considered. Yang (2001) compared Synchro and TRANSYT-7F optimization programs. The goal of the study was to determine which package could best provide a timing plan to improve existing traffic performance along an arterial in Lawrence, Kansas. The test site included nine signalized intersections 16,050 feet in length. CORSIM was to evaluate the effectiveness of the signal timing plans. The study showed that Synchro coordination produced great results.

3. CALCULATE OFFSETS BY ALGEBRIC METHODS

Algebraic method determines the best public signal cycle and offset by seeking the ideal intersection distance which match with the actual intersection distance best, in order to make the t arterial coordination and control system get the greatest possible bandwidth and the ideal coordination and control effects [8-9]. The steps are as follows:

1. Determine the initial public signal cycle,
2. Determine the ideal distance between the intersections,
3. Get the best ideal value of the intersection spacing and make sure the best ideal intersection spacing match with the actual distance between the intersections.
4. Determine the best public signal cycle of the final Selection.
5. According to the location relative to the ideal intersection in which the position located, we determine the phase size.

4. METHODOLOGY

Step 1: Collecting the information on the intersection. Researchers can record the road width, road properties, signal timing, queue length and time delay through surveying. And researchers can record the traffic flow in various directions and time segments and save the traffic condition through video recording.

Step 2: Inputting the collected road network data into the AutoCAD to establish static network model accurately. Then the researcher can input the proceed flow data, motorcycle type ratio data and signal timing data, and make analysis for those data to determine the rush hour flow. Moreover, researchers can make analysis and calculations for the rush hour traffic characteristic, the remaining capacity and the saturation through determining the nature and the quantity, and then investigate the vehicle correlation non-vehicle correlation and mixing problem by observing the video recording and surveying.

Step 3: Determining the scope and time of the simulation. Then through the orthogonal test, researchers compare and calibrate parameters of the intersection with VISSIM simulation. After simulation, the researchers can proofread the simulation results with the signal timing data, vehicle flow data, queue length, delay time and video recording to ensure the precision of simulation, and then find the way to optimize the intersection system. Researchers can design the optimization strategy in geometry optimization and signal timing. Then the researcher can input the proceed flow data, Motorcycle type ratio data and signal timing data, and make architecture with significant reduction in power consumption.

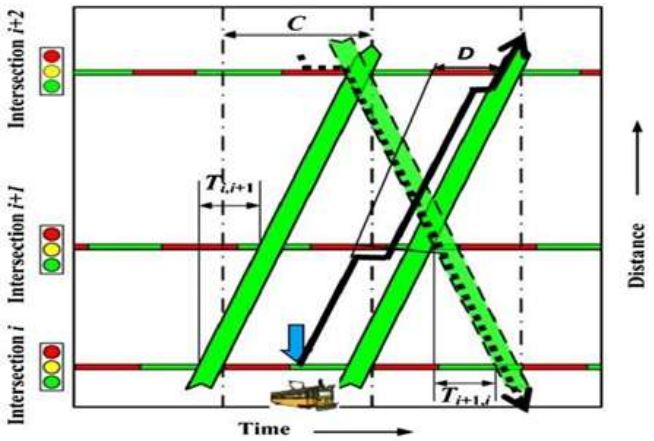

Fig -1

The study of this develop an on line adaptive priority strategy system for optimize traffic operation at a series of consecutive grade crossings normally in urban areas. The proposed strategy takes into account the effect on cross-street traffic also. The mathematical model of nonlinear programming with linear constraints can be formulated to reduce overall passenger delays at grade crossings for light rail transit and to minimize the impact on cross-street traffic. The optimization can be enabled by real-time or arrival-time predicted by use of GPS-equipped vehicles. It exhibit the recalculated performance of the proposed strategy system, both a numerical analysis and a simulation test are conducted. There are several phases of operation in standard

traffic models. For example, 2-phasesystems, 3- phase systems etc. The Fig. Illustrates the two phases in the 2-phase operation. As it can be seen the 2- phase systems are only suitable for junctions with less percentage of right turns.

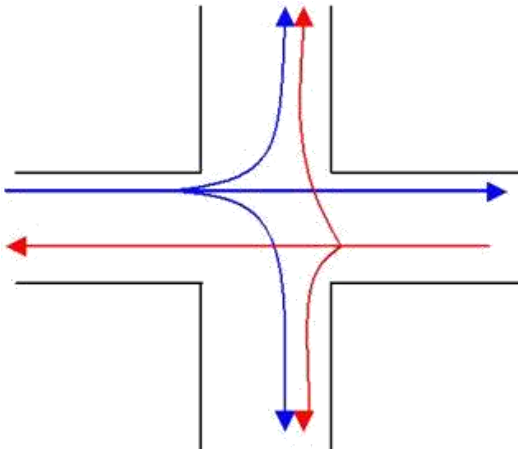

Fig -2: Phase 01

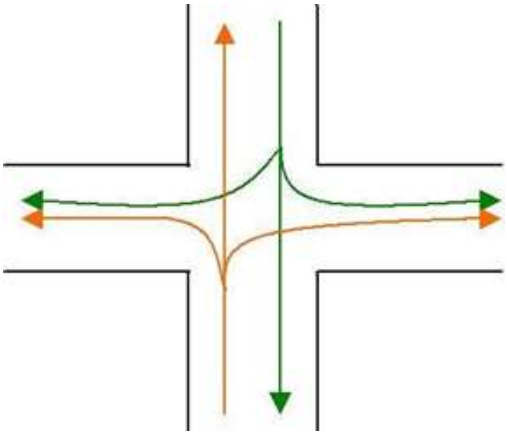

Fig -3: Phase 02

5. THE COMBINATION OF VISSIM AND SYNCHRO IN TRAFFIC SIMULATION

VISSIM is a discrete, stochastic, time step of microscopic traffic flow simulation model [6]. Moreover, VISSIM is capable to model and analyze the urban traffic operation under various traffic conditions such as road setting, traffic composition, traffic signals, bus stops, etc. VISSIM can simulate directly and vividly the changing conditions of vehicle configuration and road situation. And then evaluate the strategy [7]. Synchro system specially engages in signal timing. It sets the time delay, number of stop and queue length these three indices as the target function, and consider the maximum period, minimum period and phase minimum green light time as the limitation [8]. Synchro is an easily and excellent signal timing optimization software to make up for the trouble of manual calculations [7]. In this paper, micro-simulation software VISSIM and Synchro are combining used to simulate and optimize the practical intersection issue which can make up the shortcoming of using software alone. The combination exerts the advantages of VISSIM which can simulate the status and output accurate simulation conclusions and the advantages of Synchro which evaluates the status clearly and accurately. The combination makes the simulation and optimization simply, conveniently and overcome the trouble of manual calculations. The evaluation of combination has a strong practical and there is a certain reference for other intersections solving congestion problems.

6. CONCLUSION

The intersection is one of the most important parts in traffic network. It is act like the key node in for avoiding traffic congestion so the intersection control study is attracting more and more researcher's attention. Signal optimization is very effective techniques for improving intersection level of service and make it more efficient.

REFERENCES

[1] Zhao Xin-hua., 2010. Optimal design of urban road intersection,. Railway Construction.

[2] Yuehui Yang, Yao Lu1, Limin Ji2, Yong Qin, Honghui Dong. 2012. Optimized simulation on the intersection traffic control and organization based on combined application of simulation softwares 24th Chinese Control and Decision Conference (CCDC).

[3] Zichuan Li. 2011. Modeling Arterial Signal Optimization with Enhanced Cell Transmission Formulations. Journal of Transportation engg. ASCE.

[4] Ilsoo Yun, Byungkyu. 2006 application of stochastic optimization method for an urban corridor. Proceedings of the 2006 Winter Simulation Conference.

[5] Diao Pengdi, Nuerlan Muhan, Wang Zhuo1, Zhang Zundong, Dong Honghui. 2012 IEEE

[6] Li Min. 2011" Amendment to Traffic Signal Optimization for Transverse Interference " 2011 International Conference on Transportation, Mechanical, and Electrical Engineering (TMEE)

[7] Yinfei Li . 2009. 2009 IITA International Conference on Services Science, Management and Engineering.

[8] Li Yinfei, Wei Wei, Chen Shuping. 1989. Optimal Traffic Signal Control for an Urban Arterial Road. Second International Symposium on Intelligent Information Technology Application.

[9] D.T Dissanayake, S.M.R Senanayake, H.K.D.W.M.M.R Divarathne, B.G.L.T. Samaranayake 2009. Real-Time Dynamic Traffic Light Timing Adaptation Algorithm and Simulation Software

[10] Guoyuan Wu1 LipingZhang, Wei-bin Zhang, and Masayoshi Tomizuka. 2012. Signal Optimization at Urban Highway Rail Grade Crossings Using an Online Adaptive Priority Strategy.

[11] Zhao jun bo,Yang jie and zang hui –ling. 2010 Optimization method of the cycle and critical phase on signal control intersection.. International conference on optoelectronics and image processing.