Performance Improvement of Traffic Monitoring System using Fuzzy Logic

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Abstract-*A multi-level framework is necessary for the traffic management and control purposes. This multi-level structure should range from a vehicle controller at the bottom level to the traffic management controllers at roadside, area, and regional at higher levels. Fuzzy Logic approach is a good method for traffic management and control purposes in both roadside and area controllers. By the combination of IV-based platoons and multi-level framework, performance improvement of 10–30% is possible.*

Keywords-Traffic Monitoring, Fuzzy Logic, Congestion.

I. INTRODUCTION

Over several decades, traffic congestion has become a serious problem in the INDIA major cities. Congestion has been increased due to motorization and the diffusion of the automobile, which has increased the demand for transportation infrastructure. However, the supply of the transportation infrastructure has often not been able to keep up with the growth of mobility.

Traffic congestion problems consist of incremental delay, vehicle operating costs such as fuel consumption, pollution emissions and stress that result from interference among vehicles in the traffic stream, particularly as traffic volumes approach a road's capacity. In the real urban traffic environment, the goal of all the traffic controlling methods is to serve the vehicles better and more reasonably so as to meet the needs of people's going-out and the economic and cultural development in the society.

Hence, the simulation research of vehicles in the traffic simulation environment is very important. Most former simulation models of vehicles are based on mathematic model, not having taken into account of the fact that people control vehicles. Our hope is that we can grant the vehicle with intelligence in simulation so as to make the simulation in the whole system closer to real traffic conditions.

Thus, we can make better controlling strategy by referring to the simulation effectively. Moreover, the vehicle should be capable of adjusting the driving behavior in accordance with the outside traffic conditions. In the following part, we will discuss the simulation in vehicle agent.

II. PROBLEM STATEMENT

Traffic congestion problems consist of incremental delay, vehicle operating costs such as fuel consumption, pollution emissions and stress that result from interference among vehicles in the traffic stream, particularly as traffic volumes approach a road's capacity. Across the metro cities more people are spending more time sitting in traffic jams than ever before. According to data released by Census (2000) nationwide the average commute increased 20 percent in the last ten years. In Delhi, traffic congestions statewide cost Rs 60000crores due to lost time and wasted fuel every year. The city sees at least 1 lakhs of vehicle of everyday on the road and that make the city roads congested and unbearable. The city has unplanned roads and that make it even worse to be controlled. In this regard the state's official forecast shows the 2 number of km driven on Delhi and other national highway roads will increase 45 percent by 2020.

Table 1.The causes of traffic jams

Bottlenecks	45% of total congestion
Traffic Incidents	20% of total congestion
Defects in road condition	15% of total congestion
Defects in motor vehicle	10% of total congestion
Poor signal timing	5% of total congestion
Special events/Other	5% of total congestion

Consequently, all of these factors affect our communities both mentally as well as economically.

III. MOTIVATION

As a civil engineer who has dedicated lots of his studies to the field of traffic and transport, I have been always fascinated by the intercity traffic management and traffic control systems. Traffic congestion is an ever-increasing problem in towns and cities around the world. People would face with losses in the shape of time, money, and health.

Wasting time of motorists and passengers, as a non-productive activity for most people, congestion reduces

regional economic health. Delays, which may result in late arrival for employment, meetings, and education, resulting in lost business, disciplinary action or other personal losses. Inability to forecast travel time accurately, leading to drivers allocating more time to travel "just in case", and less time on productive activities. Wasted fuel increases air pollution and carbon dioxide emissions which may contribute to global. Increased fuel use may also in theory cause a rise in fuel costs. Wear and tear on vehicles as a result of idling in traffic and frequent acceleration and braking, leading to more frequent repairs and replacements. Stressed and frustrated motorists, encouraging road rage and reduced health of motorists. Emergencies-blocked traffic may interfere with the passage of emergency vehicles traveling to their destinations where they are urgently needed. Spillover effect from congested main arteries to secondary roads and side streets as alternative routes are attempted which may affect neighborhood amenity and real estate prices.

Many developing countries still do not consider the importance of managing adaptively the traffic congestions and do not pay enough attention toward this ever-growing dilemma which causes lots of costs to the government. In this regard extensive attention goes toward the methods of managing the traffic in different parts of the world and to make a comprehensive comparison chart for countries involving in the problem.

IV. RESEARCH METHODOLOGY

We select the sample model to simulate just to testify the method's effect.

1. Waiting vehicles pass through the intersection one by one when the red light of certain phase transforms into green.
2. According to the distribution of arriving vehicles, calculate the number of arriving vehicle (both red light and green light); then according to the green light time and calculate the number of vehicles released; thus obtain the length of waiting vehicles of each phase at the intersection by the time of switch of red 1ight and switch of green 1ight.
3. Suppose the phase is the same, a simulation comparison is done between the multi-intersection fuzzy control plan based on road network and the single-intersection plan. The average quantity of waiting vehicles in an intersection in a signal cycle is targeted for the comparison, and the simulation data .

V. RESULTS

1. Existing Work

The concepts of fixed-time traffic light control and traffic-response control together and propose an adaptive traffic light control algorithm which can dynamically adjust the traffic light phases for multiple intersections of urban main roads by prediction of traffic situation and cooperation among traffic light controllers. The results demonstrate the efficiency and practicability of their algorithm in reducing unnecessary waiting time for vehicles and traffic load, thus enhancing traffic throughput of intersections.

2. Proposed Solution

Existing algorithm works in prediction of traffic situation which was not accurate in Real Time. Out concept works on fuzzy logic which will control and adjust green light according to number of vehicle arrived. Number of vehicle arrived and exits can be counted by Infra Red Counter. Following is simulation of our proposed solution

3. Simulation:

After yellow light of street 4, algorithm will give green light to road which has heavy rush. Eq. street 2 in following case.

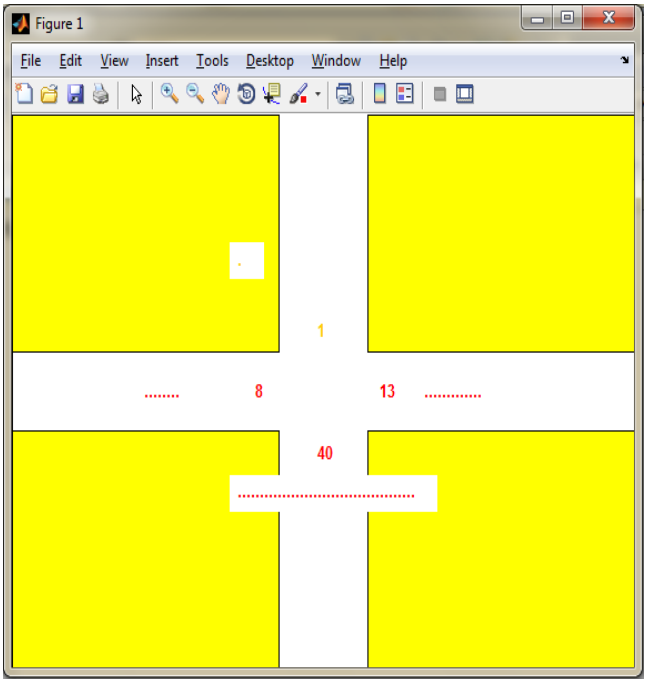

Figure 1: Yellow Light for street 4

Green light is set for street 3 as it has maximum number of vehicle. Next signal will be given to street 2 if street 2 has maximum vehicle at time of yellow light of street 3

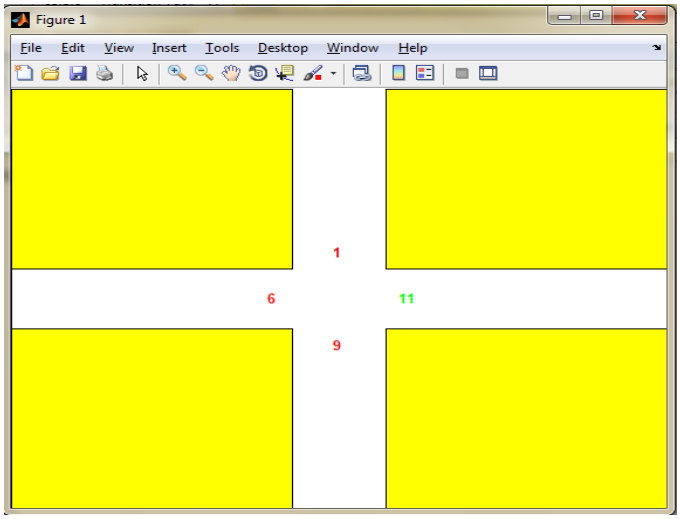

Figure 2: Green Light for Street 3

4. Traffic Passed from each Road:

Following graph shows number of vehicle passes from each road. Road 2 and 4 passed maximum vehicles it means green signal given to them was more than street 1 and 3 which is shown in Fig. 3

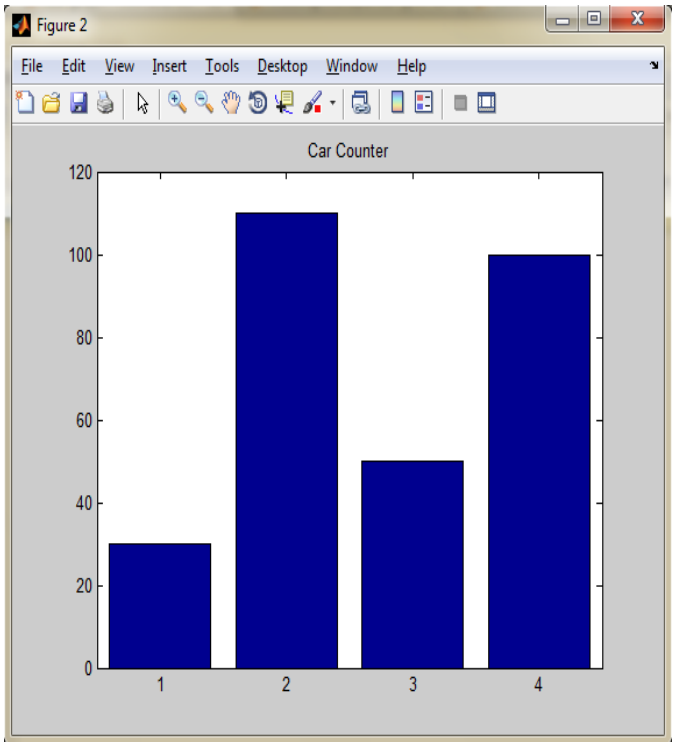

Figure 3: Car Counter from Each Road

5. Green Light Counter

Green light assigned to street 2 and 4 is 3 times while street 1 has 1 time and street 2 has 2 times. It was assigned according to traffic.

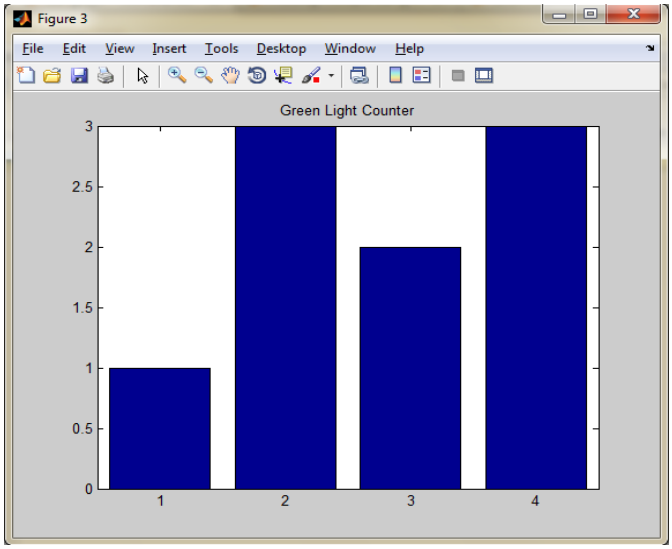

Figure 4: Green Light Occurrence for each Road

6. Results

Street	Traffic	Green Light
1	30	1
2	110	3
3	46	2
4	100	3

VI. CONCLUSION

Taking in consideration methodology of Fuzzy traffic management with priority allocation to public transport vehicles where such management has great influence on whole traffic, through simulation model it is expected to lower Rush and Manage Traffic by Adjust Timing of Green Light by Monitor Traffic on Road.

Through simulation it is proven that travel Waiting time at heavy rush road shorter with optimization of traffic signals. This analysis of current state and technology that is already implemented in current traffic brings summary of possibilities.

Improvements in Counter for vehicle enter and exit a road that can give opportunity for implementing new technology. Combining technology and knowledge of Faculty of traffic and transport science can produce new applications, algorithms and infrastructure that will in future interact on new level.

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