Traffic Management using Virtual Traffic Light

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Abstract: Based on election algorithm examination of Virtual Traffic Lights (VTLs) using ring algorithm is used to improvise the efficiency of a VTLs. Ring algorithm uses a leader among all the vehicles near the intersection by passing message to all the vehicles. In this a Traffic Monitoring System is used to decide the leader to avoid the crossing conflict. The key contribution in this paper is the improvisation of previous algorithms. The proposal is investigated in synthetic scenario results shows that with the use of election algorithm the overall driving experience is increased positively in high traffic load.

Key words- Virtual Traffic Lights, Election Algorithms, Ring Algorithms.

I. INTRODUCTION

The objective of smart city is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of ‘Smart’ Solutions. In the concept of Smart city efficient urban mobility and public transport is among the most prior element of implementation. When we think of Smart City means smarter people will spend more in vehicles. We have to deal with thousands of cars running through the roads each and every day. Traffic congestion is a big problem in the Smart City concept. The reasons behind the traffic congestion are more cars, poor traffic control. Management and faulty practices on behalf of traffic management employers.

The ministry of urban development government of India nearly 31% of India’s current population lives in urban areas and contributes 63% of India’s GDP (Census 2011). With increasing urbanization, urban areas are expected to house 40% of India’s population and will contribute 75% of India’s GDP by 2030. This requires overall growth of people living in the cities which includes development of physical, institutional, social and economic infrastructure. Development of smart cities is a initiative in that direction.

The core infrastructure elements in a Smart City described by the ministry of urban development government of India:

- Adequate water supply
- Assured electricity supply
- Sanitation, including solid waste management
- Efficient urban mobility and public transport
- Affordable housing, especially for the poor
- Robust IT connectivity and digitalization
- Good governance, especially e-Governance and citizen participation
- Sustainable environment
- Safety and security of citizens, particularly women, children and the elderly
- Health and education

In this paper efficiency of virtual traffic light (VTLs) in providing smooth traffic flow at intersection is examined. With the implementation of VTL the need of physical traffic light system will we over. For implementation of (VTLs) election algorithms is used to form a wireless network between the vehicles. In this paper the other technologies which are used to implement VTL is extended and improvised. Election algorithms are of two type bully algorithm and ring algorithm. The ring algorithm is used which treat all the nearby vehicles to the intersection as in a form of a ring each vehicle knows the structure of the ring according to which a leader is decided which will cross the intersection first.

II. RELATED WORK

There is lot of work which has been done previously and still going on in the improvisation of VTLs. Starting from wireless coordination of vehicles and Adaptive traffic lights which gathers data from approaching vehicles and adapt green times-albeit. This research is primarily deals with physical lights at intersection using a custom road built traffic simulator. Apart from reducing traffic many simulators like DIVERT combined with NS-3 has the potential to reduce Carbon-dioxide by up to 18% as shown by Ferreira et al. A new scheme to introduce to place another traffic light in front of intersection was coined by Avin et al. these traffic lights are placed dynamically and it allows a very fast time over the intersection due to synchronized program. Using microscopic road traffic simulator SUMO which shows that road traffic is reduced by 20%. Viriyasitavat and Tonguz used simulations based on SUMO are used to show that vehicles which are in
state of emergency can reach their destination minutes earlier with the help of VTLs. After studying these implementations the idea of using election algorithm with a monitoring system is pointed out. The key contribution in this paper is the improvisation of VTLs using election algorithm and to measure its performance in real world simulations.

Synthetic simulation scenario: multi-lane four-way Intersection.

Synthetic Scenario: Traffic Density vs. Travel Time

Synthetic Scenario: Traffic Density vs. Ratio of Successful Channel Accesses (out of all packets sent)

III. WORKING PRINCIPAL

For the implementation of election algorithms. There is a requirement of system in which vehicles are equipped with GPS and IEEE 802.11p technologies. One of the requirements for this implementation vehicle will be equipped with GPS

Implementation of election algorithm consist a traffic control system which analyzes the position, speed and acceleration of the vehicles. Control system will get the information regarding the distance of vehicles from the intersection it will choose the leader and pass the message to all the nearby vehicles and the information is periodically updated by the ring structure of the vehicle near the intersection. Control system will choose only one vehicle as leaders at a time after that particular vehicle crosses the intersection another vehicle will be chosen as leader according to the conditions. In the case of crossing conflict control system will check several parameters and then decide the leader between the two vehicles. The information will be shown to the drivers inside the vehicle through the display.

Ring Algorithm Example:

Distance at the intersection
Above figure shows the implementation of ring algorithm in realistic scenario:

IV. FUTURE WORK
In this paper representation of VTLs with the help of ring algorithm is done externally. Practical implementation will clearly provide us with the more realistic view of the proposed scenario. Integration of pedestrian is one of the key aspects to be included in the future protocol by this pedestrian will able to know the crossing time of intersection which will allow them particular time to cross the intersection and also able to detect the presence of the vehicle.

Above figure shows the future aspects of the scenario:

V. CONCLUSIONS
In this paper the improvisation in VTLs through election algorithms is presented. Election algorithms are basically used in operating systems for the distribution of resources among all the processes the same algorithms can be used in VTLs with use of ring algorithm it can be seen that experience of driving is increased positively and reduces the traffic significantly. However, it is identified that a traffic control system has to be establish for the monitoring of vehicles which increase a overhead in the case it get fails.

Future work might include VTLs without any monitoring in which vehicles can communicate with themselves and follow election algorithms like ring algorithm.

VI. REFERENCES