CATS: An adaptive traffic signal system based on car-to-car communication

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Abstract

Traffic signal controls play an important role in regulating vehicular flow at road intersections. Traditional systems are not capable of adjusting the timing pattern in accordance with vehicular demand. This results in excessive delays for road users. Hence it is necessary to develop dynamic systems that can adjust the timing patterns according to traffic demand

Introduction

Recent years have witnessed an exponential increase in vehicular traffic in urban scenarios .This has result in efficient traffic flow.

So it is essential to optimize traffic signal control in accordance with traffic demand. Such optimizations will not only result in smoother traffic flows, but also reduce the number of vehicles that stop at intersection. This new concept will help to reduce travel time for users and also to cut vehicle emissions. The main goal of this adaptive system is to reduce the average waiting time experienced by vehicles at intersections along with the reduction in the number of vehicles that stop at intersections.

Related work

Traffic signal systems can broadly be classified as either static or dynamic systems. Static Signal creates traffic jams at road intersections and brings about the need to develop dynamic traffic signal systems.Of the various existing dynamic systems, adaptive control systems are currently the most advanced and complex. These are similar to traffic signals based on a responsive technique in which real-time data is used.But, instead of matching current conditions to an existing timing plan, the system uses an online computer to create an optimal plan. Hence, the need for a database of the timing plans is eliminated. Amongst the numerous. Here the signal parameters, the cycle length, the split and the offset are defined as CSP and the optimal cycle length is determined by solving CSP with reduction in waiting time as the constraint.

For faster convergence to optimal timings the concept of a smart intersection is introduced which makes use of wireless communication.

In this system each car sends its information, such as speed and distance from the intersection, to the traffic signal. Using this information, traffic signal control decides whether a car can go through the intersection or not. is one such solution where one hop car-to-car communications is used to implement traffic controls. In this contribution, traffic signal control listen to the communication between cars and estimate the density of vehicles around them and adjust the signal timings accordingly. for the implementation of adaptive traffic systems. This motivates the design and implementation of VANET-based adaptive traffic signal control that is advocated in this

paper, which can considerably improve traffic conditions by reducing the waiting time at intersections when compared with static and other dynamic systems.

In the pro- posed approach, a cluster-based data dissemination protocol called Clustering based on Direction In Vehicular Environment (C-DRIVE) is designed and developed. This algorithm is developed over the WAVE Short Message (WSM).

The clustering algorithm assumes that each participating vehicle have it's Global Positioning System (GPS).Moreover, it considers that each vehicle is equipped with digital maps which enable the to determine the direction of travel .Therefore, the direction in formation at the intersection can be computed a priori .It also assumes that each vehicle is equipped with at least one wireless transceiver.

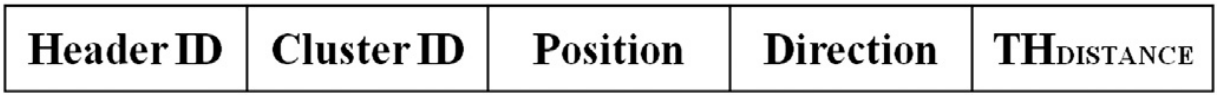

Fig. Packet Format

Since VANETs are used to gather density information, it is also necessary to consider the latency of the communication between vehicles and the infrastructure. In CATS this delay is around 210ms.which is well within the limits.

Finally, one important aspect is the fact that no vehicular collisions occurred at the Intersection.