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Intelligent Transportation To Prevent Traffic Congestion Using VANET

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Abstract—Vehicular ad hoc networks play a vital role in intelligent transportation system. Nowadays due to increase in population and development in the lifestyles people prefer using vehicles like cars even for travelling a short distance. This change has influenced traffics in road segments as a result of which we often experience traffic breakdowns and accidents. Often the traffic breakdowns occur due to perturbation of the human drivers. In order to overcome this we consider the usage of beacon messages. The driver receives a periodic beacon message stating vehicles position, velocity, acceleration, time stamp. This periodic beacon messages are sent for every fixed intervals to all the neighbouring vehicles. Whenever the average velocity of vehicles ahead decreases below a threshold velocity, a beacon message is emitted to the neighbouring vehicles with critical position and time set. The driver receives the beacon message containing the additional position and time stamp marking a critical road segment. The beacons are broadcasted via stable paths that have existed for a long duration. In this way we avoid messages getting lost due to path breaks in emergency situations.

***Index* Terms—Intelligent transport system, Vehicular Ad hoc network, Topology control protocol, OLSR, beacon messages.**

I. INTRODUCTION

The Intelligent transport system is gaining popularity in recent days. VANET as said before is one of the important stream of intelligent transport system. VANET has an enormous capability in providing luxury driving enabling passengers to experience comfort to the core.

VANET provides the ability to access internet while travelling in vehicle and also enable us to download contents from internet. VANET also provides the ability to play games by communicating with the nearby vehicles. VANET also provides the passenger with local information such as nearby parking area that is free, nearby fuel stations, location of tourist spots etc.

Mostly positioning systems are used to locate places as mentioned above.In our approach we use topology based routing instead of positioning systems. The routing protocols for ad hoc networks is of three categories unicast topology-based, unicast position based or group-based multicast and broadcast.

The topology based routing protocols store the routing information by periodically studying the topology changes in the network. This type of protocols includes Ad hoc On-Demand Distance Vector Routing (AODV), Optimized Link State routing (OLSR),TORA, FSR etc.

Most of the studies conducted in VANET resulted in the following outcome. On computing the performance of AODV and OLSRit has been concluded that OLSR outperforms AODV in urban scenario.

Theworks comparing routing algorithms for ad hoc networks traditionally adopt evaluation metrics such as path length, end to end delay, packet delivery ratio and routing overhead. They lack a metric that guarantee network stability.

In our work we select a broadcast node from among the one hop neighbours that are within the radio range of a node. It is this broadcast nodes that are going to broadcast the beacons when the average velocity of the vehicles ahead drops below a threshold average velocity. We use the OLSR topology based routing protocol that use multi point relays. Here the broadcast nodes selected are used as multipoint relays to transmit the beacons covering the entire network.

The broadcast nodes are selected based on its stability value. Only highly stable nodes are selected as broadcast nodes. This is done to build highly durable paths through which the beacons are to be transmitted. Thus we overcome path break that occurs frequently in an ad hoc network where the topology of the network changes frequently. This ensures delivery of beacons which is a signal to drivers to slow down to prevent path breaks.

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II. EXISTING SYSTEMS AND PROBLEM DEFINITION

Existing approach states that when a congested roadway is identified, an alternative route is being suggested, but there is a risk of congestion being caused on the alternative route as well. Vehicles receive a warning message when the gap between the predecessors is reduced, but the human reaction time to adapt to their driving behaviour is not taken into account. Alternatives are being suggested only after the occurrence of the traffic congestion. Methods are not proposed to prevent the congestion before it actually occurs. Beacons are passed in a certain interval of time. The vehicles suffer warnings in emergency cases (i.e.) when a vehicles suddenly drops velocity, the message will be received only at the next interval of time. Furthermore the ad hoc network suffers a frequent path breaks which led to the loss of beacons as a result of which the vehicles may not receive the needed information to change the driving behaviour. So in our approach we go in for durable paths to overcome path breaks and loss of messages.

III. IDENTIFYING BROADCAST NODES

Each node transmits Beacon messages to all the neighbouring nodes within the radio range. Whenever a neighbour node first receives a beacon message from a node a unicast link is formed between the two nodes. The beacon messages are sent periodically over a given time interval to all the linked neighbouring nodes. Each node calculates the duration of its neighbour as follows.

Duration of link= number of beacon messages received

Therefore, Duration of link=Stability value between the two nodes

We are fixing a threshold stability value Kstab. If the Stability value between the nodes is greater than or equal to Kstab the link is said to be stable else the link is said to be unstable.

L1: when a node n does not have any stable link then no broadcast node is selected for it.

L2: when none of the node n's neighbour has a broadcast node then n selects a neighbour having the smaller address from the set of nodes having high durable link with n.

L3: node n chooses itself as a broadcast node if it is already a broadcast node for some other neighbour.

Since we use OLSR protocol in our approach we use 1 hop neighbours of node n that have been selected broadcast nodes and that has a stable link with node n as multi point relays. This subset of n's neighbour will reach the second hop neighbours of n and so on. Thus the beacon messages are transmitted through these multipoint relays covering the entire network.

IV. IDENTIFYING CRITICAL ROAD SEGMENT

Relation between traffic flow F and vehicle density D has been studied in previous works .When the vehicle density D is lower than the fixed Dmin the vehicles can be driven in desired speed i.e. when D **<**Dmin. When the vehicle density D is high that is above the fixed maximum density that is Dmax the vehicles cannot move in desired speed as they hinder each other i.e. when D>Dmax. Now what happens in an intermediate state where the vehicle density is between the minimum and maximum fixed density? i.e. Dmin**< D <**Dmax. It is in this situation the drivers tend to drive at a high velocity and tend to hinder other vehicles causing a traffic breakdown to occur. Thus a traffic breakdown occurs due to the driver's inability to maintain a constant speed adapting to the average velocity of the neighbouring vehicles when the vehicle density in the road segment is between the maximum and the minimum vehicle densities.

Usually the beacon messages contain vehicles position, velocity, acceleration, a unique vehicle identifier and time stamps. With this information we also add two variables a critical position cp and critical time stamp ct.

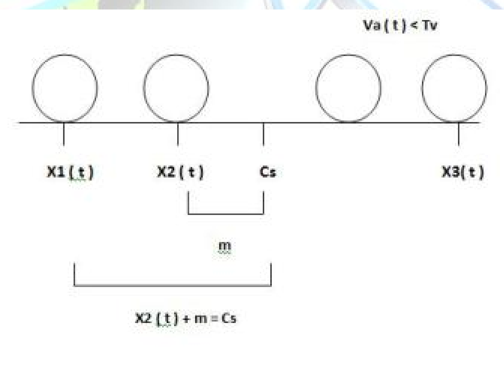

Figure 1: Critical road segment

From the beacons received during the interval **(t, t+** del **t)** , the average velocity of the vehicles ahead is calculated by the vehicle that receives the beacon. When this average velocity drops below a threshold velocity Tv for two successive intervals as follows.

Va (t-del **t) <**Tv AND

Va (t) <Tv

The road segment is marked critical by setting ct = t and cp = x(t)+m where m is the radio range covered by each node. We use a Boolean variable behaviour_change attached with the beacon message which determines whether the vehicle should decelerate or not.

By default Behaviour _change = false
If ((t-ct<Tt)AND(cp-x(t)<Ts))
Behaviour_change = true

Where Tt is the time limit for a beacon to be valid and Ts is the distance limit for a beacon to be valid. [4] discussed about creating Obstacles to Screened networks. In today's technological world, millions of individuals are subject to privacy threats. Companies are hired not only to watch what you visit online, but to infiltrate the information and send advertising based on your browsing history. People set up accounts for facebook, enter bank and credit card information to various websites.

CONCLUSION

Thus in this paper we present a method to prevent traffic breakdown by using periodic beacon messages. Since an ad hoc network often suffers frequent path breaks the messages cannot be carried out to needed destinations as the messages gets lost due to the topology changes. So we have determined to optimize the path selected to message the neighbours that ensures the entire network broadcasts .This is done by selecting highly durable or stable neighbours to be the broadcast leaders. We have thus included variables in the beacons that indicate a critical road segment with respect to the average velocity of the vehicles ahead. The variables are also used to determine whether the beacon message is still within a valid time and distance for the beacon itself to be valid. Thus we prevent, traffic breakdowns efficiently through beacons and the topology control protocols.

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