An algorithm to Ensure the Availability of Communication Channel for Event Driven Messages in VANET

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ABSTRACT
Mobile ad hoc network (MANET) is a collection of mobile computers or devices that cooperatively communicate with each other without any pre-established infrastructures such as a centralized access point. There are several issues in VANET. One of them is congestion control. In case of increase in the number of beacon messages broadcasted by many vehicles, the communication channel will easily be congested. So, to overcome this problem we have proposed an algorithm that increases the availability of communication channel for emergency messages over the beacon messages.

Keywords
MANET, VANET, Mobility.

1. INTRODUCTION
Vehicular Ad hoc Network (VANET) is a form of mobile ad-hoc network (MANET) that provides communication among the vehicles and vehicle-to-roadside infrastructure by wireless communications. It first came into existence when it was used by the US government Department of Transportation. Indeed, because of its wide application in society that promises to revolutionize the way we drive, various car manufacturers, government agencies and standardization bodies have organized national and international consortia devoted exclusively to VANET. Examples include the Car-2-Car Communication Consortium [1], the Vehicle Safety Communications Consortium [2], and Honda's Advanced Safety Vehicle Program among others. The first thing comes into mind is to provide safety and convenience for travellers. The Intelligent Transportation System (ITS) can provide wide variety of services such as routes to improve safety and reduce transportation times and fuel consumption.

There are two types of safety messages in ad hoc networks; beacon messages and emergency message. The beacon safety messages are generated after a certain period of time for the neighbouring vehicles to make aware of them to the speed, location etc. These messages are preventive in nature, and its objective is to avoid the occurrence of dangerous situations. On the other hand, the emergency messages are generated if any abnormal condition may occur [3], [4].

Communication delay and reliability are two stringent requirements for event-driven safety messages. The safety message will propagate from a source outwards as far as possible in order to inform as many nodes in the network as possible about the situation. As a result, such messages have the highest priority. Due to the VANET's unique characteristics, such as scalability, high robustness expectations, strict delay requirements and security issues; the design of such a technology becomes an extraordinary challenge for the wireless research community.

Many congestion control algorithms in Vehicular Networks (VANETs) have been studied. However, most of congestion control algorithms are not directly applicable to uni-priority of event-driven safety messages the emergency messages must be delivered to each neighbouring node without any delays. A single delayed or lost emergency message could result in loss of life. To resolve this issue we should keep in mind that the emergency message transmission takes place before the beacon messages.

The uni-priority of event-driven safety messages are caused by the traffic of the same priority. So, to solve this problem many scheduling algorithm has been proposed.

When every node in the network has messages to send, a good organized measure of broadcast performance is the average rate at which *any* particular node receives packets successfully from *any* other source. We call this the *broadcast efficiency*. This can be achieved by minimizing the number of transmitted packets, but still achieving a high number of messages by all nodes in a specific geographic region. Many simulation-based works have been conducted to analyse similar performance metric. VANETs' safety applications will rely on broadcasting as the major block for localization, routing and dissemination of safety and warning messages to all vehicles in their neighbourhood. Vehicles will be equipped with sensors and GPS systems to collect information about their position, speed, acceleration and direction to be broadcasted to all vehicles within their range. Upon receiving and processing this information, vehicles can detect and avoid potential dangers.

2. OBJECTIVE AND SCOPE OF WORK
Vehicular ad hoc network has received a lot of interest in a last couple of years. To ensure safe and reliable communication within VANET message priorities are evaluated according to the type of message whether it is event driven or beacon. As one of the main issues of VANET is the high demand of ITS applications for both safety and comfort purposes, it is not good to alter the performance of these applications (by reducing the transmission of power or beacon transmission rate) to prevent network congestion. To overcome with this problem we have proposed an algorithm that ensures the availability of control channel for the emergency messages. Information sharing between vehicle to vehicle and vehicle to infrastructure plays very important role in order to decrease the message crowd and to improve the performance in terms of reliability and delay. In this we will concentrate on the feasibility of deploying the safety

application by reducing the number of beacon message propagation and also simulate the result.

As discussed in [5], the transmission of event-driven messages within a geographical area as in Fig. A particular vehicle produces a hazard warning message (emergency message) in case a dangerous situation is detected This emergency message should be propagated on the road as quickly and reliably as possible, in order to enable the drivers of approaching vehicles to undertake adequate Countermeasure for safety and security of the self and the neighbouring nodes.

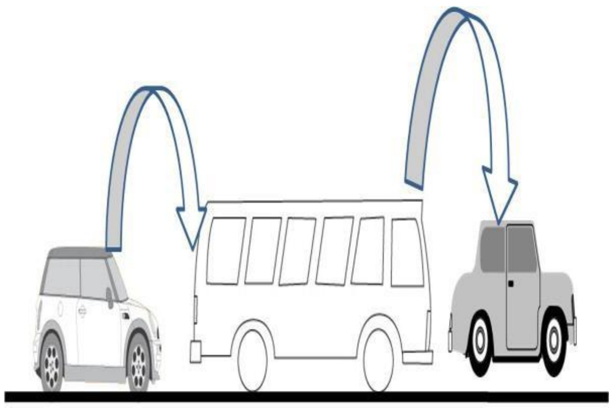

Fig.1 A Car to car communication

3. LITERTURE REVIEW/RELATED WORK

Congestion control algorithm in Vehicular Networks (VANETs) has been extensively studied. However, most of congestion control algorithms are directly applicable for event-driven safety messages. In research paper [8] a congestion control approach based on the concept of dynamic priorities-based scheduling has been discussed. They have evaluated dynamic priority factor based on: node speed consideration, message utility consideration and message validity consideration. This approach requires context exchange between neighbour nodes, which generates a communication overhead. In this paper the problem of broadcast storm is also not addressed. On other hand, the congestion control algorithm for event-driven safety messages was developed in [9]. In [10], J,,Chen, H.C.proposed congestion control algorithm for DSRC based on safety applications. However, they just assumed the CCH channel is successfully reserved for event-driven applications without testing the success rate for event-driven safety messages.

According to [11], consider beaconing a service (BaaS).For this they propose two approaches service-oriented beaconing strategies, Beacon Forwarding Service (BFS) and Beacon Rate Control Service (BRCS), which are based on the following design principles:

- Vehicles send beacons with a minimum interval of 2 Hz and 500 ms lifetime.
- Every vehicle can request a beacon update from its neighbours. Hereby, the requester is specified as a service user (SU) that triggers a service at the service provider (SP) by sending a service request message (SREQ).
- The behaviour of SP and the particular service characteristics can be influenced by an SU specifying appropriate service attributes within the SREQ message.
- Single-hop propagation is basically used. However, a requested beacon is forwarded using one additional hop.
- A dual radio concept is mainly applied.

These are the specific conditions or assumptions at which beaconing can be considered as service.

The challenges for the existing research are that any congestion control algorithm is not able to control the beacon message. Above research only discusses how we can check the worthiness of the nodes that are transmitting the beacon message at very high rate or how we can compensate beaconing as a service. This research includes the detection of type of message (beacon or event driven) and after detection how we can control the situation.

4. PROPOSED METHODOLOGY

The event-drive detection method monitors the event-driven safety message and decides to start the congestion control algorithm whenever event-driven safety message is detected or generated. The congestion control algorithm will launch immediately the queue freezing method for all MAC transmission queues except for the event-driven safety message. In order to send event-driven safety massage timely, we have to control the transmission of beacon message. The event-driven detection method has been used in the existing congestion control algorithm by in [13]

Our proposed scheme has three phases [14]:

a. Congestion Detection
i. Emergency Detection
ii. Beacon Detection
b. Scheduling
c. Rebroadcasting Scheme

```
/* Congestion Control */
If ((event-driven safety message is locally generated)
or (event-driven messages is globally detected))
{
Block all MAC queues except for the event-driven
Safety messages
}
Else {
If (Queue length for beacon message> Threshold)
{
Discard CCH channel for beacon messages
}
Else {
If (no. of event-driven messages detected >1) {
Block all MAC queues except for the event driven
Safety messages queues based on PRIORITY based
Scheduling
}
}
}
```

Working of the proposed algorithm has been described with the help of flowchart given below.

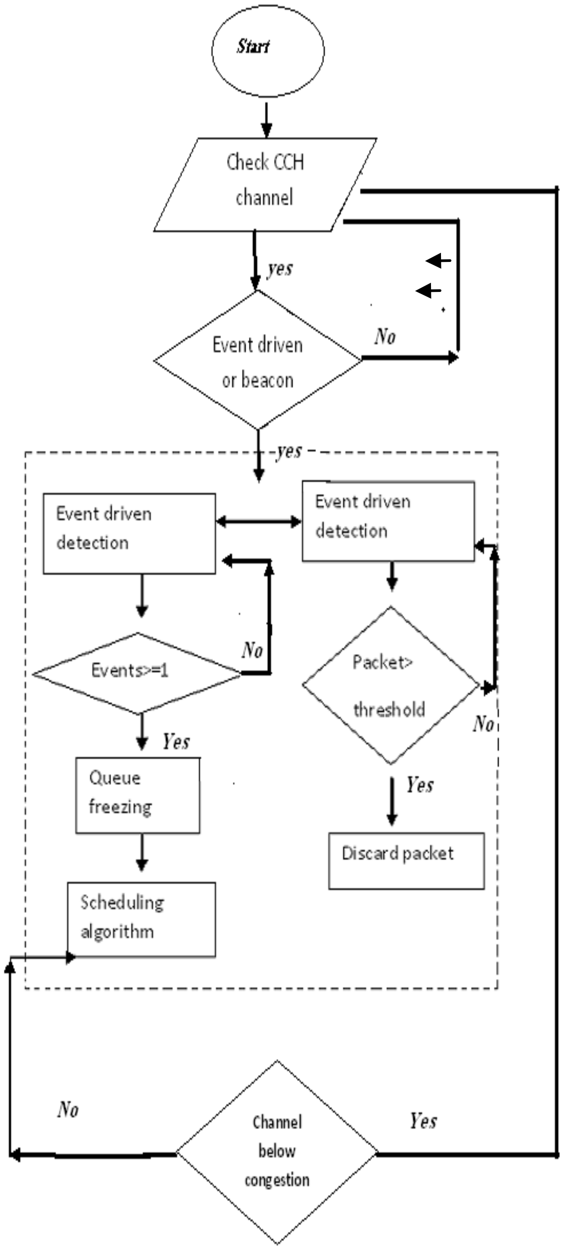

Figure 1: Flowchart steps of the proposed congestion control algorithm

4.1 Congestion Detection

The purpose of the congestion detection is to monitor Communication channel and detect congestion. We will apply emergency detection method and develop a new measurement-based detection method in proposed congestion control. The emergency detection method will block lower priority packets if the node detects emergency message. While the measurement-based detection method monitor the communication channel and detect communication channel for congestion. The communication channel is congested if the packet queues of beacon messages exceed the defined threshold, and the congestion control will discard further beacon messages. In dense network, we assumed the high number of beacon messages generated by vehicles.

4.2 Scheduling

In VANET, the packets with same priority are scheduled with FIFO approach. But FIFO technique is not suitable for all VANETS. So for this purpose fully distributed congestion (FDC) control algorithm is used. This algorithm set different priorities for each VANET application. The priorities depend on how crucial this information is for vehicle safety. The highest priority is given to emergency message, such as road accident or malfunctioning of brakes.

4.3 Rebroadcasting Scheme

In VANETs, its shared wireless medium, blindly broadcasting of packets may lead to frequent contention and collisions in transmission among neighbouring nodes.

5. EXPECTED OUTCOME

In this Paper, we have tried to expose the strong and weak points of some of the existing congestion control algorithms in VANETs. Our proposed algorithm will control the message crowd and make the communication channel available to the warning messages .It will definitely improve the efficiency of the communication channel as well as it ensures the timely delivery of the event driven messages in VANET environment. In future work, we are also planning to verify and evaluate performance of our proposed congestion control algorithms using network simulator with the help of some parameter.

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