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Review Article

ACCIDENT WARNING SYSTEM BASED ON VEHICULAR AD-HOC NETWORK (VANET): A REVIEW

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Vehicular Ad Hoc Networks (VANETs) are new paradigm of wireless communications that aim to exploit the recent advances in wireless devices technology to enable intelligent inter-vehicle communication. There are lots of studies about preventing or detecting the car accidents. Most of them include sensing objects which might cause accident or statistics about accidents. In this study, a system which detects happening accidents will be studied. The system will collect necessary information from neighbor vehicles and process that information using machine learning tools to detect possible accidents. This study aims to analyses traffic behavior and consider vehicles which move different than current traffic behavior as a possible accident. The goal of this system is to detect and warn the driver of potential hazard conditions.

Keywords: VANETs, Wireless communication, Traffic behavior

INTRODUCTION

Vehicular Ad-hoc Networks (VANETs) are considered suitable for AWS deployment mainly because of their infrastructure-less decentralized nature and dedicated car-to car communication spectrum. A VANET is a type of wireless network that is specially designed for intelligent transportation system. It uses short-range wireless communication protocol IEEE 802.11p and operates in the 5.9 GHz band that the Federal Communication Commission (FCC) allocated for Licensed Dedicated Short Range (LDSR) communication in the United States and the European Telecommunications Standards Institute allocated for Intelligent Transportation System in Europe. The p version of the 802.11 MAC is particularly designed with a view to reduce latency and enhance bandwidth of networks operating in a vehicularenvironment compared to other versions of the protocol. Unlike IEEE infrastructure based networks, such as cellular networks, a VANET is very flexible and can be formed on-the-fly. It also

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does not require expensive equipment apart from the wireless connectivity that is likely to be standard in next generation vehicles. AWSs and VANETs have a complex relationship that varies depending on the architecture of the system.

The next generation of vehicles will be equipped with automated Accident Warning Systems (AWSs) capable of warning neighboring vehicles about hazards that might lead to accidents. The key enabling technology for these systems is the Vehicular Ad-hoc Networks (VANET) but the dynamics of such networks make the crucial timely delivery of warning messages challenging. While most previously attempted implementations have used broadcast-based data dissemination schemes, these do not cope well as data traffic load or network density increases.

RELATED WORK

1. **Chowdhury *et al*.**, In this paper the author presented a practical model of an accident warning system by stipulating the requirements in a realistic manner and thoroughly reviewing previous proposals with a view to identify gaps in this area. According to author an Accident Warning System (AWS) was a safety application that provided collision avoidance notifications for next generation vehicles whilst Vehicular Ad-hoc Networks (VANETs) and provided the communication functionality to exchange these notifications. The main contribution of this paper was summarized as: identifying preliminaries and key requirements that were necessary to build an AWS and having reviewed existing proposals.
2. **Surmukh *et al*.,** In this paper the author presented various existing routing protocols with their merits and demerits. The research presented several routing protocols in VANET that may be a promising technology for intelligent transportation (ITS). It also presented some applications of VANET. The merits and demerits of the studied protocols were also described. By learning various routing protocols in VANET supported numerous traffic situations, it was analyzed that more analysis was needed to verify the numerous characteristics of a routing protocols.
3. **Barba *et al*.,** Author aimed to transmit information about the traffic conditions to help the driver take adequate decisions. In this work, the development of a warning system composed of Intelligent Traffic Lights (ITLs) that provided information to drivers about traffic density and weather conditions in the streets of a city was proposed. In this work the authors designed a smart city framework for VANETs that included intelligent traffic lights (ITLs) that transmitted warning messages and traffic statistics. They explained how the ITLs gather traffic and weather conditions of the roads.
4. **Karagiannis *et al*.,** in this paper the author introduced the basic characteristics of vehicular networks, provided an overview of applications and associated requirements, along with challenges and their proposed solutions. In addition, the author provided an overview of the current and past major ITS programs and projects in USA, Japan and Europe. The ITS architectures and protocol suites used in the different parts of the world were introduced and discussed. Finally the recent main

research challenges associated with vehicular networking were introduced and several solutions for these research challenges were described

5. **Kim *et al*.,** Author proposed a security model for Vehicular Ad-hoc Networks to distinguish spurious messages from legitimate messages. In this paper, they explored the information available in a VANET environment to enable vehicles to filter out malicious messages which were transmitted by a minority of misbehaving vehicles. More specifically, they introduced a message filtering model that leveraged multiple complementary sources of information to construct a multi-source detection model such that drivers were only alerted after some fraction of sources agree.

6. **Tonguz *et al*.,** Author reported the first complete version of a multi-hop broadcast protocol for (VANET). The results clearly showed that broadcasting in VANET was very different from routing in mobile ad hoc networks (MANET) due to several reasons such as network topology, mobility patterns, demographics, traffic patterns at different times of the day, etc. These differences implied that conventional ad hoc routing protocols such as DSR and AODV were not appropriate in VANETs for most vehicular broadcast applications. They identified three very different regimes that a vehicular broadcast protocol needed to work in: i) dense traffic regime; ii) sparse traffic regime; and iii) regular traffic regime. They built upon their previously proposed routing solutions for each regime and they showed that the broadcast message was disseminated efficiently.

7. **Lin Yang *et al*.**, Author proposed a channel adaptive broadcasting method. It relied solely on channel condition information available at each vehicle by employing standard supported sequence number mechanisms. The proposed method was fully compatible with 802.11 and introduces no communication overhead. Simulation studies showed that it outperformed standard broadcasting in term of reception rate and channel utilization. The proposed one-hop broadcasting protocol increased the reception rate at closer distances and alleviates collision possibility at further distances. It was fully compatible with 802.11 standards, consumed no extra network resource, and had little additional complexity. In the paper, the idea of sequence number based channel monitoring was verified by means of the analytical modeling and simulation study, and showed significant promise. Compared with the existing work, this method achieved the similar performance while having the merit of standard compatibility and low overhead.

8. **Haerri *et al*.**, In this paper author evaluated AODV and OLSR performance in realistic urban scenarios. They studied those protocols under varying metrics such as node mobility and vehicle density, and with varying traffic rates. They showed that clustering effects created by cars aggregating at intersections had remarkable impacts on evaluation and performance metrics. The main objective was to provide qualitative assessment of

the applicability of the protocols indifferent vehicular scenarios. This effect had a remarkable impact on standard performance evaluations of ad hoc protocols. The first one was that neither the initial nor the maximum velocity had any influence on routing protocols in urbane environments.

ANALYSIS OF THE VARIOUS RESEARCHES

While going through a couple of research papers we have come across various works which have got some weakness. The problem of designing efficient and effective warning systems has been widely studied by the author. This involves design of warning systems that are capable of acting proactively before an accident takes place, or spreading post-crash messages for avoiding further collisions, or both. The author present a practical AWS model based on a detailed requirements analysis and a comprehensive survey of previous proposals The method proposed here in base research is a very robust method to flood different category of warning messages in the surroundings. But it has certain drawbacks like it doesn't use a hop count to reduce relevance of messages with increasing distance. Next, it doesn't give a priority range to messages so that the vehicle can selectively display message to driver thereby avoiding flooding of broadcast messages.

PROPOSED WORK

Here, we propose a method, to generate warning messages, which can effectively control flooding of push messages but still not compromise with the relevance of messages. The message header looks like below

Hop count	Message detail	priority
Current speed	Breaking level	

The increase in hop count means to broadcast a message which it receives from another nearby vehicle. Then priority signifies the importance of message whether it's a normal or an urgent message. The vehicle sends its own current speed and braking level which has to be characterized with every vehicle quality by some external agency. This will help in better detection and prevention of accident messages thereby providing improved security.

CONCLUSION AND FUTURE WORK

The past decade has witnessed the confluence of Intelligent Transportation Systems (ITS) and Vehicular Ad hoc Networks (VANET) that promises to revolutionize incident detection and the timely dissemination of traffic-related information to the various interested parties. One of the key components is expected to be a Accident Warning System (AWS). In this work we have framed a methodology based on inter-vehicular interactions and interactions between vehicles and RSUs, which can be used for collision prediction. This paper follows a statistical approach to characterize the conditional probability of a collision given certain mobility parameters and states a mobility analysis to uncover the expressions of driver reaction time.

In the future, we plan to supplement our analytical results by extensive simulation such as importing real traffic data and simulating the performance of collision prediction. In addition, the cooperative collision warning can

integrate the sensor-based methods to enhance the robustness and correctness of prediction.

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