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VANET Based Message Authentication on Data Analysis for Avoiding Road Accident

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ABSTRACT: Every year road crashes result in loss of lakhs of lives and serious injuries to crores of people. In most of the cases crashes occurs either due to carelessness of driver or due to lack of road safety awareness of the road user. Vehicular Ad hoc Networks (VANET) are regarded as the adequate solution to cooperative driving between communicating cars on the road. Main findings of this project are to avoid serious accident on highway by giving as possible as much time before that dangerous situation arrised by alerting driver. Three main scenarios are considered for demo that causes serious accident on highways are -speed breaker detection, pre-collision warning and alcohol detection.

KEYWORDS: VANET, OBU, GPS, V2V, RSU, Safety Distance Calculation, Collision Avoidance.

I. INTRODUCTION

In today's world there has been increasing number of vehicles on the road than ever before. Road and transport has become an integral part of every human being. Driving is becoming a requisite part of any normal man's life. Road safety is emerging as a major social concern in the country. Road accident that causes injuries, fatalities, disabilities and hospitalization with severe socio economic costs across the country. According to the annual report of the TRW on "Road accident in India -2015", the total number of road accidents increased by 2.5 per cent from 4,89,400 in 2014 to 5,01,423 in 2015. The total number of persons killed in road accidents increased by 4.6 per cent from 1, 39,671 in 2014 to 1,46,133 in 2015. The analysis of road accident data 2015 reveals that about 1,374 accidents and 400 deaths take place every day on Indian roads which further translates into 57 accidents and loss of 17 lives on an average every hour in our country. Driver's fault has been revealed as the single most responsible factor for road accidents, killings and injuries on all roads in the country over a long period of time. Accidents and deaths are caused due to the exceeding lawful speed/over speeding by driver and a drunken driver, as he cannot perform his tasks without risks and endangers road safety due to Intake of alcohol/drugs.

Vehicular Ad-Hoc Networks, (VANET),comes under kind of Mobile Ad Hoc Network, (MANET), in which vehicles act as nodes and each vehicle is equipped with transmission capabilities which are interconnected to form a network. The topology created by vehicles is usually very dynamic and significantly non-uniformly distributed. Vehicular ad-hoc networks technology has emerged as an important research area over the last few years. Being ad-hoc in nature, VANET is a type of networks that is created from the concept of establishing a network of cars for a specific need or situation. VANETs have established as reliable networks where vehicles use for communication purpose on highways or urban environments. Vehicular ad-hoc networks are responsible for the communication between moving vehicles in a certain environment. According to architectures of network, VANET can be divided into three categories, the first of which is the Wireless Wide Area Network (WWAN) in which the access points of the cellular gateways are fixed in order to allow direct communication between the vehicles and the access points. However, these access points require costly installation, which is not feasible. The second category is the Hybrid Wireless Architecture in which WWAN access points are used at certain points while an ad hoc communication provides access and communication in

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between those access points. The third and final category is the Ad Hoc V2V Communication which does not require any fixed access points in order for the vehicles to communicate. Vehicles are equipped with wireless network cards, and a spontaneous setting up of an ad hoc network can be done for each .This study will focus on studying ad hoc V2V communication networks, which are also known as VANETs. The purpose of VANET is to allow wireless communication between vehicles on the road including the roadside wireless sensors, enabling the transfer of information to ensure driving safety and planning for dynamic routing, allowing mobile sensing as well as providing in-car entertainment. VANETs have unique characteristics which include dynamic topology, frequent disconnection of the networks, and varying environments for communication, the routing protocols.

Instant safety messages such as pre-collision warnings, blind-spot detection, pedestrian and object awareness significantly improve the safety for drivers, passengers, and pedestrians. As a result, vehicles would be able to travel closely yet safely together, forming a platoon, thus resulting in a reduction of traffic congestion and fuel consumption. Our aim is to reduce the number of people killed and injured on our roads every year because of road accident. By making car to car communication we can get alert with the help of cloud networking. Thus we can avoid roadside accident to save humans live. Three main scenarios are considered for demo that causes serious accident on highways are-speed breaker detection, pre-collision warning and alcohol detection.

II. RELATED WORK

Literature review

Zongjian He, Jiannong Cao and Tao Li,"MICE [1] described VANETs as reliable networks that vehicles use for communication purpose on highways or urban environments. The main objective of VANET is to help a group of vehicles to set up and maintain a communication network among them without using any central base station or any controller. Safety applications aim to improve the safety of passengers by exchanging relevant safety messages, examples are cooperative collision avoidance, and other hazard detection warning.

H. Hartenstein and K. P. Laberteaux [2] stated one of the major applications of VANET is in the critical medical emergency situations where there is no infrastructure while it is critical to pass on the information for saving human lives.

A. Studer, F. Bai, B. Bellur and A. Perrig [3] described that with massive amount of messages exchanged among driverless cars that command the cars' movements at high speeds and in close distances, any malicious alternation could lead to disastrous accidents. Message authentication to ensure data integrity is paramount to attack preparation. As a result, vehicles would be able to travel closely yet safely together, forming a platoon, thus resulting in a reduction of traffic congestion and fuel consumption.

L. Liang, A.J.A. Wang,"Bundle [4] described one of the first jobs of the gateway is to transform and normalize the data. The datasets generated by the sensor nodes will be in disparate formats. The gateway acquires heterogenous datasets from multiple sensor nodes and converts them to a standard format that is understood by the next stage of the data processing pipeline.

X. Lin, X. Sun, P.-H. Ho and X. Shen [5] examine how the certificate of vehicle is revoke when it misbehaves. The revocation decision is taken by RTO vehicle which observe the behaviour of vehicle before revoking it.

Rajendra Prasad Nayak [6] discussed about the Speed Based Lane Changing System in VANETs, for effective lane changing in the dynamic mobility model. In our approach we present the lane changing based system on speed and minimum gap between the vehicles in VANET.

Existing System of VANET

F. Li and Y. Wang, (2007) estimated that approximately 7% of all rear-end crashes could be reduced with forward collision warning systems, resulting in an economic benefit of $40 million (AU). Depending on various levels of effectiveness and acceptability, it was estimated up to 30% of fatal crashes could become serious injury and up to 30%. of serious injury crashes becoming injury crashes, while reductions of up to 12% of other injury and minor injury crashes were predicted [8]

H. Moustafa and Y. Zhang, [7] described the innovative techniques are employed to reduce the frequency of collisions of vehicles and to increase the safety of the life to the vehicle users.

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M. Sivasakthi and S. Suresh [9] had shown that static speed limits are posted totally based on ideal conditions in most jurisdictions and therefore it offers minimum support to drivers who have to decide a suitable driving-speed when the conditions are not ideal. He even gave combination of parameters which may be used to determine the proper numerical value of VSL.

X. Su [10] have suggested that preventing road accidents and injuries requires a "proactive approach" rather than reactive approach." Though Variable speed limit Technology does improve traffic flow but if it is integrated with VANET's infrastructure, then it'll will even contribute to the proactive approach.

III. PROPOSED ALGORITHM

A. ***Design Considerations:***

- Each vehicle is equipped with a GPS receiver that provides positional information (latitude, longitude) and direction.
- GPS receivers are known to have a localization error of ± 10 to 30m**.**
- Vehicles are capable of communication using 802.11; to transmit their GPS position to other nearby vehicles traveling on the highway.
- Considered all speed breaker position data stored on server cloud.
- Nodes are able to receive signal from server.
- Minimum distance (dist min) to be maintained between the two vehicles even after they come to a stop.
- The time (t) taken for the vehicle driver to react after receiving the alarm.
- Vehicles traveling in the same direction. Both vehicles are traveling with the same velocity but due to some reason instantly vehicle in front is traveling at a slower velocity than the rear vehicle.

B. ***Description of the Proposed Algorithm:***

Aim of the proposed algorithm is to calculates the distance between two locations (latitude and longitude). As per the research article on "Safety Distance Calculation for Collision Avoidance in Vehicular Ad hoc Networks "(SJET-2016), Haversine formula gives the shortest distance between two points over the earth's surface, ignoring elevation, hills etc. The system fetches two inputs that can be locations specified as either degrees, minutes, and seconds or by decimal degrees. The output is the distance in km and miles. Every vehicle on the highway can receive the GPS information of the other vehicles and calculate the distance (D) between its vehicle and the other vehicles using Haversine formula as given below:

Step 1: dlat = lat2 - lat1
Step 2: dlon = lon2 - lon1
Step 3: A = (sin (dlat/2)) ^2 + cos (lat1) * cos (lat2) * sin (dlon/2)) ^2
Step 4: C = 2* atan2 (sqrt (A), sqrt (1-A))
Step 5: D = R * C

Where (lat1, lon1) are the latitude and longitude of one vehicle and lat2, lon2 are the latitude and longitude of the second vehicle and R is the earth radius in kilo meter. The latitude and longitude values are given by GPS receiver in the form of degrees, minutes and seconds. The distance D is obtained in kilometer.

IV. PROPOSED SYSTEM

Main findings of proposed system is to avoid serious accident on highway by giving as possible as much time before that dangerous situation arrised by alerting driver. Three main scenarios are considered for demo that causes serious accident on highways are, speed breker detection, pre-collision warning and alcohol detection. We are getting data from alcohol sensor,GPS module and wi-fi module(ESP8266).This data is considered as input for Arduino controller. We are using java server to fetch data from server to OBU (On board unit) so that according to condition

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specified OBU can make decision and send alert to driver before any serious condition occur. In this way driver can get as much as time to take action before any collision or occurrences of accident. From GPS module we get latitude and longitude i.e position of car . This data is considered as input for Arduino controller. We send this lattitude and longitude value to Java server, server map this value with database. Thus, according to condition specified, system makes decision and display related message on LCD. At the same time buzzer is beeping to alert driver before any serious accident of occurrences.

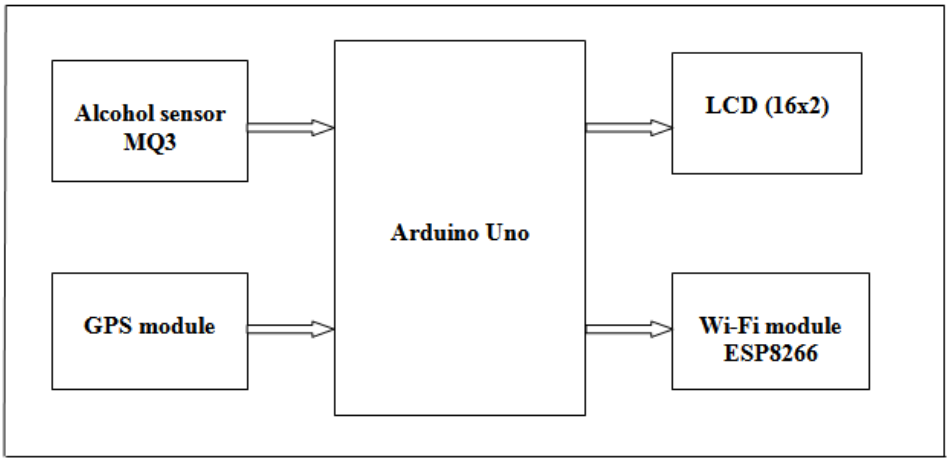

Fig 1: Architecture Design of Proposed System of vehicle section.

V. CONCLUSION AND FUTURE WORK

VANET are very effective means of communication between moving vehicles now a days. VANETs have unique characteristics which include dynamic topology, frequent disconnection of the networks, and varying environments for communication, the routing protocols with the help of which we are going to overcome issues related with road accident. VANET would provide better platform and effective communication between vehicles with further advancement and evolution of new approaches. The focus of this paper, is to determine relative position and driving context using GPS and vehicle velocity. Even with this limited amount of information, the proposed Haversines algorithm produced accurate results for the vehicle position and traffic context.

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