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A Review Paper on Accident Detection System Using Intelligent Algorithm for VANET

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Abstract
Our lives became easier with the Quick accretion of technology and infrastructure. The advent of technology has also rise the traffic hazards and the road accident take place repeatedly which causes massive loss of life and property because of the poor emergency facilities. Recently, intelligent transportation systems (ITS) have emerged as an efficient way of improving interpretation of transportation systems and enhancing travel safety. Accident detection systems are one of the most effective (ITS) tools. The accident detected system which based on Global Positioning System (GPS) and Global System for Mobile communication (GSM) can be accomplish though one or several sensors, the system can gathers the information and coordinates of accident spot then send this data to the rescues services center over a network link in shortest time, It represented as an instance helping system. In this review paper, we proposed an intelligent system that composed of a GPS receiver, Vibration sensor, GSM Modem and integrated with Vehicular AD-Hoc Network (VANET). The employ of (VANET) by enhanced Ad hoc On-Demand Distance Vector protocol (AODV) helps these services in finding the optimum route to the emergency message. The use of GSM, GPS, and VANET technologies allows the system to track vehicle and provides the most instant and accurate information about the vehicle accident spot.
Keywords: GPS, GSM, VANET, AODV.

I. INTRODUCTION

The rapid development of economic construction and people's living standard continues to improve. As well as road traffic accident take place frequently this caused huge losses of life and property to the country and people. Traffic has become an important event in the national interest. It will be serious consequences if people cannot send weft to the outside for help when traffic occur. Poor emergency incident is a major cause for the high number of traffic fatalities and the death rate in our country.

A number of technological and sociological improvements have helped reduce traffic fatalities during the past decade, e.g., each 1% increase in seatbelt usage is estimated to save 136 lives [2] , Moreover, each minute that an injured crash victim does not receive emergency medical care can make a large difference in their survival rate, i.e. Analysis shows that reducing accident response time by 1 min correlates to a six percent difference in the number of lives saved [3].

An effective approach for reducing traffic fatalities, therefore, is to reduce the time between when an accident occurs and when first responders, such as medical personnel, are dispatched to the scene of the accident. Accident detection system use sensors embedded in a car to determine when an accident has occurred. These systems immediately dispatch emergency medical personnel to serious accidents. Eliminating the time between accident occurrence and first responder dispatch reduces fatalities by 6% [4]. In this paper we discussed to the technologies which use in proposed system, GPS and GSM cooperate with VANET. In addition we studied in the related work research papers steps are being taken as to how to minimize the loss of life and property despite poor emergency facilities. The authors have also aimed at giving an overview of implementing safety services in vehicular systems of today and future development. We gave brief analysis to these research papers taking in consideration the Strengths and weaknesses. Then we proposed the system which based on vibration sensors and processing capabilities can be used to overcome the challenges of detecting traffic accidents and deliver the emergency message at short time.

II. GPS & GSM BASED SYSTEM

Mostly vehicle tracking systems are based on GPS and GSM. Short Messaging Service (SMS) is a feature available on all mobile phones which allows a small amount of text to be sent between one user and another. GPS consists of a network of 24 satellites in six different 12-hour orbital paths spaced so that at least five are in view from every point on the globe. Today, GPS has a wide range of other applications including tracking package delivery, mobile commerce, emergency response, exploration, surveying, law enforcement, recreation, wildlife tracking, search and rescue, roadside assistance, stolen vehicle recovery, satellite data processing, and resource management.

A. VEHICLE TRACKING SYSTEM

A vehicle tracking system combines the installation of an electronic device in a vehicle, or fleet of vehicles, with aim designed computer software at least at one operational base to enable the owner or a third party to track a vehicle's location, collecting data in the process from the field and send it to the base of operation. Modern

vehicle tracking systems commonly use GPS technology for locating the vehicle. Vehicle Information can be viewed on electronic maps via the Internet or specialized software.

Vehicle tracking systems are also salable in consumer vehicles as a theft protection and retrieval device. Police can simply follow the signal emitted by the tracking system and locate the stolen vehicle. When used as a security system, a Vehicle Tracking System may serve as either an extension to or instead of a traditional Car alarm. Some vehicle tracking systems make it possible to control vehicle remotely, including block doors or engine in case of emergency. The existence of vehicle tracking device then can be used to less the insurance cost [1].

B. GSM OVERVIEW

The GSM system was designed as a second generation (2G) cellular phone technology. One of the basic aims was to provide a system that would enable greater capacity to be achieved than the previous first generation analogue systems. GSM achieved this by using a digital TDMA (time division multiple access approach). By adopting this technique more users could be accommodated within the available bandwidth. In addition to this, ciphering of the digitally encoded speech was adopted to retain privacy. Using the earlier analogue cellular technologies it was possible for anyone with a scanner receiver to listen to calls and a number of famous personalities had been "eavesdropped" with embarrassing consequences.

C. GPS OVERVIEW

The GPS project was started in 1973 to overcome the limitations of previous navigation systems, integrating ideas from several predecessors, including a number of classified engineering design studies from the 1960s. GPS was created and realized by the U.S. Department of Defense (USDOD) and was originally run with 24 satellites. It became fully operational in 1994 [1]. The emergency services, for instance, can use GPS not only to find their way to an incident quicker than ever before but also to pinpoint the location of accidents and allow follow-up staff to find the scene quickly. This is particularly useful for search and rescue teams at sea and in extreme weather conditions on land where time can be a matter of life or death [6].

D. VANTE OVERVIEW

VANET belongs to wireless communication networks area, and it is the emerging field of MANETs in which vehicles act as the mobile nodes within the network. The basic aim of VANET is to increase safety of road users and comfort of passengers.

VANET is the wireless network in which communication takes place through wireless links mounted on each node (vehicle) [7]. Each node within VANET act as both, the candidate and router of the network as the nodes communicates through other intermediate node that lies within their own communication range. VANET are self-organizing network. It does not depend on any fixed network infrastructure. Although some fixed nodes act as the roadside units to facilitate the vehicular networks for serving geographical data or a gateway to internet [8]. Higher node mobility, speed and quick pattern movement are the main characteristics of VANET. This also causes rapid changes in network topology [9]. VANET is a particular type of MANET, in which vehicles act as nodes. Unlike MANET, vehicles move on predefined roads, vehicles velocity depends on the speed signs and in addition these vehicles also have to follow traffic signs and traffic signals [10].

There are many challenges in VANET that are needed to be solved in order to provide reliable services. Stable & reliable routing in VANET is one of the major issues. Hence more research is needed to be conducted in order to make VANET more applicable. As vehicles have dynamic behavior, high speed and mobility that make routing even more challenging [11].

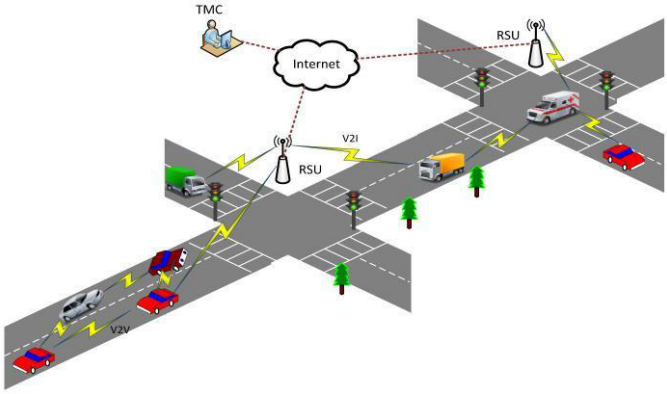

Figure 1: Infrastructure Application of VANET

VANET routing protocols history starts with traditional MANET protocols such as AODV (Ad hoc on Demand Distance Vector Routing) and DSR (Dynamic Source Routing). AODV and DSR have been considered effective for Multi hop wireless ad hoc networks [12]. Various routing protocols have been proposed to make routing more efficient and reliable in VANET.

E. ROUTING IN VANET

Routing in VANET has been analyzed widely within the past few decades. Since VANET is a particular type of ad-hoc network, the main difference between MANET and VANET is the high mobility pattern and suddenly changing topology. Routing protocols for VANET are commonly classified in two different categories according to their position accusation and the route update method [13]. They are:

Position Based Routing Protocol
Topology Based Routing Protocol
Broadcast Based Routing Protocol
Cluster Based Routing Protocol
Geo Cast Based Routing Protocol

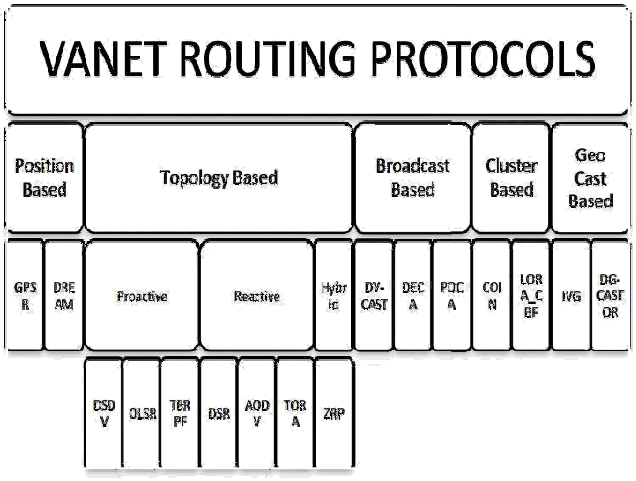

Figure 2: Routing protocol hierarchy

Practically most of tracking system and accident detection system depends on GSM and GPS technologies. The use of VANET with enhancement of routing protocol helps emergency services in finding the accident spot in short time within a large margin the arrival of emergency message.

III. RELATED WORK

Many traffic management systems develop various automatic incident detection methods to detect and respond to traffic incidents as timely as possible. While many researchers have gone into automatic incident detection based on GPS/GSM technologies, while other researchers focus on enhance of VANET routing protocol based on several algorithms. The literature review focuses upon reviewing the existing researches on automatic incident detection technologies and seeks for an efficient method of automated accident detection to deliver emergency data and VANET routing protocol enhancement.

Proposed a prototype architecture called e-NOTIFY [14], a novel proposal designed to improve the chances of survival for passengers involved in car accidents. The proposed system offers automated detection, reports, and assistance to passengers involved in road accidents by exploiting the capabilities offered by vehicular communication technologies. The goal of this system is to provide an architecture that allows 1) direct vehicle to vehicle (V2V) involved in the accident, 2) automatic sending of a data file containing important information about the incident to the control unit, and 3) a preliminary and automatic assessment of the damage to the vehicle and its occupants, based on the information received from the involved vehicles, and a database of accident reports. According to the reported information and the preliminary accident estimation, the system will alert the required rescue resources to optimize accident assistance

[15], proposed a Telematic model which has three main modules. The system is intended to capture the location of the vehicle through GPS receiver, send the location information to vehicle owner's mobile number through SMS and also to the Telematics operator server through GPRS. It consist of modules which are 1) A GPS receiver is required to get the accurate information from the GPS satellites GSM/GPRS 2) The GSM/GPRS modem utilizes the GSM network to send the location of the accident and other necessary information. The modem can be controlled by a microcontroller through AT Command set. 3) The microcontroller unit (MCU) receives data from the GPS, processes all data, send location of the vehicle to server and vehicle owner/family members.

[16] , proposed a prototype Come Safety, the main goal is to develop a European set of standards to support wide implementation and deployment of cooperative Intelligent Transportation Systems (ITS). Also it aims at coordinating the activities toward the realization of cooperative systems on European roads, focusing on all issues related to Vehicle to vehicle (V2V) and Vehicle to Infrastructure (V2I) communications. Such

technologies do not prevail in India hence we proposed this system.

[17], proposed Automatic Accident Alert and Safety System using Embedded GSM Interface, this system envisioned is automatic collision detection and warning system relying on GPS module and a GSM modem. The vehicle to be safeguarded is to be fitted with the system sturdily ensuring good mechanical coupling with the entire chassis. In the case of an accident the system detects it using the fact that the vehicle would be suddenly decelerated in such a condition. An accelerometer continuously monitors the acceleration of the vehicle and will detect decelerations greater than threshold value and send the data to the microcontroller via an ADC. The controller compares this with the threshold set value and immediately sends an SOS message to preset numbers. With this message the controller also transmits the GPS coordinates of the vehicle which it continuously obtains from the GPS module. This system will highly aid the search and rescue of vehicles that have met with an accident.

[18], introduced A working model of Automatic vehicle accident detection and messaging system using a GPS and GSM modems. The aim of this work is to find the vehicle accident location by means of sending a message using a system which is placed inside of vehicle system. The main purpose is to provide security to the vehicle in very reasonable cost. The biggest advantage of this research is, whenever the sensor is activated we will be immediately getting the acknowledgement from GSM modem to the mobile numbers which are stored in EEPROM, without any delay. This system locates the accident spot accurately, realizing the automation of accident detection and messaging system.

[19], proposed a distress call notification system using the Internet of Things and Cloud. the implementation of the proposed system using XBee WiFi module, Xbee Shield, GPS module, Seeeduino and crash sensors. The basic idea is to detect the occurrence of an accident using crash sensors, locate the exact position of the accident and communicate the co-ordinates of the location via Cloud using XBee WiFi to the nearest hospital.

The idea was to propose a system allowing global interconnect with the Internet of Things and Cloud. Despite the limitations mentioned above, the system is a step forward in the participation for realizing the Internet of Things on a wider basis. With the use of cloud application, the data can be transmitted to longer distances. This application can be further improvised by programming the system to also notify the immediate family members of the accident victim.

[20], presented a system prototype especially designed to detect and provide faster assistance to traffic accident victims. this system requires each vehicle to be endowed with a control unit (CU) responsible for detecting accident and onboard unit (OBU) reporting accident location for providing the necessary resources for the rescue operation. The proposed system which allow detection of traffic accidents for improving the assistance to injured passengers by reducing the response time of emergency services through the efficient communication of relevant information about accident.

[21] ,proposed a Performance Analysis in Routing Protocols for VANET, the main objective to this research is to study some of the important QOS metrics in VANET & vehicular traffic management solutions to improve overall safety of traffic. According to this study they found the delay and jitter in VANET would be adequate for most of the envisioned uni cast-based applications, whereas ratio the packet delivery and connection duration might not meet the requirements for most unicast-based applications.

[22], proposed an efficient system that automatically notifies these services about the accident and also guides emergency services to the spot. When an accident occurs, it is detected by the Crash Sensor of the Air Bag System installed in the vehicle. If these observations are above a preset critical point, a controller triggers a message to notify the Emergency Services. They Employ Vehicular AD-Hoc network (VANET) to deliver this message to the rescue services center. The general goal is proposed a complete automatic system for accident detection, alerting the rescue services and also assists them to reach the accident spot.

To reduce control overhead over the network (Omid Abedi et al.2009). [23] Improved AODV protocol and designed Prior-AODV. In this protocol, nodes are restricted by which they can't get the RREQ packets and by doing this number of discovered routes are decreased and as a result network overhead is reduced. In P-AODV, neighbors of any node divided into two categories based on their distance from source node; first category is prior neighbor and the second category is overhead neighbor. Both neighbors are present in their zone i.e. prior neighbor in prior zone and overhead neighbor in overhead zone. Prior zone of any node is the distance between threshold zone and transmission range of that node and overhead zone lies between node & respective threshold distance. In this protocol, broadcasting of RREQ packets is determined using two parameters. In first parameter, RREQ packets are restricted by which routes are limited. In second parameter, nodes are selected for which these restricted RREQ packets be sent to them. For the route discovery process, nodes first have to find their neighbor's type either it is overhead neighbor or it is prior neighbor. To implement this P-AODV protocol author uses GloMoSim library. The result shows that this protocol reduces the overhead and length of the route for data transmission in VANET environment.

To reduce the packet delay in the network Baozhu Li et al. [24] enhance AODV protocol and make a protocol called AODV-BD. The concept behind in this protocol is that data packets are broadcasted even when

the broken links are repaired. When there is a broken link, rather than sending a RREQ, node directly broadcasts a packet by which packet delay gets reduced and then the destination node transmits a RREP packet after receiving the data packets. The mobility model which is used to implement in this protocol is VANET MobiSim and the simulation is performed using NS-2.

Huaqun Guo et al. [25] enhance the common AODV protocol which we used in MANET and develop a protocol called AODV-VANET. The key consideration behind this protocol is to achieve an optimal path from a source to a destination for better delivery of data packets. To design AODV-VANET protocol, in the route discovery process weight of the route from source to destination node is calculated and added to the original AODV protocol. This optimized AODV-VANET protocol modifies RREQ & RREP messages in the route discovery phase. In RREQ message, source node initially added some information in RREQ like node speed, acceleration detail etc… In RREP, more weight and routing path is added in it and packet is sent to the source node. By this, the source node selects the best possible path with minimum amount of route weight on it among many possible routes. To implement AODV-VANET author used TraNS to generate realistic scenario and simulation is performed using NS-2.

In order to reduce end-to-end delivery of data packets in a VANET, Sufyan T. Faraj Al-Janabi et al. [26] proposed an enhance AODV called Bus-AODV. The key idea behind this protocol is that it only works for either a car or a bus. In the proposed model, the protocol selects only those routes in which there is less number of buses as compare to other vehicles. The advantage of this technique is that it reduces end-to-end delay in the network. The two important conditions for which author performs changes in AODV.CC file is; sequence number and hop count. Rather than select lower hop count for communication the proposed protocol chooses vehicle type i.e. it selects buses for packet forwarding.

IV. ANALYSIS OF THE VARIOUS RESEARCH PAPERS

While going through a couple of research papers we have come across various works which have got some weakness. The GSM and GPS module both play an important role in tracking and monitoring vehicles, but still it is found that there are some gaps where GSM technology fail in some times . Many spots over the roads not cover by GSM network like long road tunnels and GSM handoff spots. So if accidents happen at these locations, vehicle cannot send emergency message to request rescue services via GSM.

In other hand we can be seen that in some research papers, the most enhanced the ad-hoc on demand distance vector protocol (AODV) based on improve the protocol algorithm to achieve network metric performance. These researches adopting a normal traffic flow case, so these enhancement approaches and parameters unsuitable for special road cases scenario like what happen to the road traffic flow when accident occur.

V. PROPOSED WORK

Due to the GSM network problems which may happen in any location over the roads lead us to suggest use a redundant technology (VANET) to ensure and guarantee deliver the emergency message. Vehicle Ad hoc Network is a Network which contains mobile nodes that topology constantly changing. The mobile nodes can move quickly from one place to another place. Most current VANET routing protocols select paths according to minimum hop count. Minimum hop paths have poor performance because they tend to contain wireless links between far nodes. These long wireless links can be slow or lossy, leading to poor throughput. Cause to mobility the link between far nodes is broken speedily [27].

Proposed work can be considered by achieve method of routing which select path between the source and destination which are more stable than other paths through intermediate nodes. More stability paths can be select through a method which measures signal strength between nodes and select the average values. If received signal strength closest to the average values then it is accepted for further processing otherwise it is discarded. The benefit of this scheme is by selecting average routes to the destination, we can optimize the lifetime of the network and to meet the goal of the Accident detection system to send emergency message in short time and guarantee arrives to rescue services center.

In general, Accident detection system with VANET provide redundancy to send message to RSC ,also the expected result of the proposed algorithm will improve the network performance by avoiding broadcasting storm and decrease delivery time to the emergency message. The new algorithm will support the link stability by select the nodes have average lifetime taking in consideration the traffic flow when accidents happen.

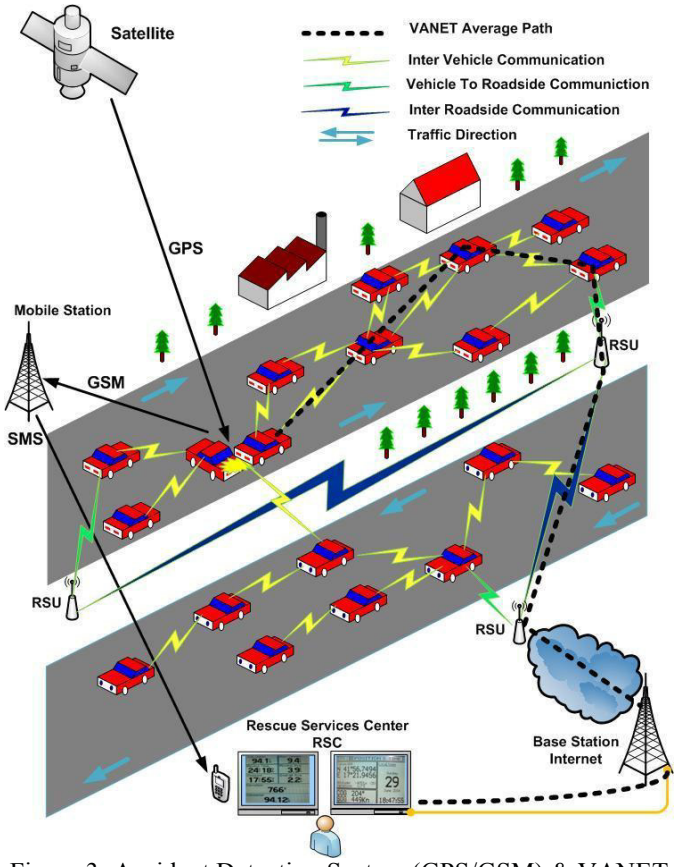

Figure 3: Accident Detection System (GPS/GSM) & VANET

VI.CONCLUSION

As the concluding part of this research, we can say that "Without proper action at proper time, danger awaits us with a bigger face." We must act on time when a person is injured. We must take care of person the way it is meant. Otherwise, a valuable life might be lost .We need to understand how precious lives of people are and what importance first-aid carries in saving these precious lives. This project is indeed helpful to the common people. Road accidents are common in whole over the world. Usually accident occurs in areas which are far away from the emergency centers, so the risk of deaths increases. Therefore with the help of this system the risk of deaths can be decreased to a large extent. This system based on (GPS, GPS and VANET) is more reliable for the fact of accuracy for detect an accident spot and informs the rescue services center by providing two routes to deliver emergency message. VANET helps in finding the optimize route to the emergency message by using enhanced AODV algorithm.

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