An Android App for Traffic Pre-Emption using VANET

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***Abstract*— Nowadays road accidents, traffic congestion and road hazards are the main traffic problem that are facing today. According to the survey made, India was listed under top 10 countries were maximum road accidents are taking place. To overcome, VANET can play a major role. The project is focusing on an android app, a database server and the hardware equipment's. Using the app, the user can know the traffic congestion prior, if in case accident occurred then the hardware equipment's report to the main server automatically with the help of GPS module, so that the web server can forward that message to authorized person. The app can also help with the route direction, weather forecasting and also it can warn the driver if there is a chance of accident due to the speed of the vehicle or any such symptoms. The Project can save many lives. It can detect the unaware accidents and the app can save their lives.**

Keywords—Android app; database server; web server; GPS module.

I. INTRODUCTION

Road safety is one issue that needs unique attention as there's one death reported every four minutes on the streets of India[1]. While traffic signals are necessary to safely control competing flows of traffic, they inevitably enforce a stop-and-go movement pattern that increases fuel consumption, reduces traffic flow and causes traffic jams. These side effects can be alleviated by providing drivers and their onboard computational devices (*e.g.*, vehicle computer, smartphone) with information about the schedule of the traffic signals ahead. With more than 272,000 traffic signals in major intersections of the USA alone [2], our daily driving experience is significantly influenced by them. India holds the most noteworthy number of deaths caused by road accidents. About five lakh street mishaps were accounted for in 2013 in which more than five lakh individuals lost their lives. A substantial amount of the victimized people were somewhere around 30 and 44 years old. Reliable with a web article revealed in Deutsche Welle[3] by Murali Krishnan dated 29.04.2010, The record in deaths due to accidents in India has touched a new squat, as toll rose to at least 14 deaths per hour in 2009 against 13 the past year.

According to another article in the Times of India, by Dipak Kumar Dash, dated Aug 17, 2009, our nation leads the globe in accident deaths on roads. Our Government and Automotive industries nowadays pay more attention towards traffic management and regulation of safe and efficient traffic measures. They are now investing many resources to prevent the adverse impact of dangerous traffic situations on human beings, thereby increasing traffic efficiency and road safety. The advancements in technology have opened more opportunities in this context. One among the foremost promising areas is that the study of the communication between vehicles and between vehicles and Road Side Units (RSUs), that result in the emergence of the Vehicular ad hoc network (VANET)[4].

Countdown timers at vehicular traffic signals constitute another alternative approach to assist drivers; digital timers next to the traffic signal display the time till the signal changes from red to green and vice versa. Such traffic signals are deployed only in a few cities, such as Copenhagen, Kuala Lampur, Bangkok and New Delhi. The cost of updating existing traffic signals to include such timers has hindered their widespread deploy

Countdown timers for pedestrian traffic signals are much more common in the USA and the rest of the world, and drivers can sometimes use these to infer when the light will turn green. However, very often these are not visible from far away but only after one has reached the intersection. At that time, it is too late for drivers to adapt speed and so they need anyway to come to a complete halt. Furthermore, at some intersections it is not easy or even possible for the driver to infer the time the signal will switch; the intersection may have a complex phase schedule and the green light for the driver may not come straight after some pedestrian timer counts down to zero.

The smartphone industry is advancing quickly. Existing smartphones are endowed with multiple wireless interfaces and high computational power, being able to perform a wide variety of tasks. By combining smartphones with existing vehicles through an appropriate interface we are able to move closer to the smart vehicle paradigm, offering the user new functionalities and services when driving. smartphones are used as an alternative On-Board-Unit (OBU) within the vehicle, accessing the information in the vehicle's internal bus wirelessly. The only requirement to achieve this goal is that the vehicle supports the OBD-II standard [5]. Since this standard is mandatory since 2001, the solution is applicable to all vehicles aged 10 years or less (as of 2011). In this work, a specialized smartphone application was developed to provide support for emergency services based on the information available in the communications bus of the vehicle. Positive accident detection is followed by any sequence of actions

defined by the user, such as sending accident details through signals to the server. In return the server sends the signal via SMS or any communication signals to the emergency services. In particular, we compare the accuracy of the acceleration estimation using either: (i) GPS information, (ii) accelerometer information, and (iii) vehicular speed provided by an OBD-II interface.

The project's objective is to develop a system that can facilitate reporting and hence alerting the drivers about things happening in their surrounding region thereby extending the range of emergency warnings. It also describes a traffic signaling method to complement the existing traffic signaling for pre-empting the traffic lights in case of emergency. Other drivers can be warned earlier and are provided with detailed information about the route of the approaching emergency vehicle. This enables them to react timely and appropriately so that they do not block the emergency vehicle. Also a pedestrian carrying a Smartphone installed with Android App app can report about road accidents, hazards and congestion that come across his journey directly to the authority on click of a button and avail emergency service to the injured without involving into its legal side. In case if the user is driving, facilities are provided such that the OBU kept inside the vehicle detects the accident automatically and reports it to the authority.

Results have shown that the application developed is able to correctly fulfill its purpose within a short time period, opening new research opportunities for the integration of smartphones and vehicular networks. This paper is organized as follows. Section II presents the related work and background. In section III, the architecture of the proposed system is presented. Conclusions are presented in section IV.

II. STATE OF ART

In the past years we have been watching a surging enthusiasm toward enhancing the applications for traffic management and road safety, to decrease the road hazards, congestion and accidents. In this manner, gathering road traffic information routines have been developed impressively. Strategies focused around the vehicle's location, in the same way as the Floating Car Data (FCD) , are a guaranteeing savvy answer for surmount the constraints of preset street side detectors. The guideline of FCD is to gather ongoing activity information by placing vehicles through Global Positioning System (GPS) or cell telephones. However, recovered information couldn't be so correct to gauge go times. A few upgrades to the FCD procedure have been proposed by G. Remy et al., chiefly focused around a decentralized methodology, as indicated by which every vehicle expressly creates its own particular information before transmitting it over the system. In the decentralized FCD construction modeling, the creators propose the Long Term Evolution (LTE) innovation to remotely exchange position and kinematics data. In this General Packet Radio Service (GPRS) and Universal Mobile Telecommunications System (UMTS) are utilized to unite every vehicle with the remote server.

Smartphone support many radio interfaces, for instance, both Wi-Fi and 3G technologies, which can be used to enhance data retrieval in VANET. Jorge Zaldivar et al. [8], proposed an Android based application that screens the vehicle through an On-Board Diagnostics (OBD-II) interface, having the capacity to identify accidents. The application responds to positive discovery by sending insights about the accident through either email or SMS to predefined targets, promptly took after by a programmed telephone call to the crisis administrations. An Android application is proposed by K. Athavan [9] to locate and notify mishaps. The Smartphone peruses Controller Area Network (CAN) transport information through the setup of a Bluetooth association with an On-board Diagnostics (OBD) interface.

The application scans the vehicle speed, the airbag sensor status, and accelerometer data; if a mishap happens then it is speedily informed, by sending SMS or an email or a telephone call to the crisis administration. In another article [10] the utilization of Smartphone is recommended to revise awful driving propensities and the outlined smartphone application coupled with sensors can discover the driving example and propose new practices to diminish the fuel utilization. A context-aware embedded system was designed and implemented by S. Cai.et.al. [11] to deploy context-aware applications.

This paper is further influenced by the expansive business accessibility of low-cost gadgets that permit private clients, even credulous, to effectively get access to their vehicle's parameters. For a discrete information gathering to be effective, the client cooperation is a key necessity. From one perspective, many people may be hesitant to join this sort of initiative, since they are compelled to purchase the hardware and to manage the cost of correspondence expenses to transmit gathered information via the Smartphone. Even then, a developing number of drivers are ready to pay to have admittance to use this facility. The boundless accessibility of Internet integration empowered by level rate memberships can fortify nationals' contributions in the information gathering. Likewise, the quick development of social networking could further propel clients to furnish their vehicles with a Android App like app for actualize 'Social IoT' (Social Internet of Things) applications.

III. PROPOSED SYSTEM

This undertaking is a Smartphone coordinated driving security application that makes utilization of a devoted equipment prepared inside the vehicle to interface with the vehicle and its environment. Not at all like existing arrangements, the product is composed additionally to play out the choice Wi-Fi Direct innovation for information transmission between vehicles. The Hardware units so outlined is an alternate approach executed progressively. It is an easy to- use course of action, which just requires the customer to interface the Smartphone enabled with Android App, to

the OBU stage. It suspects an android application module in the Smartphone in charge of client connection with the server and different clients.

A. Proposed System architecture

The framework comprises of an On-Board Unit, an android application in the Smartphone, a server and Road Side Units (RSUs). The OBU is put inside the vehicle. RSU is intended to put at the street convergences. The server constitutes a facilitated database and a web application. The android application so created is titled Android App It is incorporated into a route framework that grants get to guides, current area and course data through an interface. The application is developed to the point that a person on foot conveying a Smartphone introduced with Android App likewise can report any mishaps or street dangers straightforwardly to the expert on snap of a catch and reports to the authorities. On the off chance that if the client is driving, offices are given with the end goal that the OBU kept inside the vehicle distinguishes the mischance consequently and reports it to the expert. Availability amongst OBU and Smartphone is accomplished through the Bluetooth innovation. The correspondence between the RSUs is built up with the RF handset. Vehicles can speak with themselves through Wi-Fi Direct.

The contingent on different occasions, for example, mishap, therapeutic crisis, sudden breakdown and blockage, the Smartphone will send messages demonstrating the pertinent information alongside the area of the vehicle to the fundamental server. The server monitors every vehicle and ongoing movement information. The server speaks with every vehicle and will additionally encourage applicable administration. The design of this framework is appeared in the Fig.1.The framework parts and their capacities are:

- OBU: It gathers the sensed data from vehicles. It is thus responsible for data acquisition and collection from different sensors equipped in the vehicle.
- RSU: Controls the traffic signal.
- A hosted database: to store user accounts, vehicle details, hospital details and emergency vehicle details.
- A web application:
- Website-Provides an interface to create, manage and monitor vehicle and hospital registration.
- HTTP Service- To facilitate requests from the mobile client to the database server where the data is stored it will also facilitate the communication between the client mobile devices and the database server.
- Android application-client that will allow users to participate in the Android App Androidapplication.

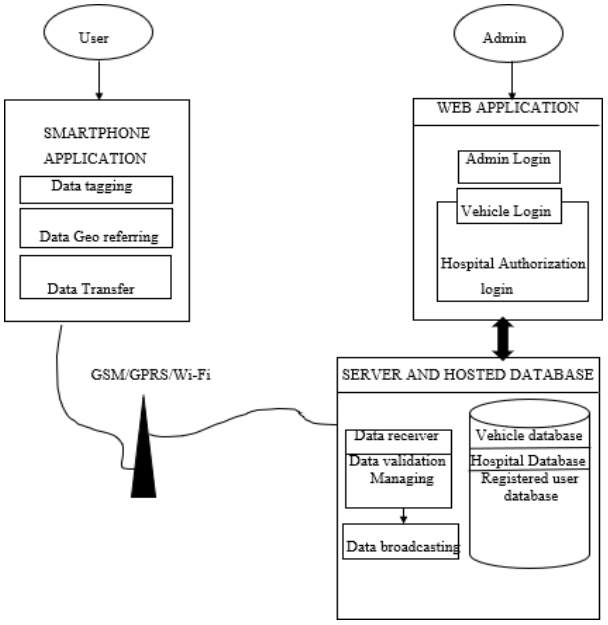


Fig 1: Proposed system architecture

The framework in this manner is a combination of installed, Android and .Net stages. Fig.2 indicates how the segments are associated with each other. The web application is constructed in light of the customer/server demonstrate. The web application and database are on the server-side, and the versatile application is the customer. Both the web application and versatile application will likewise influence utilization of a 3- level to approach where every level is produced and kept up as autonomous modules. Three-level engineering has the accompanying three levels, as delineated underneath:

- Presentation tier: This is the topmost level of the application which displays the information which the users can directly access.
- Application tier (Controllers): The application tier is also known as the business logic or logic tier. It is the middle layer, and controls application functionality by performing detailed processing.
- Data tier: This tier consists of the database server. Information is stored and retrieved here.

The information level will execute the information show and will exist on the server close by the web application. The web application will give the introduction and application level required to permit the creation, administration and observing of the application, however it will likewise encourage the correspondence between the customer cell phones and the database server.

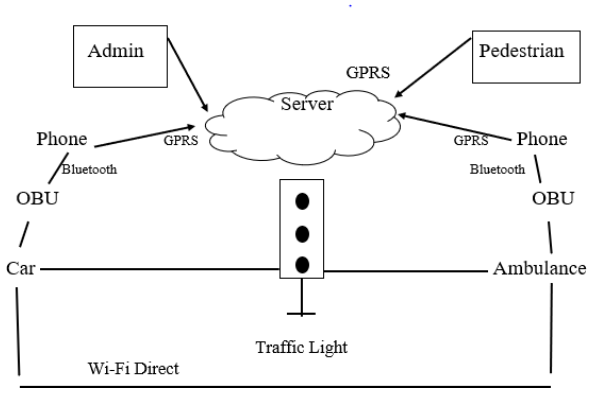


Fig 2: Network Architecture

B. On Board Unit & Road Side Units (OBU &RSUs)

The on-board unit (OBU) is the gadget, introduced in the engine vehicle of the street client. The OBU permits the BelToll framework to gather toll through precise ID of the toll-paying vehicle and handling of put away information, and the Vehicular correspondence frameworks are organizes in which vehicles and roadside units are the conveying hubs, furnishing each other with data, for example, security notices and movement data. Vehicular correspondences is typically created as a piece of keen transportation frameworks (ITS).

OBU is the information accumulation and pre-handling module which is kept inside the vehicle. It is acknowledged through a devoted microcontroller board accepting contributions from sensors, inside the auto itself. It is likewise in charge of consolidating and incidentally putting away recovered information. As per the proposed framework, each vehicle ought to be outfitted with OBU. The OBU comprises of an accelerometer for detecting any expansive scale vibration in the vehicle, and thusly distinguishes mishaps, ultrasonic sensor to recognize the deterrents in front of the vehicle and henceforth to check if the vehicle is keeping a protected separation from different vehicles in front of it, a microcontroller, a bell, a Bluetooth module, UI switches and status LEDs.On gathering of these detected information, the microcontroller checks them against their edge esteems.

In the event that the detected information is past these qualities, the controller turns on the bell alarming the driver. The accelerometer indicates x, y and z facilitate values. The controller contrasts them and an edge esteem and on the off chance that it surpasses that, at that point the controller naturally sends a summon to the android application for setting off the mishap occasion. The application is designed to the point that it begins a clock show on gathering of this charge. In the event of a minor mishap, the traveler most likely would not require the administration of the rescue vehicle and can thusly turn off the clock before time out, by squeezing a reset switch in the OBU. Or something bad might happen, on time out it would trigger the detailing occasion relating to mischance and sends the vehicle id and its present area (scope and the longitude) to the server.

Alongside this reset switch there are 2 more status switches in the OBU. One of them is utilized as an interface for detailing therapeutic crisis. At the point when this switch is squeezed the controller sends a charge to the android application which from that point sends a demand to the server for allowing the vehicle as a crisis element. The server gives this demand and sends back subtle elements of course to the healing center to the cell phone. On the off chance that if the vehicle faces a sudden breakdown or any irregular conditions like smoothed tire, client can report it by squeezing the other switch. At the point when this happens the controller sends another summon to the cell phone, which will start vehicle to vehicle correspondence action through Wi- Fi Direct. The correspondence amongst OBU and RSU is set up through the RF handset. At the point when the vehicle turns into a crisis element, it will send a one of a kind transmitter ID by means of the RF transmitter. The transmission recurrence for the model is 435 MHZ.

RSU comprises of two subsystems; one for the current activity framework (Traffic Junction Unit-TU) and the other one is a Smart Traffic Control Unit (STCU) that can work in conjunction with the current one. Activity flag framework containing STCU screens and controls the entire movement and offers need to crisis vehicles with the goal that they won't stay at crossing point focuses for long. STCU comprises of two modules; Junction Unit (JU) and Repeater Unit (RU). The RU is intended to be set 900m far from the JU, which is kept alongside the TU at flagging Junction. At the point when a crisis vehicle outfitted with a RF transmitter approaches this Repeater unit, it sends this data to the JU. On getting this data the JU cripples TU and runs its own crisis mode succession and turns on the green flag toward that path when the vehicle achieves the activity convergence.

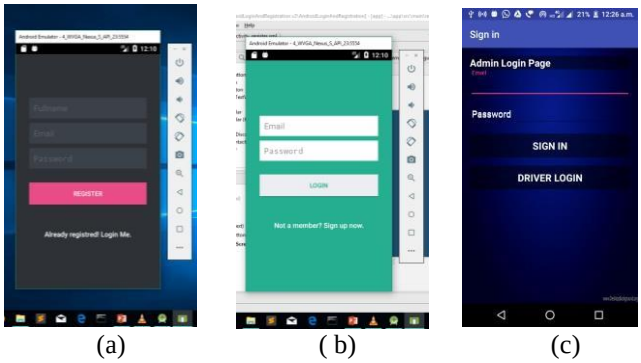
C. The Android APP

The Android App application is exhibited in an instinctual way and give simple to utilize functionalities to acknowledge information from the OBU and from the client. Bluetooth correspondence is utilized essentially to do the information correspondence between the OBU and the Android cell phone. A Bluetooth association with the OBU is started from the Android App application on the Android gadget while the OBU is turned on. In the event that the client is a person on foot, the application can be keep running without summoning Bluetooth benefit. Android App has the accompanying principle capacities:

- Receiving Data from OBU.
- Setting up and keeping up association with the facilitated database and the Web Application.
- Tagging Data recovered from OBU with the GPS data.
- Displaying data to the customer through Graphical User Interfaces (GUI)
- Transmitting Data to the facilitated database.
- Vehicle to vehicle correspondence foundation.

The information got from OBU is incorporated with

information amassed by the cell phone itself, i.e., GPS data, time and area arranges. The data are then transmitted to the server. Cell GPRS innovations and the Wi-Fi interface are utilized for this reason. The server accepting the information can incorporate the data furnished with every vehicle. By following the area of a Android App -prepared vehicle, a close constant kinematics data can be given the server. The OBU module also reports about a sudden vehicle blame and the comparing information are quickly transmitted over the most solid and low-inertness Wi-Fi coordinate availability interface. Consequently the Android App application handles, Safety applications to maintain a strategic distance from crashes, In conjunction with OBU reports naturally about accident, Alerts about mishaps in close-by places in its route, Alerts and reports session street risks and genuine activity infringement, Alerts and reports about estimate of crisis vehicles, thus forth, Applications for movement administration and checking, which permit cautioning and additionally staying away from automobile overloads.



(a) (b) (c)

(d) (e)

Fig 3: Smartphone Application Snapshots
(a) Register activity
(b) Login activity (c) Hospital admin activity (d) Ambulance driver activity (e) Getting map location from ambulance driver

The user interfaces of the app consist of 5 activity classes in Fig 3. The layout for different activities in an application can be defined using the XML based layout file. The first one is the "Register" activity that is implemented as the welcoming screen. The user interface of this activity consists of linear layout components, three text views and a button widget that is used to register into the application and proceed to the next activity. If the user is already registered then, by clicking "LOGIN ME" link in this activity, the user is directed to second activity which corresponds to the sign up activity.

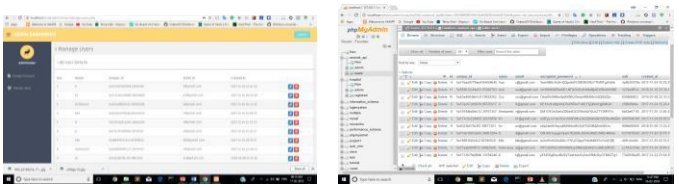
If the user is already an existing one, after clicking the LOGIN IN button he will be directed to the admin page, which lets the user to select either user login or driver login options. On selection of the Drive-in option the application will invoke the Bluetooth service to get connected with the OBU. After connection establishment he is navigated to the main activity of the app, where he will get the longitude and latitude of the particular location where the accident has happened.

D. The Hosted Database and the Web Application.

The server imparts and controls all aspects of the framework. The site ought to be open, in a perfect world by means of any gadget with web availability. The server must have the accompanying databases:

- •A healing center database - containing doctor's facility name and its area (GPS organizes) points of interest.
- •A vehicle database-containing subtle element of every enrolled vehicle.
- •Registered client database - contains every one of the subtle elements of the enlisted clients.

The site has the login office for the Admin, vehicle expert and the healing center specialist. At the point when a vehicle meets with a mishap, the Android App application promptly sends GPS area alongside the vehicle subtle elements to the server in Fig 4. The server at that point chooses the closest rescue vehicle to the mischance spot from the emergency vehicle database containing the subtle elements of free and occupied ambulances by then of time. From there on the server sends the area of the mischance vehicle and the healing center to the Ambulance.



(a) (b)

Fig 4: Web server Snapshots (a) Admin WebUI for managing users (b) Database of registered users

IV CONCLUSION

In this paper, we portrayed about our task in which we planned a VANET based framework that disperses movement related messages in a vehicular system. The framework encouraged detailing and henceforth cautioning the drivers about things occurring in their encompassing district for expanding the scope of crisis notices and to supplement the current activity flag strategies for pre-empting the movement light. A simple strategy for usage of an apparatus for sending VANETs with OBU and the Android App application is in this manner introduced. This application energizes the speedy advancement of vehicular systems. Thus, its advancement can go about as a motor for advance imaginative undertakings in ITS.

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