Vehicle Accident Detection using IoT & Live Tracking using Geo-Coordinates

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Abstract— In today's daily life, vehicle holds an important place in every one's life. Each day millions of peoples uses personal and public transport system to reach to their location on time. In these transport systems, roadways transport is one of the major transport systems used by commuters. Roadways transport system not only allows the commuters to reach their destination but also allows tons of goods to reach their destination. This roadways transport system gets effected when it met with the accident. It may be due to various reason but most of the cases comes from drink and drive habits. Using the help of various sensors, GPS, GSM and IoT, we can detect accident and exact location of the vehicle. GPS fetches the Geo-Coordinates of the vehicle and using the help of Google Maps API, we can track to the location of vehicle which had an accident. It will help the Ambulance to reach the location with fastest route and save precious life. Using the help of Alcohol sensor, we can also control the ignition of engine in a way to prevent an Accident.

Keywords: GPS, GSM, Real-time Tracking, Maps Positioning, IoT

I. INTRODUCTION

The development of technology is increasing day by day and it is solving our daily needed works in very short span of time. As the access to internet is getting smooth, number of internet-based devices are also increasing in exponential way. These developments are converting our world into a smart digital world. In today's era, we all are somehow dependent on the internet to fulfill our daily necessities. Using maps to reach our destination faster, to order food online, to purchase medicines online, every platform is now connected with internet. Thus, area captured by internet in our daily life in increasing day by day.

In developing countries where everything is changing at very fast rate, chance of meeting an accident is very high. Every developing sector is prone area of accident. This accident graph is increasing day by day and one of the major contributions in this graph is from road accidents. In a survey, 1.25 million peoples died due to road accident and 15% is only from drunken driving. These statistics are very disheartening for a nation which is on the path of becoming a developed nation. Road accidents which took place in remote areas are very hard to get traced. It is due to the fact that in a developing nation, neither every corner is covered with high speed internet nor every part is covered with cellular connectivity. Hence to find the location where accident occurred is a major challenge for the hospital and police authority which results in loss of valuable lives.

II. METHODOLOGY

This study includes the implementations of IOT in the field of automotive sector. It is developed on IOT platform using the help of existing embedded system of vehicles. Sensors and actuators are used to get the data and controller is used to perform the instructions based on the data received from the sensors. Benefits of implementing this concept are: safety of passengers can be achieved by locking the ignition system of the vehicle if the driver is drunk. If an accident took place, we can easily find the location of accident using the geo-coordinates. GPS module will send the data to server where we can track the location using Google Maps. GSM module will send a text alert to relatives of the passengers along with the co-ordinates.

III. RELATED WORK & DISCUSSION

In this research paper, GPS module is used to provide the location of vehicle if it met an accident. GSM modem is used to send the latitude and longitude of the vehicle so that it will get traced on the Google maps. Location provided on the mobile via SMS and by clicking the link it will be directed to the server where Google maps will show the tracking details.

1) The system is based on the concept of IOT where device will share the data to the webserver so that it can be available through-out the globe and anyone which have the proper credentials can access the data.

2) The ASAD system is inbuilt with the vehicle along with the controlling units of vehicle. It is interfaced with the ECU of cars which have the proper protocols access on which sensors are interfaced.

3) Tilt sensor is interfaced with the controller which gives the information about the accident. Once the vehicle had an accident, it will send the command to the controller to execute the instruction written in the program.

4) Once the accident is confirmed, the much-needed information Latitude and Longitude are shared with the local authorities and the nearby hospitals and police stations so that valuable lives can be saved.

5) As a pre-safety measure, alcohol sensor is attached nearby driver area. Any consumption of alcohol by the driver will led to seize the ignition of engine and passengers are alarmed.

6) Accident detection and tracking algorithm is used by author is dependent on the platform of IOT. Data sent to the server can be viewed and used by the authorized people and proper credentials were shared.

7) Wi-Fi connectivity is required every time to put the data to the server from device. If Wi-Fi is not available data from device is sent to mobile using SMS along with the Latitude and Longitude details.

8) Threshold value is defined for the Tilt sensor, so that false reading can't be used to trigger the alarm of accident. That threshold value is collected from the

standard impact force calculator panel. Based on the data, threshold value is calculated.

9) This is not useful in those area which have low cellular connectivity and GPRS connectivity. As device will put the data to the server which require Internet connectivity throughout the device. System will also send SMS to the user's mobile hence for this purpose cellular connectivity is required.

10) Mobile should be present at the user's side so that information about the accident can be shared and necessary actions can be taken place.

IV. PROPOSED SYSTEM

On the basis of above survey and description, our system includes Tilt sensor, Alcohol sensor, IR sensor, Vibration sensor and different communication modules like GSM, GPS to find out the exact location of the device. Once the location is fetched, Latitude and Longitude data is submitted to webserver where Google map api comes into picture and locate the place using Geo-coordinates.

Alcohol sensor will detect if driver of the vehicle is drunk or not, if he is drunk command to seize the ignition of Engine is sent to the ECU of Vehicle otherwise Engine will start. If vehicle met with accident during its journey then sensor values are captured and sent to the Webserver indicating that accident of the vehicle has been occurred.

That data consists of Latitude and Longitude of the location including the date and time of the accident. Once we landed to the web portal, there is an option to track the location using Google Maps. Accident alert SMS is also sent to the registered mobile number informing the location and time of Accident. To interface GSM and GPS, serial communication UART protocol is used. Other sensors are interfaced with the help of ADC present on the Arduino. Data is collected and compared with threshold value written in program.
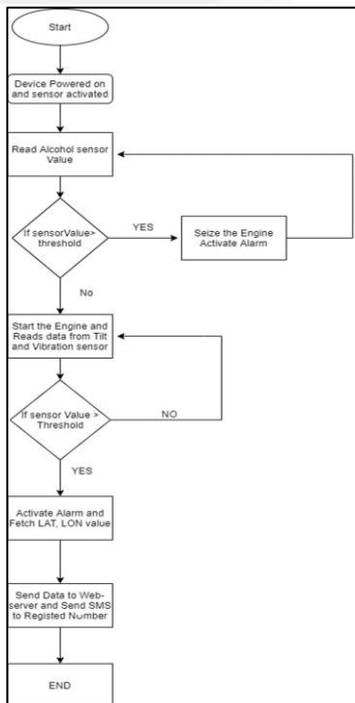

Fig. 1: Flow Chart of the Proposed System

A. Arduino Uno

This is the controlling unit in device which in incorporated with the ECU of vehicle. This controller is from AVR family of micro-controller. AVR stands for Advance virtual RISC. RISC is reduced instruction set computing. This controller has architecture which is of 8-bit architecture, it means data flow on its data lines are of 8-bit. We can also demonstrate this as the size of data carried by the data bus is of 8-bit. This controller has inbuilt crystal oscillator, so in hardware module no need to connect crystal oscillator as clock pulse is provided by internal source. Arduino is the general-purpose development board developed by Arduino Corporation to increase the knowledge of robotics in programming world. This is open source development board so that no need to purchase any library or IDE for its development. Arduino family of development boards have various variants in it. We are focusing on Arduino UNO, one of its variants which used ATMEGA328P controller as its computing unit.
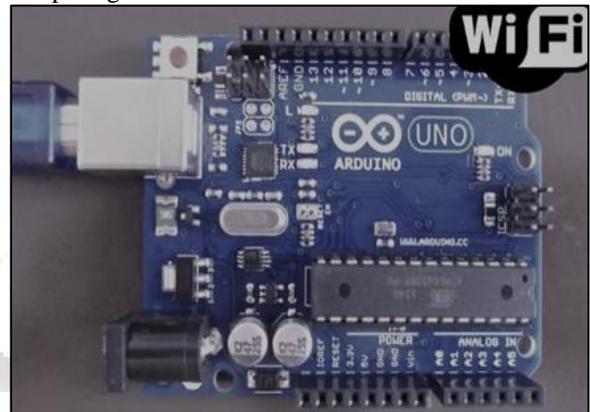

Fig. 2: Arduino Uno

B. GPS

GPS is an acronym of Global Positioning System. This module is used to locate the position of the device using the geo-coordinates. These tiny devices are a satellite navigation system that gives location and time information in all climatic conditions. GPS is used in various application devices like vehicle, mobile, airplane, watches all have the same functionality to give the exact location and time.

It consists of three main segments:
a) The space segment: The GPS satellite
b) The control system: Operated by U.S military,
c) The User segment: which includes both military and civilian user and gps equipment.

Fig. 3: Global Positioning System

C. Tilt Sensor

Tilt sensor is based on mercury conductivity between two electrodes. This module has 3 pin output which are 5v VCC, Output, GND. Liquid mercury is present between two electrodes in the sensor module.

Initially output value of the sensor is Low when the module is not tilted because the liquid mercury completes the circuit between two electrodes. Now if we tilt the sensor, continuity breaks between two electrodes because of the liquid mercury hence resulting the output value as High.

Fig. 4: Tilt Sensor

D. GSM Modem

GSM is an acronym for Global System for Mobile communication. It is a standard protocol designed and developed for mobile telephones. It has second generation cellular network.

This modem is used to access the mobile communication using the SIM card of any telecom service provider. This module is used to access the internet as well using the GPRS communication on GSM modem. This modem allows us to use Incoming call, Outgoing calls, send and receive SMS, access the internet on its shield.

Fig. 5: GSM Modem

E. LCD Module

To show the information on the device LCD module is incorporated with Arduino. LCD is an acronym of Liquid Crystal Display. This module has 16 pin which is used to interface with Arduino. 8 data lines and 3 control lines are connected with GPIO of Arduino to receive the binary data from Arduino. These data is displayed on the screen of LCD.
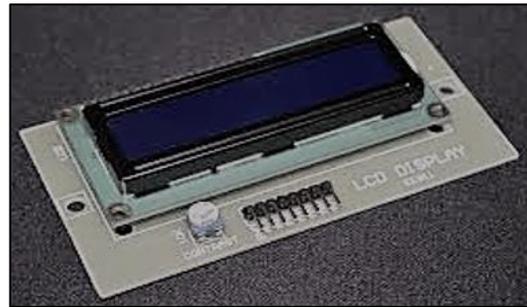

Fig. 6: Liquid Crystal Display

F. Vibration Sensor

Vibration sensor module is used to sense the impact when collision of vehicle happens. It sends the voltage value according to the impact on the surface of vehicle. Transducer is attached with the sensor module which converts the force into voltage value. O-amp is also inbuilt with the sensor module.

Once these voltage values are present on the op-amp, it compares these values and if voltage of inverting is greater than voltage on non-inverting, then output is LOW and if voltage on non-inverting is greater than inverting then output is HIGH.
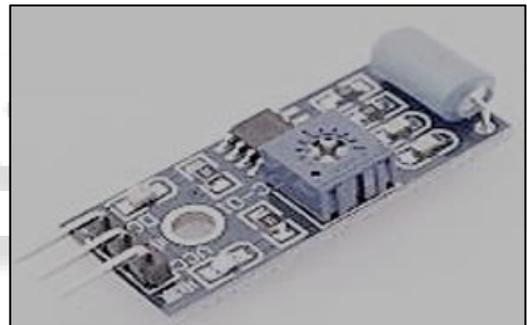

Fig. 7: Vibration Sensor

G. Alcohol Sensor

In this system Alcohol sensor is incorporated to detect the presence of alcohol consumed by the driver. This sensor is fixed near by the seat of driver and before turning on the engine, driver have to blow mouth air inside the sensor receiver. Alcohol content in the mouth air is calculated by the sensor transducer and that value is converted into electrical voltage value. This Electrical voltage is now checked with the threshold value present in the program of Arduino.
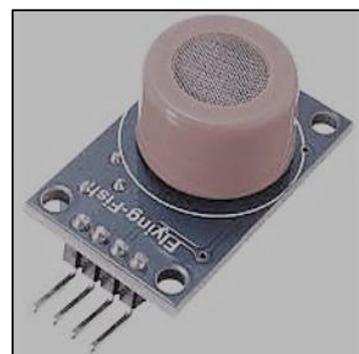

Fig. 8: Alcohol Sensor

H. Web Server

To locate the vehicle which met an accident, Latitude and Longitude data is sent to webserver where these data are stored in Data Base. Form this database, data is fetched and displayed in a table format on webpage.

There is a link from which that location is traced using Google Maps API.

Fig. 9: Screenshot of webpage

V. RESULT

In this application system, Vehicle safety is achieved using different IOT modules and protocols. This system is helpful in reducing road accidents and locating road accident occurred unfortunately.

This system comprises of alcohol sensor, vibration sensor and tilt sensor which gives the safety to the vehicle. Along with the sensing modules, GPS, Wi-Fi module, GSM are used to provide the connectivity to web server and users mobile. Google maps api is also incorporated with webserver so that real time tracking can be achieved.

When vehicle is turned on, alcohol sensor is activated and allows user to blow mouth air through air blower fan. If alcohol is detected by the sensor with proper air blow pressure with predefined speed of air-blower fan, your device will seize the vehicle ignition system and display the information. If alcohol is not detected, your engine will start normally.

Fig. 10: Screenshot of vehicle

Now during the vehicle ride, if it met with an accident it will send the Latitude and Longitude along with the date and time to the web server. These data is collected from GPS module, so it will be the real time data.

Once data is uploaded to the web server, SMS will be sent to the registered mobile number from GSM module. This message will have the Latitude and Longitude coordinate.
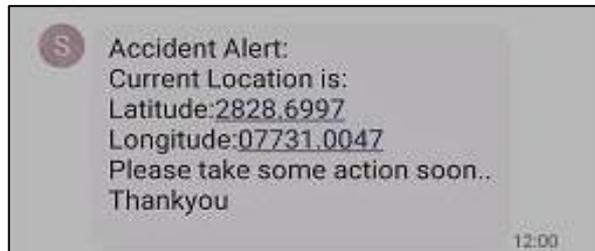

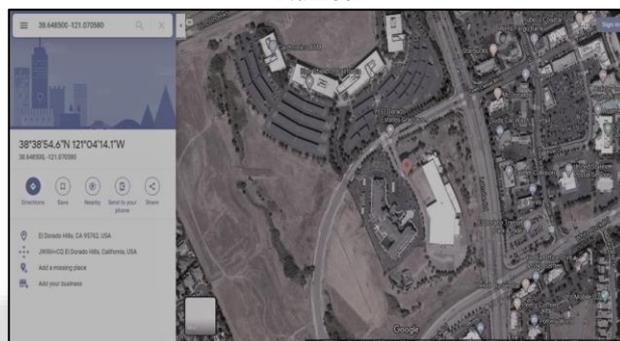Fig. 11: Screenshot of SMS Received On Registered Number

Fig. 12: Screenshot of Google Maps Tracking

VI. CONCLUSION

This application is used to detect the accident of vehicle occurred in remote location and sends its Latitude and Longitude along with date and time to the web server. It also allows user to locate the actual position of accident and tracks the way through Google maps API. This application also sends SMS to the registered mobile number and notifies about the accident and location with date and time.

This system is useful for the safety of the passengers travelling every day in remote areas where finding the accident location is very tuff. This system incorporated Alcohol sensor which seizes the ignition of the engine if driver is drunk. This system will enable the authorities to take control on the rate of road accidents.

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