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IOT based Accident Alert and Vehicle Tracking using GPS and GSM module

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Abstract: *In this project, an IoT based vehicle accident detection and rescue information system is developed in order to detect vehicle accident and send the location information of the accident place to vehicle owner, nearest hospital and police station via a web service. The communication between the web server and hardware device is established via GSM/GPRS shield, and the location is traced by using the GPS shield. The accident is detected through vibration sensors, keypad and buzzer. The project is developed for real time data fetching form the hardware device using through web application, android mobile application or SMS. This project approximately provides the accurate detection of the location of accident occurred, and send notification to the nearest police station and hospital.*

Keywords: GSM/GPRS, sensors, buzzer, accident detection, android mobile application

I. INTRODUCTION

In this project, vehicle accident detection and rescue information system is developed in order to detect vehicle accident and send the location information of the accident place to vehicle owner, nearest hospital and police station via a web service. The communication between the web server and hardware device is established via GSM/GPRS shield, and the location is traced by using the GPS shield. The accident is detected through vibration sensors, keypad and buzzer. The project is developed for real time data fetching form the hardware device using through web application, android mobile application or SMS. This project approximately provides the accurate detection of the location of accident occurred, and send notification to the nearest police station and hospital.

II. LITRETURERE SURVEY:

Sr. No	NAME OF AUTHOR	NAME OF PAPER	YEAR	COMMENTS
1	Manuja M, Kowshika S, Narmatha S, Gracy Theresa W	Iot Based Automatic Accident Detection And Rescue Management In Vanet	2019	In this system we are transmitting the alert message using RF module and within the range of RF module the alert message is received by the moving vehicle and that is send to the next moving vehicle and the process is continued until the vehicle receives message, which is in the network area. The alert message contains four types of messages. They are detected by piezo electric sensor, mems sensor, flame sensor, and temperature sensor.
2	Shivani Sharma, Shoney Sebastian	IoT based car accident Detection and notification algorithm for general road accidents	2018	The purpose of this paper is to introduce a framework using IoT, which helps in detecting car accidents and notifying the mimmediately. This can be achieved by integrating smart sensors with a

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				microcontroller within the car that can trigger at the time of an accident.
3	Swetha Bergonda, Shruti, Sushmita	IoT Based Vehicle Accident Detection and Tracking System Using GPS Modem	2017	In this project we describes about "iot based vehicle accident detection and tracking system using gps technology". We are using Raspberry pi in our project. When the system is switched on, LED will be ON indicating that power is supplied to the circuit. The vibration sensors that we are using in our project sense the obstacle, and then it sends interrupt to Raspberry Pi. The GPS receives the location of the vehicle that met with an accident and gives the information back.

III. PROJECT METHDOLOGY

In this system at first, we worked on the prevention of vehicle accident and even after all the preventive measures applied if the accident occurs the system detects it. After the detection of vehicle accident, the system automatically reports to the ambulance service and police station without any time loss so that the casualty might not loss is/her life due to late in rescue. The system is installed in the vehicle. As the preventive measures for vehicle accident the sensors like MQ-3 alcohol sensor, IR sensor, vibration sensor, buzer, lcd display ,microcontroller, regulated IC MHZ crystal oscillator are used. For the detection of vehicle accident accelerometer is installed and for reporting GPS module and GSM module are used. Motor (control switch) is used for engine control and buzzer; led lights etc. are used for warning during prevention. All these devices are interfaced with the central microcontroller (Arduino Uno) unit. Alcohol sensor helps us in detecting if the driver is drunk or not. If he/she is over drunk the vehicle provides warning and the engine stop functioning Accelerometer detects the occurrence of accident and sends signal to the microcontroller for further functioning. GPS module provides the location, speed, time and date of the certain place where the vehicle is in the real time. If accident occurs, the accelerometer detects it an location of accident is obtained using GPS, and finally sends the information to the ambulance service and police by the help of GSM module. The message obtained in mobile phone consists of the location of the accidental place in the form of google map link which will help to the emergency units like ambulance service and police station to reach the casualty in time and rescue the lives.

IV. PROPOSE METHOD

The proposed research problem is to address the gaps in the literature and contribute to the existing work to enhance the quality of the framework. Dhanlakshmi and Leni designed a system that monitors the condition of the car during its journey, while Pin and Wang proposed a vehicle collision detection algorithm that works well for T-intersection road design. The parameters considered for the design of the algorithm are curvature area and predicted time for the two cars to meet at the junction. Therefore, there is a need for modifying the existing work done by authors to support the general road accidents. This approach addresses the gaps in the hardware setup of an IOT based car by adding an accelerometer, vibration sensor and most importantly heartrate sensor. It also introduces an algorithm for general road accidents that is appropriate for this hardware setup. The algorithm operates on the data gathered by accelerometer ADXL345, vibration sensor, heartrate sensor, GPS and GSM module. The accelerometer's input range can be 2g to 200g (negative and positive) and it can vary even more. The vibration sensor has only two states, low and high. The heart rate sensor is essential since it keeps track of the driver's heart beats during the journey. Figure 1 is the block diagram for the system.

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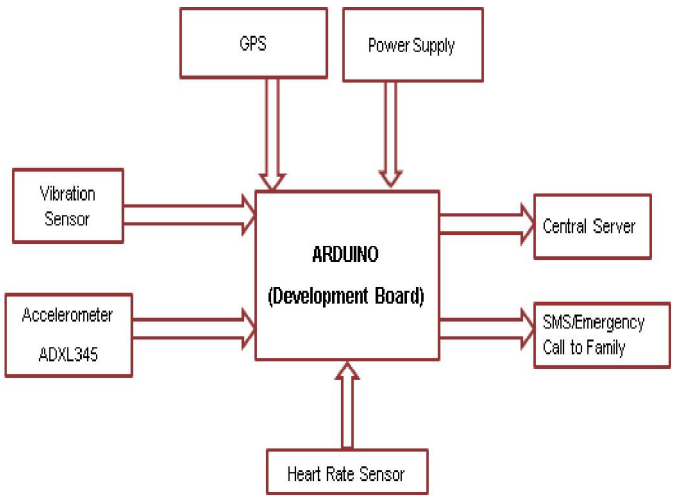

Fig1. Block diagram of proposed system

The overall model includes the following components:

- Adriano: This is the core unit of the entire system as it controls the flow of information between sensors. It is basically a development board which gives the flexibility of writing C programs for the sensors and later they can be deployed in flash memory of Arduino to check the functioning o f sensors.
- Vibration Sensor: This sensor can recognize vibrations in a given area. It has two values as low and high. Usually, it remains low for the scenarios where vibration impact is not that powerful. It attains high value on receiving high vibrations from the environment.
- Accelerometer: It is a type of sensor which is designed to measure acceleration accurately. It measures acceleration in three axis which are x-direction, and z-direction. The x-axis of the accelerometer gives the measure of positive acceleration, y-axis gives the measure of negative acceleration (retardation) and z-axis indicate the angle of turnover of the device in which it is installed designed to measure the change in the volume of blood. It keeps a track of the person's heartbeat.
- Global Positioning System (GPS): A global positioning sensor is a receiver which gives position, speed and timing information of an object. On installation of this sensor, any device can be tracked to locate its position.
- GSM: It is a component which is used for mobile to mobile communication. It is responsible for sending SMS to the desired number or making a call whenever instructed.
- Central Server: Once an accident is detected, the central server is immediately informed about it. It is responsible for locating nearby ambulances that can reach the accident location.

V. PROPOSED ALGORITHM

Proposed system is a generalized accident Heart rate sensor: The heart rate sensor is based on the principle of photoplethysmography. It is detection and notification algorithm that takes different inputs into account and generates results that are helpful for determining the status of the proposed system. To generate intended results, the following are considered: deployment of hardware components in every car, algorithm works only for the area which has strong networks, only cases for possible crash are considered, and driver must wear seat belt each time to record the heartbeats since heart rate sensor is embedded in seatbelt. There are four cases that are considered for an accident and its chances: Warning to Avoid Accident, when the car is static, and when the car is moving. Emergency services must be prompted for rescue in these cases. Table 1 depicts the above stated cases.

Table 1: Sensor Ranges to determine an Accident

VIBRATION SENSOR	ACCELEROMETER M/S^2	HEART-RATE SENSOR (BPM)	INFERENCE
LOW	PEAK VALUE	NORMAL RANGE	OVER SPEED
HIGH	0	PEAK VALUE	ACCIDENT

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HIGH	0	0	ACCIDENT
HIGH	PEAK VALUE	PEAK VALUE	ACCIDENT

VI. RESULT ANALYSIS

The system is simulated using Arduino IDE as a tool to generate test results for each sensor by giving an input value to it. To use this tool, it is required to use a programmable circuit commonly known as a microcontroller which is the sole component for this tool. The code is written for sensors in C programming language in Arduino IDE and it is uploaded in the flash memory of the microcontroller to test the sensor. The data generated by the sensor can be analyzed in the output screen of the Arduino IDE.

Simulation for static car accident:

In this case, there can be a possible crash when the car is at rest and driver is inside.

The accelerometer will give values low value or mostly 0m/s^2. The vibration sensor will switch from low to high, the moment it experiences a crash with larger impact. Table 2 depicts the numerical values responsible for an accident. From the Figure 2, it can be inferred that heart rate sensor gives peak value for heart beats when the acceleration is 0. This means that driver is not in healthy condition. Also, when both the sensor gives 0 values then that means the driver is not inside the car and that is why the heart rate sensor is 0

VIBRATION SENSOR	ACCELEROMETER M/S^2	HEART RATE SENSOR (BPM)	INFERENCE
	0	190	ACCIDENT
1	0	170	ACCIDENT
1	0	195	ACCIDENT
1	0	185	ACCIDENT
1	0	00	CRASH

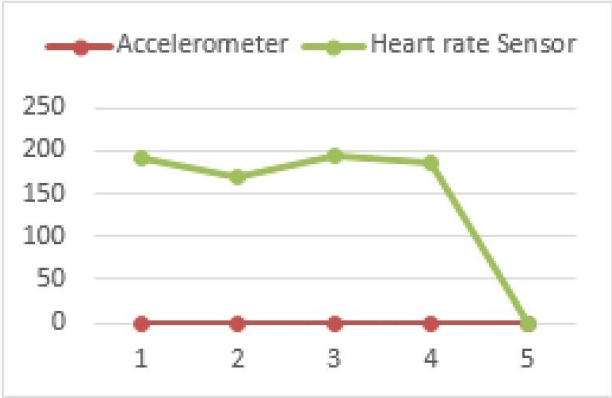

Fig 2:Graph between accelerometer and heart rate sensor

VII. SIMULATION FOR MOVING CAR ACCIDENT

This is a specific case depicted for a moving car. When the car meets with an accident the accelerometer will experience a certain amount of retardation (negative acceleration). At this moment, vibration sensor switches from low to high state. There are situations where the driver gets injured due to impact of crash because of which there will be a drastic change in the driver's heartbeat. Table 3 represents the above stated scenario.

VIBRATION SENSOR	ACCELEROMETER M/S^2	HEART RATE SENSOR (BPM	INFERENCE
0	130	100	OVERSPEED
1	-150	190	ACCIDENT
1	-180	170	ACCIDENT
1	-170	195	ACCIDENT

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1	-200	185	ACCIDENT
1	-195	200	ACCIDENT

Note that the values of heart rate sensor vary according to the age of a person and it has not been used for simulation. Only vibration sensor and accelerometer have been considered for testing. However, in the both the tables only those cases are depicted that requires the need for a warning to the driver or emergency call to an ambulance.

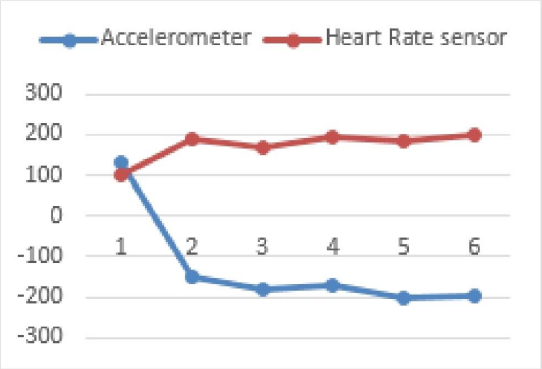

Fig 3: Graph between accelerometer and heart rate sensor

VIII. CONCLUSION

The main idea of this paper is to notify the concerned authorities about an accident only if the passengers are injured. The proposed framework is intended to solve the same by incorporating more features in the already existing work done by the authors. With the addition of above discussed functionalities, this system can resolve most of the accident scenarios by detecting accidents on time and triggering immediate help from emergency services without wasting any time. Moreover, the driver's health is being tracked by heart rate sensor (embedded in seatbelt) which serves as the added advantage. If implemented with proper planning and resources, this framework could serve to be a great help to the society. Hence, there is need of such systems that could save the lives involved with accidents.

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