IoT-Based Accident Detection and Emergency Health System Design and Implementation

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IOT-BASED ACCIDENT DETECTION AND EMERGENCY HEALTH SYSTEM DESIGN AND IMPLEMENTATION

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ABSTRACT

In today's world, we see people dying in accidents all over the place, such as in newspapers and on television news. In both urban and rural locations, road accidents and traffic congestion are important issues. As a result, we planned to implement a new system that uses sensors to detect accidents automatically. This technology is completely automated, so it detects the accident site and assists you.

Keywords: Accident Detection, Raspberry Pi, GPS Module, Accelerometer.

I. INTRODUCTION

The rising demand for vehicles has exacerbated traffic risks, road accidents, and people's lives are at stake. This study introduces an automated car accident alert system.

The system proposed with respect to accidents could be detected far less frequently and basic information sent to the emergency hub in just a few seconds to the nearest hospital covering the exact latitude and lengths of the accident site, In order for ambulances to extract the person in need in minimum time.

A. RELATED WORK

Prof. Yogesh Thorat[1], Kiran Sawant, Imran Bhole, Prashant Kokane, Pirihi doifhodi, proposed accident alert and tracking system specifications. Benjamin Coifman [2] describes an in-house vision system for tracking and monitoring vehicles.

Tracking system for vehicles and locking explained by R. Thangam, N. Suthanthira vanitha, N. Valarmathy, M. Thiruppath, S. Selvaraju [3], To track the car of Stolen, they presented a revolutionary approach to track and lock vehicles using GPS and GSM technology.

Kunal Maurya, Mandeep Singh, and Neelu Jain explained how a car tracking device is installed in a vehicle to allow the owner or a third party to follow the vehicle's location [4]. This design will continuously monitor a moving vehicle and deliver status updates as needed.

The vehicle cabin safety system, explained B. Palaniappan, K. Kartick, V. Ramya [5]. The system controls the toxic gas level, such as CO, LPG and alcohol, and alerts the user as alarm in hazardous situations. SMS is sent to the licenced individual by means of the GSM.

The cloud computing infrastructure is described in detail by R. Ezhilarasie and Albert Alexe [6]. Sensors in this system will monitor the gasoline level, the driver's conditions, and the vehicles speed. Through a GSM device, the data is transmitted to a cloud server. Every car is equipped with a GPS antenna to help locate the position. To ensure that drivers do not drive while they are drunk, the alcohol sensor is installed.

Rached N. Zantout [7], Adnan I. Yaqzan and Issam W. Damaj stated the remote monitoring solution, SMS/alert and GSM-based methods were discussed. The system's two components are the monitoring centre and the remote monitoring station. The monitoring centres made are comprised of a computer and a GSM communication module. As shown in this paper, the system can track and control remote communication between the monitoring centre and the distant monitoring station.

II. METHODOLOGY

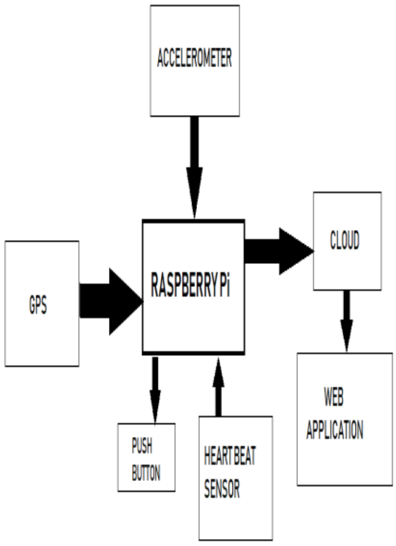

Figure 1: Block diagram

The operation of the system that may be constructed for this project is depicted in the block diagram.

For automating and controlling various supporting appliances, such GPS, GSM, ultrasound sensor, push-buttons, push-buttons, cardiac beat sensor, etc. Raspberry Pi is used.

This paper offers a working model for an information system for car accident detection and rescue, which can track, track and detect accidents across a large area. This system is divided into two components. The first is GPS-based position tracking. As the automobile drives, the location of the car changes frequently, thus the GPS recognises the location. The accident is detected by a sensor, GPS unit installed in the vehicle, which sends the position of the accident to a main server unit, which holds the database of all surrounding hospitals. The patient is taken to the hospital by an ambulance on the spot of the accident.

B. HARDWARE IMPLEMENTATION AND WORKING :

(i) Raspberry pi

Figure 2: Raspberry pi zero

On the model Raspberry pi there are 40 GPIO pins. There are 2 pins each with a 5V power and a 3V power. There are eight ground pins and there are various link-up protocols such as interfaces SPI, I2C, UART and SD card. GPIOs3,5,27, and 28 are utilised in the I2C protocol, for example. This connection is identical to that found in most smartphones and tablets. Many Raspberry Pi loaders for smartphones work, but not all. The Pi is hungry for power over most micro-USB devices and requires up to 700mA to work. Certain chargers can supply just up to 500mA, which causes intermittent operational problems.

(ii) GPS MODULE :

Figure 3: GPS module

Constructed with the SIM900A GSM/GPRS dual-band engine and operated on frequencies 900 and 1800 MHz. The RS232 modem interface, which connects both the PC and the RS232 microcontroller (MAX232). The RS232 baud rate can be configured with an AT command from 9600 to 115200. The internal TCP/IP stack of this GSM/GPRS modem enables you to use GPRS to connect to the Internet. Transfer to M2M interface is possible via SMS, Voice and DATA transfer applications. Here you can connect unregulated power supply with wide range onboard.

(iv) ACCELOMETER SENSOR :

Figure 4: Accelorometer sensor

Multiple component accelerometers can be purchased as a standalone device. These components are embedded into key technology and can be accessible through the governing software or operating system in practically all technological devices. There are many axes, two of them to determine the most 2D movements with 3D positioning option. Cars only utilise a two-axis model to determine the moment of impact, whereas all cellphones use three-axis models. Because, they are designed to detect even the slightest changes in acceleration, these devices have a high level of precision.

(v) Push Button :

Figure 5: Push Button

One press button is a simple tool used to control certain aspects of the machine or process for the on and off mechanism. Buttons are typically constructed of a hard substance, such as plastic or metal. Use the top surface to fit the human finger or hand in a flat or shaped form so that it is easily depressed or pushed. Although many un-biased buttons require a spring to restore to their un-pushed condition (because to their physical nature), buttons are the most biased switches. The terms 'pushing' and 'depressing' are both used to describe the act of pressing or depressing a button.

III. MODELING AND ANALYSIS

There are various articles that claim to be able to identify accidents, but none of them are accurate because they rely on external information to do so. One concept of this kind is to spot incidents with Google maps that imagine an accident occurring whenever there is a highway conjunction. It cannot be used when there is no traffic especially at night, as it depends on traffic junction.

C. FLOW CHART

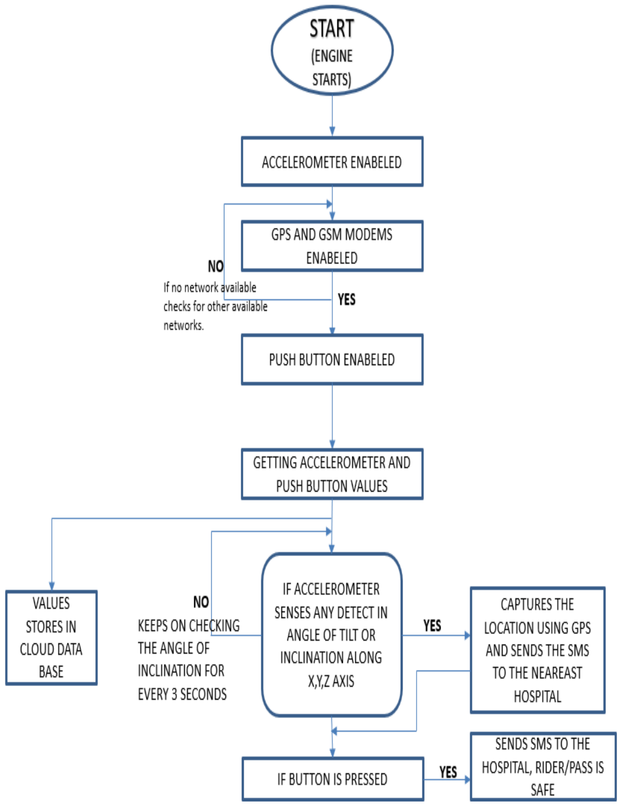

Figure 6: Flow Chart

Step 1: Accelerometer sensors will first feel an accident and provide the microcontroller with its output.
Step 2: The GPS determines a vehicle's latitude and longitudinal position, as well as its angle of inclination.
Step 3: Through the GSM network, the vehicle's latitude and longitude region are sent as a message.
Step 4: The emergency dispatch server's static IP address is stored in the EEPROM.
Step 5: In the event of an accident, the position will be identified and a notification will be sent to the saved static IP address.

D. ALGORITHM SUGGESTED

(i) Pseudo Algorithm:

Initialization:

Step 1: Lastlon=0, LastLat=0, LastAlt=0, DistTh=0
Step 2: Receive new data GPS
{Lon, Lat, alt, Speed, hdhop, status}
Step 3: Make a new point (GPS data)
Step 4: Repeat Step.2

(ii) location display on map:

Step 1: Set the latitude and longitude to zero.
Step 2: Set the value of the marker to null.
Step 3: If the server retrieves the location (i.e. location= found).
Step 4: Otherwise, use the Google Map API to display the location.
Step 5: Get the server's location.
Send a message to a certain mobile device once the vehicle accident occurs.

(iii) Accident alert message:

"Accident alert"
Latitude: 2400.0090, N
Longitude: 12100.0000, E
Time: 12:00"

Proposed system also uses the LCD linked to it to display the vehicle's location in order to ensure that the microcontroller is in good working order.

Figure.7 depicts the graph between the accelerometer and the heart rate sensor. The driver's pulse rate rises substantially in the diagram, indicating the potential for injury if the car is delayed due to a collision. This necessitates the dispatch alert to an ambulance right away.

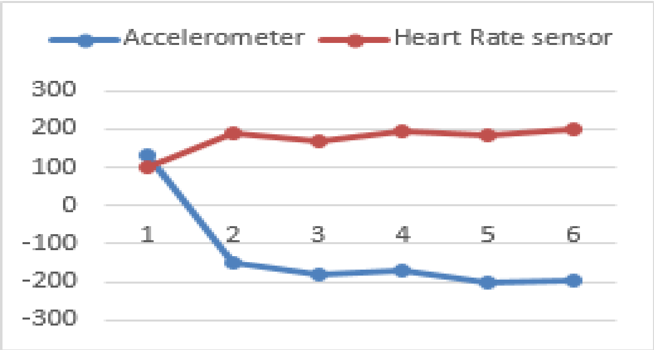

Figure.7: Diagram between the heart rate sensor and accelerometer

IV. RESULTS AND DISCUSSION

The accelerometer will undergo a certain level of retardation when the car is involved in an accident (negative acceleration). The vibration sensor shifts from low to high at this point. The driver gets injured in situations because of the impact of a crash that will change the driver's heartbeat dramatically. Table 1 shows the scenario mentioned above.

Sensor to measure Vibrations	Accelerometer (m/s^2)	Sensor to measure Heart Rate (bpm)	Conclusion
0	129	100	Excess/Over Speed
1	-149	189	Accident
1	-180	170	Accident
1	-169	194	Accident
1	-200	183	Accident
1	-194	200	Accident

Table.1: Moveable car accident sensor readings

Note that the cardiovascular sensor values vary by individual age and were not used for simulation. The test was only conducted using the vibration sensor and accelerometer. Only case which require a driver's warning or emergency call to an ambulance are displayed on the tables.

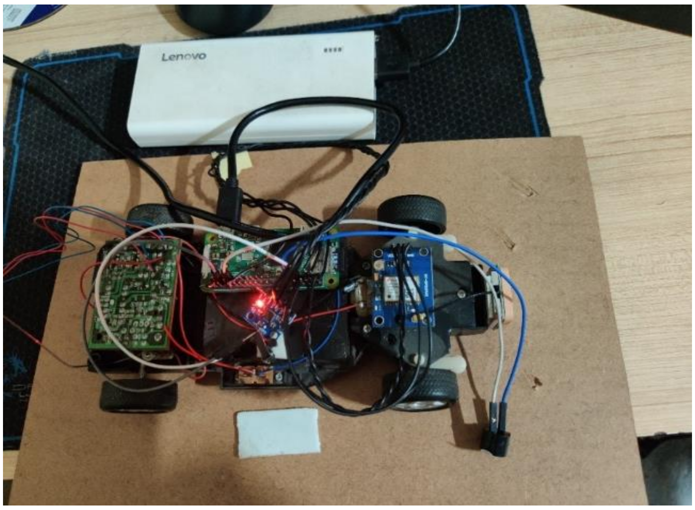

Figure 8: A Car With An Accident Detection Prototype

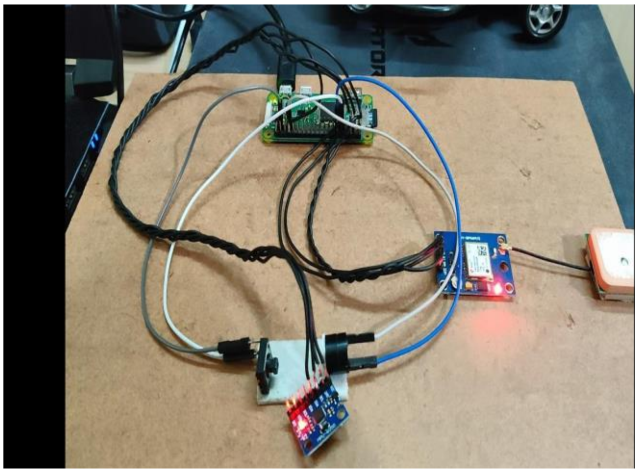

Figure 9: Raspberry Pi Zero Sensors

The proposed design is for a system that can identify accidents in a fraction of the time and provides critical information to the First Aid Center. The crew receives the alarm message and works to save as many lives as possible in a short amount of time. The cloud will serve as a link between software and hardware. To detect sensor information, the sensors are connected to a Raspberry Pi0 (Raspberry Pi 3). Raspberry Pi serves as a gateway between sensors and the cloud. Because this technology is totally automated, it can quickly locate the accident site and assist in getting to the hospital.

V. CONCLUSION

This paper seeks to provide an overview of tracking systems for vehicles and the detection of vehicles. This vehicle accident detection system can automatically track geographical data and provide a text message for an accident alert. Experimental work was done attentively. The result demonstrates greater sensitivity and precision. It is proven that this system benefits the automotive industry greatly.

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