WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

IOT based Automated Accident Detection System

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ABSTRACT:

We humans often travel from one place to another for various reasons. One of the important modes of transport is via road. Nowadays the vehicles are no longer a means of luxury but rather a 'need'for transportation. Day in and day out, even for shorter distances we tend to use our vehicles. Through the recent years, accidents are increased due the increase in the vehicles on road. Furtherthe new generation of vehicles have emerged which are meant to reduce the accidents caused. However, despite the implementation of innovative ideas to reduce accidents in the modern vehicles there are still chances of occurrence of accidents. It is of a greater importance to reduce the number of accidents cases and to protect human lives. One of the major reasons for the loss oflives is the delay of medical treatment of the injured person. Due to the ignorance of the people, help to the injured person is delayed thereby costing their lives. As the technology advances, the need for providing a more reliable system for helping the people increases. Thus, we have designed a system using IOT, GPS and smart sensors to accurately send SMS to the family member of the injured person as well as nearest hospital when accident takes place.

Keywords: accelerometer, internet of things, sms, vibration sensor, gps, location tracking

Introduction:

In the current world, we can observe that the road accidents are being constantly due to colorful reasons like unexpected manhole or cross vehicle who didn't follow the signals. Sometimes, indeed though we're driving carefully, accidents will do may be because of behind vehicles or front vehicle so to track these issues without driver attention we need a vehicle tracking system. As per the statistics handed by the Association for Safe International Road Travel(ASIRT), around1.25 million individualities crowded in road crashes every time, 20- 50 million square measure hors de combat or challenged. These vehicle collisions square measure cost account over$ 518B word wide, cost account individual countries from 1- 2 of their monthly value. The challenges imposed to original PSOs in saving human lives performing from vehicles accidents have come a critical concern due to the huge foregoing number of departed people. As far as multiple injured could lose their lives, and since no on- point medical assistance has been handed instantly as a result of(1) late accident reporting,(2) inaccurate geographic position, and(3) lack of injured medical information, the need for automated and intelligent mobile result attacking this burden becomes a necessary.

Literature Review

Multiple experimenters carried out their studies on accident discovery system. AishwaryaS.R explained an IoT grounded vehicle accident prevention and tracking system for night drivers. In this paper provides Eye Blink Monitoring System(EBM) that alerts the subject during state of sleepiness.

(1) Sadhana B have explained Smart helmet intelligent safety for motorcyclist using raspberry pi and open CV. The idea is obtained after knowing that there's increased number of fatal road accidents over the times. This project is designed to introduce safety systems for the motorcyclist to wear the helmet properly.

(2) SarikaR. Gujar explained advanced Embedded System of Vehicle Accident Detection and Tracking System. The main ideal of this system is to first detect the accident location and call for the emergency services. Vehicle accident detection is possible with the help of sensors. A GPS and GSM module helps to trace the vehicle.

(3) Shailesh Bhavthankar explained Wireless System for Vehicle Accident Detection and Reporting using Accelerometer and GPS. In this paper, Accelerometer detector is used to detect crash and GPS give location of vehicle. In case of any accident, the system sends automated message to thepre-programmed number such as family member or emergency medical services via GSM.

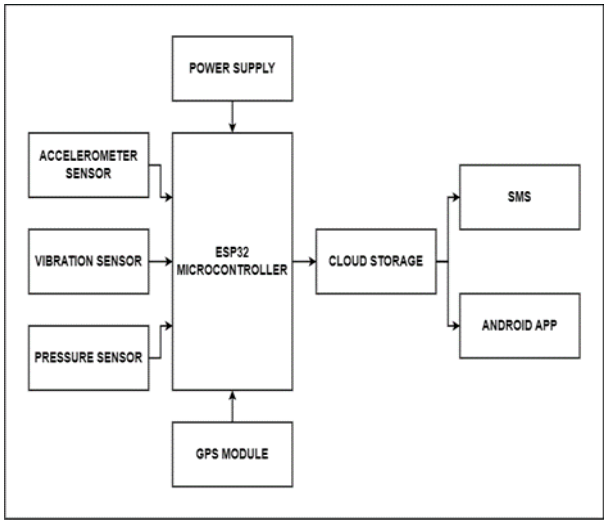
(4) JagdishA. Patel explained Raspberry Pi based smart home. This paper aims at designing a basic home automation application on Raspberry Pi through Interfacing camera as security purpose and the algorithm for the same is implemented in developed in python environment which is the default programming environment provided by Raspberry Pi.

Objectives:

Objectives of the IoT Based Accident Detection System developed are as follows:

1. Determines accident with the help of accelerometer, vibration sensor and pressure sensor values.
2. Sends data to cloud and determines user location using GPS.
3. Sends an alert message to family members of user as well as nearest hospital

Methodlogy:



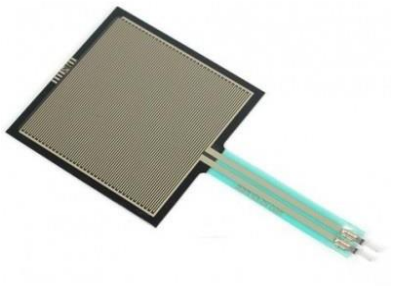
In this project we are using a ESP32 microcontroller. When the system is switched on, LED will be ON indicating that thepower is supplied to the circuit. When the accelerometer sensor, vibration sensor or pressure sensor senses any accident, they send interrupt to ESP32 microcontroller. This data is sent to Thing Speak Cloud Storage over internet. TheGPS receives the location of the vehicle that met with an accident and gives the information back. This information will be sent to a mobile number through SMS. This messagewill give the information of longitude and latitude values. Using these values, the position of the vehicle can be estimated. Also a message is sent to the nearest hospital by tracking the location of the vehicle and comparing it with thehospital database.

Sensors:

1. ESP32 Microcontroller

ESP32 is a series of low-cost, low-power system on a chip microcontroller with integrated Wi-Fi and dual-mode Bluetooth.ESP32 is created and developed by Espressif Systems, a Shanghai-based Chinese company, and is manufactured by TSMC.ESP32 can perform as a complete standalone system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor.ESP32 can interface with other systems to provide Wi-Fi and Bluetooth functionality through its SPI / SDIO or I2C / UART interfaces

2. Pressure Sensor



This is a Force sensitive resistor with a square, 1.75x1.5",sensing area. This FSR will vary its resistance depending on how much pressure is being applied to the sensing area.The harder the force, the lowerthe resistance. When no pressure is being applied to the FSR its resistance will be larger than 1M. This FSR can sense applied force anywhere in the range of 100g-10kg. Two pins extend from the bottom of the sensor with 0.1" pitch making it bread board friendly. There is a peel-and-stick rubber backing on the other side of the sensing area to mount the FSR. Just Connect a resistor to form a voltagedivider and measure the voltage at the junction to find the force applied. These sensors are simple to set up and great for sensing pressure, but they aren't incredibly accurate. Use them to sense if it's being squeezed, but you may not want to use it as a scale.

3. Accelerometer ADXL345

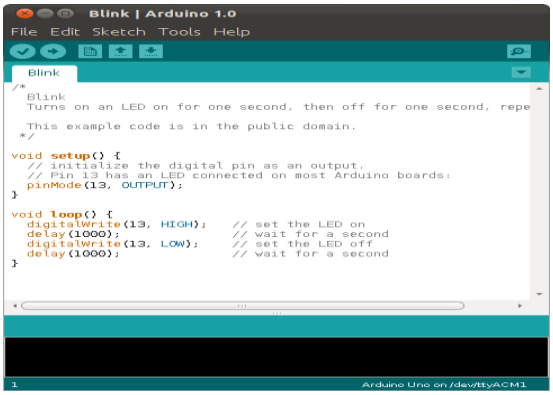
ADXL345 Triple Axis Accelerometer Board is a small, thin, low-power, 3-axis accelerometer with a high resolution (13-bit) measurement at up to ±16g. Digital outputdata is format as a 16-bit two's complement and is accessible through either an SPI (3- or 4-wire) or I2C digital interface. The ADXL345 Triple Axis Accelerometer Board is well suited for mobile device applications. It measures the static acceleration of gravityin tilt-sensing applications, as well as dynamic acceleration resulting from motion or shock. Its high resolution (4 mg/LSB) enables measurement of inclination changes lessthan 1.0°.

4. NEO-6M GPS Module

This is a complete GPS module that is based on the NEO 6M GPS. This unit uses the latest technology to give the best possible positioning information and includes a largerbuilt-in 25 x 25mm active GPS antenna with a UART TTL socket. A battery is also included so that you can obtain a GPS lock faster. This is an updated GPS module that can be used with ardupilot mega v2. This GPS module gives the best possible position information, allowing for better performance with your Ardupilot or other Multirotor control platform. The GPS module has serial TTL output, it has four pins: TX, RX, VCC, and GND.

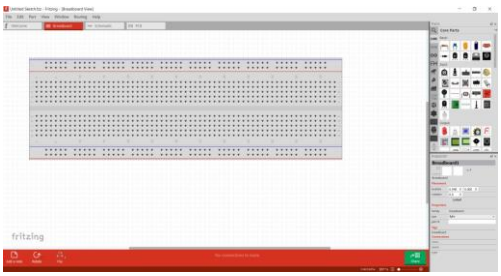
Working:

1. ARDUINO IDE



The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino board. The source code for the IDE is released under the GNU General Public License, version. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

2. FRTIZING



Fritzing is an open-source hardware initiative that makes electronics accessible as a creative material for anyone. We offer a software tool, a community website and services in the spirit of Processing and Arduino, fostering a creative ecosystem that allows users to document their prototypes, share them with others, teach electronics ina classroom, and layout and manufacture professional pcbs.

3. TELEGRAM

Telegram is a messaging app with a focus on speed and security, it's super-fast, simple and free. You can use Telegram on all your devices at the same time — your messages sync seamlessly across any number of your phones, tablets or computers. Telegram has over 500 million monthly active users and is one of the 10 most downloaded apps in theworld.

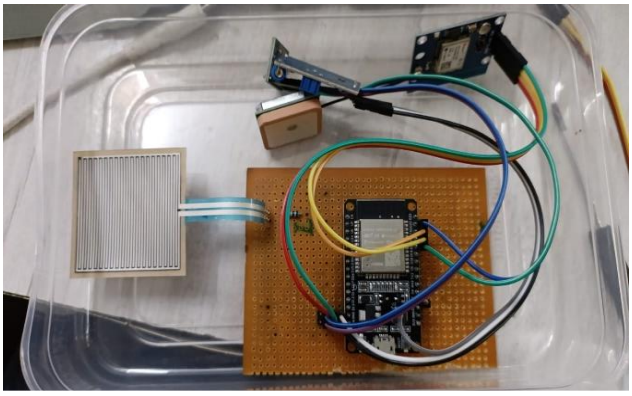
With Telegram, you can send messages, photos, videos and files of any type (doc, zip, mp3, etc), as well as create groups for up to 200,000 people or channels for broadcasting to unlimited audiences. You can write to your phone contacts and find people by their usernames. As a result, Telegram is like SMS and email combined — and can take care ofall your personal or business messaging needs. In addition to this, we support end-to-end encrypted voice and video calls, as well as voice chats in groups for thousands of participants.

4. THINKSPEAK CLOUD

According to its developers, "ThingSpeak is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP and MQTT protocol over the Internet or via a Local Area Network. ThingSpeak enables the creationof sensor logging applications, location tracking applications, and a social network of things with status updates". ThingSpeak was originally launched by ioBridge in 2010 asa service in support of IoT applications. ThingSpeak has integrated support from the numerical computing software MATLAB from MathWorks, allowing ThingSpeak usersto analyze and visualize uploaded data using Matlab without requiring the purchase of a Matlab license from Mathworks. ThingSpeak has a close relationship with Mathworks, Inc. In fact, all of the ThingSpeak documentation is incorporated into the Mathworks' Matlab documentation site and even enabling registered Mathworks user accounts as valid login credentials on the ThingSpeak website. The terms of service and privacy policy of ThingSpeak.com are between the agreeing user and Mathworks, Inc. ThingSpeak has been the subject of articles in specialized "Maker" websiteslike Instructables, Codeproject, and Channel 9.

5. IMPLIMENTATION

In this project we are using a ESP32 microcontroller. When the system is switched on, LED will be ON indicating that the power is supplied to the circuit. When the accelerometer sensor, vibration sensor or pressure sensor senses any accident, they send interrupt to ESP32 microcontroller. This data is sent to ThingSpeak Cloud Storage over internet. The GPS receives the location of the vehicle that met with an accident and gives the information back. This information will be sent to a mobile number through SMS. This message will give the information of longitude and latitude values. Using these values, the position of the vehicle can be estimated



Conclusion

Over the period of time various accident detection and notification systems have been studied and developed. This paper aimed to enlist their advantages and disadvantages on the basis of a comparative study. All these systems discussed above in the paper are entirely different from one another in terms of hardware and technology used but have thesame purpose i.e. to detect accident and notify the registered users. There are various advantages of each system but there are a few disadvantages as well for example the problem of false alarms is a major drawback. In the above paper is entirely different from one another hardware and technology that are used in these systems but they have the same purpose that is to detect accident and notify the users as well as the hospital that is nearest to the accident spot these.

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