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Automatic Traffic Accident Detection and Notification with Smartphones

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Abstract

This project is an IoT project that helps to reduce the time between the accident and when emergency medical personnel are dispatched to the scene.

Traffic accidents are one of the leading causes of fatalities all over the world. An important indicator of survival rates after an accident is the time between the accident and when emergency medical personnel are dispatched to the scene. Eliminating the time between when an accident occurs and when first responders are dispatched to the scene decreases mortality rates by 6%. One approach to eliminating the delay between accident occurrence and first responder dispatch is to use in-vehicle automatic accident detection and notification systems, which sense when traffic accidents occur and immediately notify emergency personnel. These in-vehicle systems, which is an IoT based project will help to notify the necessary persons, once the accident occurs.

1. A Spike in Deaths has been seen in accidental cases due to lack of Medical Attention these days.
2. A major Behind this is that they are unable to contact for help.
3. To Resolve this problem we would be taking the initiative to build an app that would be connected to a device that can SOS (Save our Souls) message.
4. Containing contact details and location of the accident to Its Family Members and also hospital and Police (112)(100).
5. This Would Help them get immediate medical care and Could save the Their Lives.

Introduction

An IoT ecosystem consists of web-enabled smart devices that use general-purpose embedded systems connected to the internet to collect, send and process data. IoT is making the fabric of the world around us smarter and more responsive, merging the digital and physical universes.


As Traffic accidents are one of the leading causes of fatalities all over the world An important indicator of survival rates after an accident is the time between the accident and when emergency medical personnel are dispatched to the scene.

Automatic Traffic Accident Detection and Notification will be a new IoT appliance that is used to detect a car's accident and sends the required notification (Time, Location and type of accident) to specific people such as the nearest Police station, Hospital and closest relatives.

We will use 2 types of sensors to receive the accident details:

- ❖ GPS Module
- ❖ Crash Collision Sensor Module (Robot Model for Arduino)

NEO-6M GPS module: NEO-6M global positioning system (GPS) module, a very popular, cost-effective, high-performance GPS module with a ceramic patch antenna, an onboard memory chip, and a backup battery that can be conveniently integrated with a broad range of microcontrollers. The NEO-6M GPS module has



four pins: VCC, RX, TX, and GND. The module communicates with the Arduino via serial communication using the TX and RX pins, so the wiring couldn't be simpler.

Crash Collision Sensor Module: The collision Sensor can detect whether any collision movement or vibration happens. It will output a low pulse signal when vibration is detected. To make the output signal more reliable and neat, we added a necessary exterior circuit to reduce the noise impact. So, normal shaking will not cause any output.

The outcome of all these two sensors will be collected and reformatted by the Arduino device. Arduino is an embedded system and will be connected to all the sensors and will receive the data in different formats and it will send the proper output to a mobile application through Wi-Fi.

Mobile Application:

The App will be able to connect with the Automatic Traffic Accident Detection and Notification system through Wi-Fi.

Once the application is connected to the System, we will be able to control the flow of Data using different buttons.

Proposed Method with Algorithm:

We planned to build the project into three major parts:

A frontend, backend infrastructure and, an IoT module are custom-built for the purpose of this project.

A mobile application will be developed using Flutter and will be compatible with both Android and IOS devices.

Front end:

The sign in and sign Up Screens are there for the user to enter the Main screen, the Main screen will contain the details about the location of the car at the moment and also there will be a specific field that if there is an accident, it shows the time and the location of the accident with the type of accident.

The frontend will be developed using Dart language and Flutter framework. Flutter was introduced by Google as an open-source technology for coding and creating native apps for Android and iOS. Flutter is relatively new as it was officially presented in December 2018 as the first stable version 1.0.

Backend:

The backend needs to support the data communication with the IoT module which uses the standard **ESP8266** Wi-Fi module for communication.

We will use firebase as a backend database which is a Google-backend application development software that enables developers to develop iOS, Android and Web apps. Firebase provides tools for tracking analytics, reporting and fixing app crashes, creating marketing and product experiments. The Firebase Realtime Database is a cloud-hosted NoSQL database that enables data to be stored and synced between users in real-time. The data is synced across all clients in real-time and is still available when an app goes offline.

IoT Module:

The IoT module will consist of a standard general-purpose microcontroller unit at its core.

A Wi-Fi module will facilitate connection with Internet network to communicate with the backend server to fetch the instruction from the user input.

A NEO-6M global positioning system (GPS) module will be connected to the microcontroller to detect the location of the car and send the output to the microcontroller.

A Crash Collision Sensor Module will help to detect the collision or any other damage to the car and send the output to the microcontroller.

All the above sensors will be connected together in a proper manner and all will be set up in different parts of the car to scan the time type of damage and location of the accident.

Connection Infrastructure:

We will develop a custom algorithm to receive data from all sensors and collect them as a single module and send it to the mobile app.

Programming environment and tools used

- ❖ **Frontend application:**
 - Flutter mobile application
- ❖ **Backend server:**
 - Firebase server
- ❖ **IoT Module:**
 - Arduino(Uno, Mega, Lilypad or similar)
 - NodeMCU with ESP8266
- ❖ **Wi-Fi module:**
 - ESP8266
- ❖ **NEO-6M global positioning system (GPS) module.**
- ❖ **Crash Collision Sensor:**
 - Switch Module for Robot Model RC car Drones

Milestones

- ❖ Support backend server.
- ❖ Module assembly.
- ❖ Covert different inputs into a single module.
- ❖ Wi-Fi configuration system.
- ❖ Accurately measuring the Location, time and Type of damage.
- ❖ aesthetic and user friendly.

REFERENCES

Term Appendix:

- Arduino (<https://playground.arduino.cc/>)
- Flutter (<https://flutter.dev/docs/>)
- NodeMCU (https://www.nodemcu.com/index_en.html)
- EEPROM (<https://www.arduino.cc/en/Reference/EEPROM>)
- IoT Microcontroller (<https://www.nabto.com/iot-microcontroller-guide/>)
- Arduino IoT Cloud API (<https://www.arduino.cc/reference/en/iot/api/>)
- ESP-8266 WiFi module
(<https://create.arduino.cc/projecthub/neverofftheinternet/esp8266-setup-and-first-wifi-connection-76f>)
- c3c)
- NEO-6M GPS moduler
(<https://create.arduino.cc/projecthub/amalmathewtech/arduino-gps-module-destination-notifier-288a55>)
- Crash Collision Sensor Module
(http://wiki.sunfounder.cc/index.php?title=Collision_Switch_Module)
- Firebase (<https://www.firebase.io>)