

IoT Based Driving Assistance and Mishap Succour System

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Abstract: Driving assistance and mishap succour endeavour several services along with minimizing the hazard of accidents by alerting and controls the security of handling vehicles. Suppose the vehicle crosses the hazard ratio and is raised up a certain threshold, a programmed logic is triggered to diminish it through initiating various processes. Nevertheless, it is affordable for mid-range cars and tackles many issues that drivers might face on the road. Driving assistance and mishap succour hold a genuine prospect to advance roadway safety and to minimize the danger of collisions and accidents as many of such clashes are caused by the negligence of humans either by alcohol or fatigue or by rash driving, over-taking or unable to track another vehicle. The proposed system is a blend of real-time IoT verticals, software and hardware. The system's working is administered through an android application for sending the location of a mishap through SMS as well as an email of the recording of an incidence to the emergency contacts through firebase. It plays a vigorous part in minimizing the overall cost of the proposed system

Background: Whenever a road accident happens the people nearby have to manually call the ambulance which causes a waste of time [1]. Therefore, there is a setback for crisis assistance to reach at the spot of the accident. In order to correct this obstacle, we are going to develop a system that will accommodate emergency adroitness for the sufferers in the least time feasible.

Key Word: Vehicle Automation, ESP32 cam module-based project, Internet of Things, Driving Assistance, Electronics Project Black Box, Microcontroller, Global Positioning System (GPS), Global System for Mobile Communication (GSM).

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I. Introduction

The motivation behind information/data picked up after a mishap is to help decision-makers understand the nature, causes, and injury outcomes of crashes. The aforementioned data presents the context for the design of tactics and arbitrations that will diminish mishaps and their consequences.

In most cases, accident analysis data is used to:

1. Concentrate on regional and state authority enforcing forces
2. Execute enduring legislation to secure driver/vehicle yielding (that is, certified driving licensing, liquor as well as extra speeding
3. Administer obstacle identification and the advancement of rules for protection and security programs
4. Recognize eminent accident spots and tender engineering and construction enhancements to the streets
5. Develop Emergency Health provision through methods such as coaching EMS organization's staff

There are several strategies to provide protection and security by observing the vehicle's real time accurate positioning and information using various technologies. The investigation of creating a trustworthy solution utilizing GPS, GSM, Camera module and other few sensors is being initiated to save people's lives from a road accident [2]. In this paper proposed the implementation of an ESP32 Cam module and Arduino-based vehicle accident alert system. The fundamental idea is to restrict the vehicle system by receiving the real-time position of the vehicle through GPS and send the information through the GSM module via SMS service. The accelerometer identifies the immediate difference in the axes of the vehicle and the GSM module sends the alert message on your Mobile Phone with the location of the accident. The location of the accident is longitude and latitude, derived from the GPS module. This module operates in the same manner as a regular phone. The aforementioned application implements the supreme way to inadequate crisis amenities rendered for road mishaps to the most attainable extent. Mishaps/crashes are vital and the most dangerous incidents which lead to death. The street accident is something from which everyone is scared, and no one wants it to happen to anyone, though they happen quite usually. The

unfavorable circumstance is that we are not discovering from our blunders on the highway. Maximum of the drivers are very well aware of the universal laws and security standards while practicing on the roads, but it is merely the leniency on the part of drivers, which leads to accidents and crashes. The principal constituent of accidents and collisions is due to rational human flaws. Here are some of the flaws embellishing on some of the prevalent practices of humans, which leads to leads accidents.

- 1) Over Speeding
- 2) Drunken Driving
- 3) Distractions to Driver
- 4) Blind spot detection
- 5) Non-compliance to lane driving and overtaking in a wrong Manner
- 6) Recording of video during an accident to be sent to the contact details given
- 7) Email of the recording sent to the contact details
- 8) SMS of the location sent to the emergency contact details
- 9) Overview of project

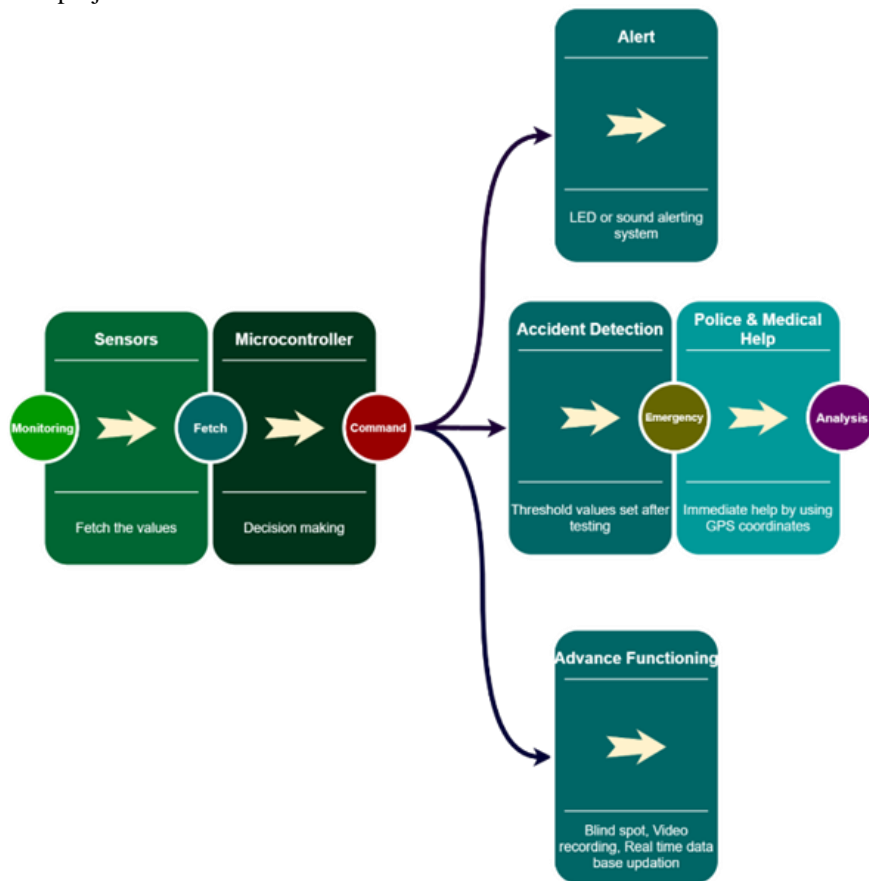


Figure 1: Block diagram

As given in fig 1 segment 3 Accident detection and the alerting mechanism can be equipped in a vehicle and is responsible for notifying about any such incident on the go. [3] GPS is used for obtaining the coordinates of longitude and latitude of the location of the accident while GSM is used for sending the message to the emergency contact as given in fig 2 segment 4.

There are numerous mechanisms deployed into cars for safety measures, they vary in type, features, cost, coverage area etc. Some systems are advanced and highly capable of detection but are equally costly to install in every car for large manufacturing brands. The advancement in industries like IoT and embedded has opened the doors to new mechanisms at lower price range allowing development of systems like Automotive Black Box. Automotive Black Box is a capable mechanism in the new area of data collection and analysis. It has the capability to read and record metrics like ultrasonic readings, accelerometer readings, video feed, alcohol status to detect drunk drivers, temperature and impact sensor readings. The data that will be saved is the one that is recorded a few seconds before impact, saving space and solving one of the big data problems, ultimately reducing storage costs and providing critical data only for analysis. The results yielded from Black Box are very crucial to research road accidents in depth. The analysis will aid in segmentation, demographics and statistical study of such events. It has the potential

to reveal commonly repeated patterns which can be neutralized with a single solution-wide effect method to highly reduce accidents happening in a few particular ways at particular spots. The data generated will also be advantageous, as historical data, in predictive models applied to machine learning in modern accident prevention features, measures and mechanisms in new vehicles.

II. Material And Methods

The system will operate according to the following workflow. There are three different sections, first one is alerting i.e., Arduino nano with thresholding values of sensor saved which will give alert by glowing LED. The second is capturing and saving the video i.e., the ESP32 cam module will record video and save it in SD card module. Although after every 45sec 1st video will be overwritten by the upcoming one. The last one or third is for data sending and emergency help i.e., if the accident will be detected GPS coordinates will be sent to the emergency phone number along with the email of the recording as shown in fig 2.

Blind spot detection –IR sensors will be placed at the position of the blind spot as the side-view mirrors so that it will detect the vehicles whenever it is in the blind spot range and an alert can be given to the driver for the same.

Vehicle collision avoidance -Ultrasonic sensors will be placed at front and backside of the car which will give an alert to the driver when the object or another vehicle is very near to the car.

Accident detection - The vibration sensor which is placed at the outer body of the car will detect the impact on the car and if it is larger than the threshold then GSM & GPS will be activated for further operation.

Lane Crossing -Usually, there are white marked lines on the black concrete road so IR sensors can be used to detect those white lines and it can further give an alert whenever the boundary is crossed.

Accidental analysis – At the end, all the parameters such as alcohol value, Temperature, Humidity and recorded video can be useful for analyzing different parameters which cause the accident, and which will help to reduce the future accident and improvement in technology.

Video monitoring System - The video monitoring system will be on throughout the drive, but the last few seconds (approximately 15 seconds) will be saved on the SD card.

GPS & GSM Data sending - GPS will record the current coordinates of the location and send that data to nearby hospitals and police stations if needed through the GSM module via SMS.

Accelerometer-Gyro Threshold alerting - In case of rash driving the coordinates of accelerometer-gyro meter will give an alert to the driver based on an exceeding allowable parameter.

Firestore Updating - As soon as the accident was detected by the impact sensor firestore will update the value and the local server will also host a webpage.

Email sending System - Two emails first containing the text of helping and next attached with the video of the last 30-45 sec before the accident will be sent to the recipients mentioned for emergency help.

Android application development

In-built Accelerometer –Every android mobile utilizes an accelerometer. This sensor is accessed using the Black Box android application to track and record the acceleration of the car as the acceleration of mobile will be proportional to the vehicle.

In-built GPS –For mitigation purposes, the same android app that consists of an accelerometer will include GPS to pin down the location of an accident.

In-built GSM –The GPS service of the mobile will be accessed by the ‘messaging module’ of the android app to send a distress message to a pre-saved contact. We optimized android in-built sensors such as accelerometer, GPS and GSM to integrate and built final application. To facilitate the user with providing emergency contact details, email and customized message.

The diagram given below will give an idea about the flow of the project and hardware- software system integration. By analyzing the system flow chart one can dive deep into the root of the required parameter at each time instance between the system and can get a clear idea about the flow.

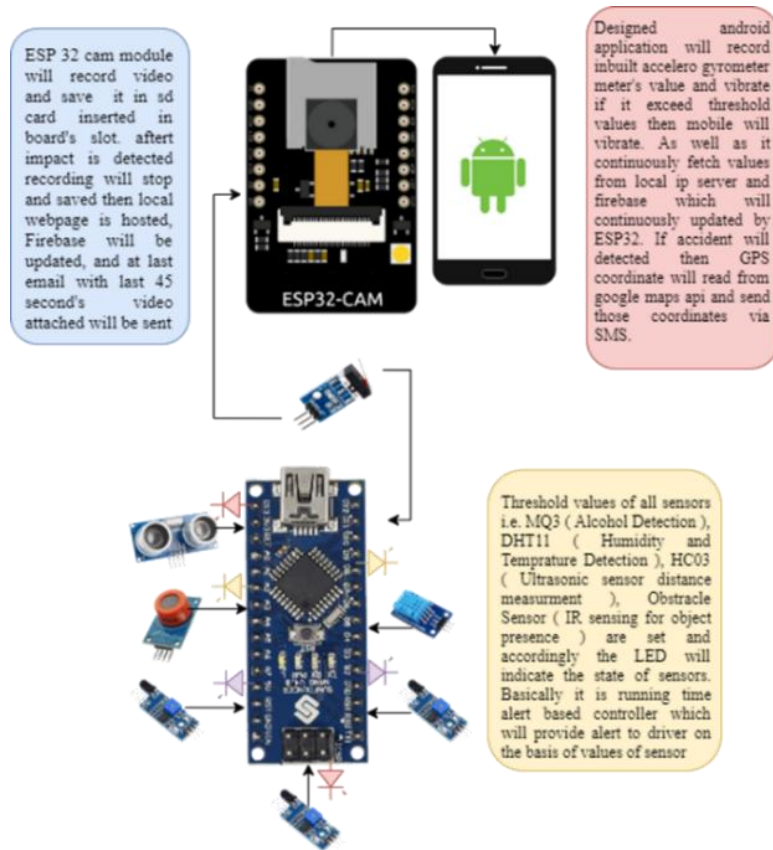


Figure 2: Workflow

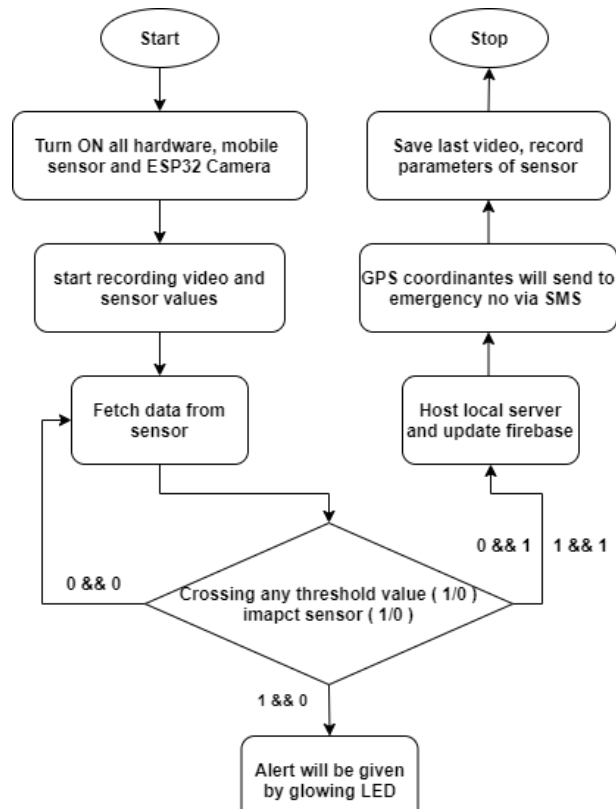


Figure 3: Flow chart

III. Result

a. Alerting system: All the sensors are integrated on remote controlled car for the demo. LEDs at front are used for giving alert whenever a sensor is triggered [Figure 4]



Figure 4: Alerting System

b. Firebase updating and email sending mechanism: As threshold is 0 on Firebase before the trigger which is seen in real-time database. Once the impact sensor gets trigger due to accident the threshold will become 1 and immediately email will be sent along with the emergency message and attachment of the video recording.

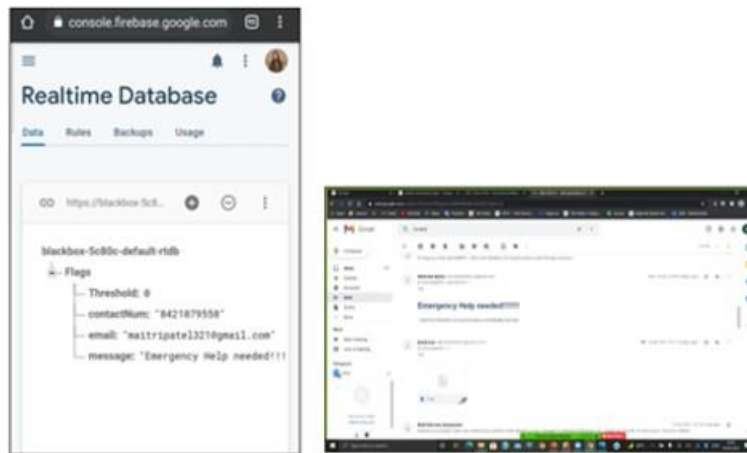


Figure 5: Firebase updating and SMS sending

c. Android application interface and Final prototype: User has to set contact details once and then whenever accident occurs SMS with emergency contact message and Location details (Longitude and latitude) will be sent to the given number. Acceleration is also displayed on the screen.

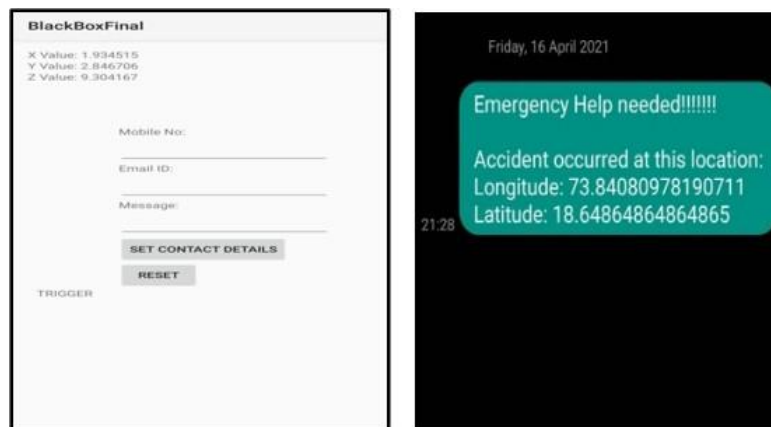


Figure 6: Results

IV. Discussion

The results above show that the proposed system is capable of fetching sensor data and saving video recording to the SD card through the ESP32 cam module. Based on the sensors data the system activates the altering system as well as the SMS and email system. The most prominent benefit of using assistance systems is that they enable communication between vehicle operations. This enables the trade of information for better vision, devising and decision-making of the vehicles. Both sensor alerting and Email along with SMS) are principally aimed to enhance safety and comfort.

Future Scope-

- a. The proposed system can be used for analysis to avoid similar kinds of accidents in future.
- b. The system can be integrated this state/central government to provide coordinates directly to nearest hospital.
- c. This system can also be used in two wheelers by doing some modifications
- d. This particular system having huge scope in military vehicle as per requirement
- e. This device can also be integrated with autonomous vehicle driving system for better performance and remote streaming.
- f. Insurance company can be collaborated for finding out the depth and truth of the accident by proving video recording

V. Conclusion

Accidents on the highway are described as a crash amid any on-road cars, hindrances or strollers. The rate of survival of the injured is highly dependent on the emergency help either via an ambulance which necessitates reaching the location of the mishap and then carries the patient to the hospital. Meanwhile, in maximum instances of highway crashes, the damages are not too critical, and the life of the sufferer can be preserved, however, due to the late arrival of the rescuing people, the damages become dangerous. Therefore, the main purpose of identifying where the accident occurred was accomplished and the information was sent to the emergency contacts in considerably less time, so that they can take the essential steps, to protect the life of the sufferer.

All the objectives of the proposed system were attained completely, and it turned out to be the perfect combination of hardware, software and Internet of things (IoT) which will be beneficial and contribute to save severe injuries either via alerting system or by emergency help.

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