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IoT Based Accident Detection and Alert System

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Abstract: *Speed is one of the basic reasons for vehicle accident. Many lives could have been saved if emergency services could get accident information in time. This paper proposes a system that deals with accident detection and alert system. The system uses various components like accelerometer, pressure sensors, Renesas microcontroller to detect the accident occurrence and GPS and GSM to alert the frequent contact person for help. An efficient automatic accident detection with an automatic notification to the emergency service with the accident location is a prime need to save the precious human life. The goal of the proposed system is to detect accident and alert the frequent contact in time.*

Keywords: Accident detection, Alert system, Accelerometer, GPS, GSM, Pressure sensor, Renesas microcontroller.

I. INTRODUCTION

The invention of a transportation system has given humans the ability to have the highest civilization above all other living things on the planet. Our daily lives are greatly impacted by automobiles. People use it to go to their places of employment, stay in touch with friends and family, and transport their wares. But it can also do us harm and possibly result in our deaths from accidents. One of the most significant and fundamental danger factors when driving is speed. It influences a crash's severity as well as one's likelihood of getting into one.

Accidents still happen occasionally despite the numerous efforts made by various governmental and non-governmental organizations throughout the world through various programs to raise awareness against irresponsible driving. If the emergency services had been able to get the crash information in time, many lives might have been saved. According to a study, 4.6% of accident fatalities may have been avoided if emergency services had been available at the scene of the accident in a timely manner. As a result, effective automatic accident detection with automatic transmission of the accident location to the emergency services is essential to save the priceless human life.

Because of this, there are more traffic accidents in various cities. Accidental death is a growing cause of death in modern times. Due to a shortage of emergency facilities and rescue teams, if an accident occurs on a national highway road, no one will be there to save the person who was involved. When a vehicle accident occurs, our paper suggested that an automatic signaling device be used to warn people of the risk as soon as feasible. This is because waiting too long could result in fatalities. As a result, this technology will quickly identify an accident and transmit the information to the police station and the rescue system.

II. RELATED WORK

Numerous researchers have investigated accident detection systems. Traditional traffic accident prediction relies on long-term traffic information such average daily and hourly volumes over the course of a year. Real-time traffic accident prediction, in contrast to conventional traffic accident prediction, links accident occurrences to real-time traffic data acquired from a variety of detectors, including induction loops, infrared detectors, cameras, etc.

The current era of mobile phones has just begun with the introduction of this concept proposal. Security applications based on GPS were proposed with the introduction of GPS sensors in mobile devices. Then they suggested unique hardware components that may connect to mobile phones. However, it had the drawback of actually costing more money to purchase additional hardware. The additional hardware can be eliminated thanks to the rapid advancement of mobile phones over the past ten years and the addition of new sensors. The current version of this paper's application is

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only available in a relatively small number of nations, and by sharing information with friends, family, and emergency services, the application's effectiveness can be significantly boosted.

Drawbacks:

- The live system can't work if any of the following occur at the time of the crash:
- Automatic or phone is disconnected or damaged.
- No GPS signal at the time of the crash.
- Insufficient cellular signal to upload crash details

III. PROBLEM STATEMENT

The percentage of the population using automobiles is rising. Accidents are becoming more frequent day by day as a result of traffic congestion. The delay in ambulance arrival at the scene of the accident or from the accident scene to the hospital results in the loss of life. Therefore, the accident sufferer must be taken to the hospital as quickly as possible. Every time an accident happens, the rescue unit must be notified. In order to reduce the amount of time needed for the rescue the proposed system has been designed.

IV. OBJECTIVES AND SCOPE

The primary goal of this effort is to stop fatalities brought on by a delay in receiving medical care. Without a doubt, the utilized electronic gadgets will be able to send the spontaneous message and precise location if the accident occurs due to other circumstances.

To recover victims, there are both police and an ambulance. The major objective of this study is to leverage the mobile phones' accelerometer and GPS to prevent casualties from traffic accidents. The location of the accident is delivered at the same time as the accident to the friends and relatives that the user permitted and stored, as well as to the rescue and emergency services, based on the information gathered from these sensors, which are present in the majority of mobile phones.

V. PROPOSED SYSTEM

In the proposed system Renesas is used as controlling unit, communicating between modules for better information transformation at time. Accelerometer can be used for detecting the collision direction from tri- lateral axis movements. The device also confirms from pressure sensors which detects the collision after a threshold voltage increase. Then a buzzer is provided to indicate the false detection of accident to the passenger. Within of limited time of buzzer signal the GPS module collects the coordinates from Google Module. These co-ordinates are shared to the rescue fellows of the passenger. This is attained using GSM module.

VI. SYSTEM ARCHITECTURE

In this system, the accident detection module detects external disturbances, and when it does, a function is run to locate the user's present location using GPS in the location detection module. The emergency services are contacted for assistance using the location information gleaned from the GPS.

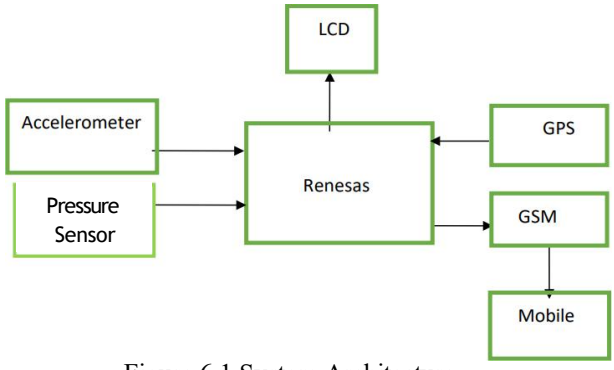

Figure 6.1 System Architecture

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An accelerometer is part of the vehicle unit, and it continuously updates the microcontroller with the coordinates of the vehicle's position. If it is discovered at random, the GPS location tracker keeps tabs on it and, via the GSM SIM module, notifies the emergency number with the location's latitude, longitude, and Google Maps coordinates.

VII. IMPLEMENTATION

Our system comprises two phases: Accident detection and Alert/Notification phase.

Accident Detection Phase: In the accident phase a hardware model is designed with the accelerometer and pressure sensor with the Renesas microcontroller.

Accident Notification Phase: In the alert phase, an android application is developed with which the user can update the rescue members phone number, from which the alert message is sent to the rescue fellows.

The workflow of the system is described below:

1. The Microcontroller setup is installed in a vehicle's crash guard or in bumpers of the vehicle on each side.
2. When collision occurs sensors get triggered, and it sends a notification to the microcontroller.
3. Microcontroller collects the sensed values and compares with the threshold values and triggers the GPS module.
4. The coordinates are shared through GSM.
5. Through GSM the notification is passed to the saved mobile number.
6. The application is used to know the route and location.
7. If the accident is not severe the person can turn off the buzzer and the device will come back to normal.

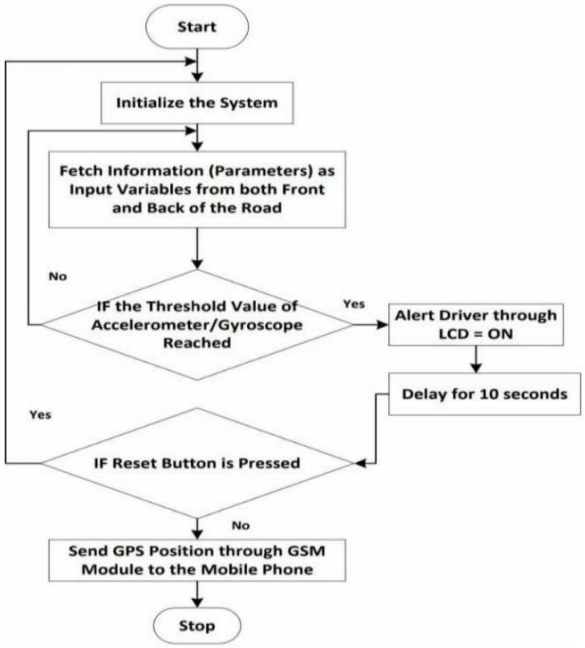

Figure 8.1: Data Flow diagram

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VIII. RESULTS

The hardware setup of the system with Accelerometer, Microcontroller, GPS, GSM are used to detect the accident.

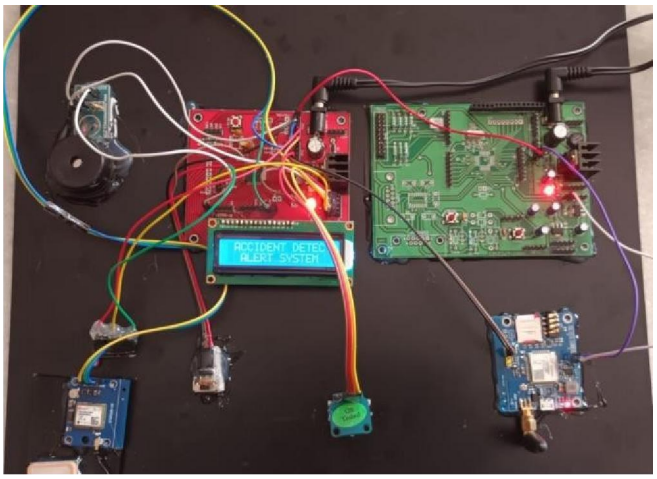

Figure 9.1: Hardware Setup to Detect Accident

An android application is developed to notify the cause to the rescue members through which the location co- ordinates are shared to them. Using this application, a user can login, update the rescue members details and also view the activity of the user in the application.

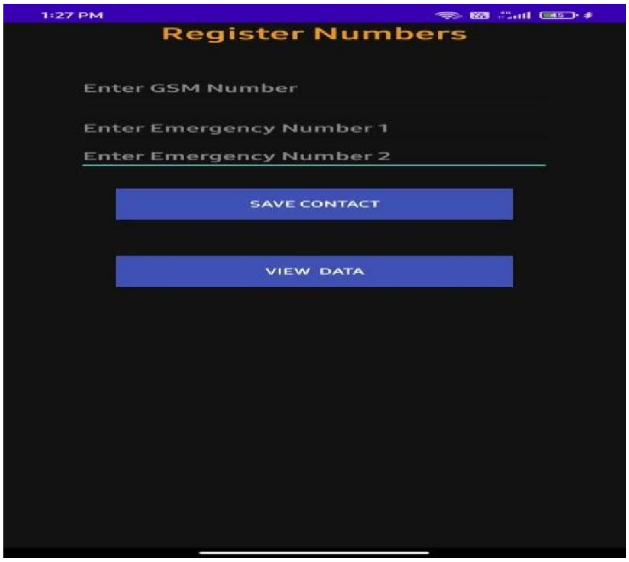

Figure 9.2: Application interface

When the system detects accident occurrence a pop-up notification through the app is displayed with the latitude and longitude co-ordinates of the accident location and a notification message is sent to the rescue members.

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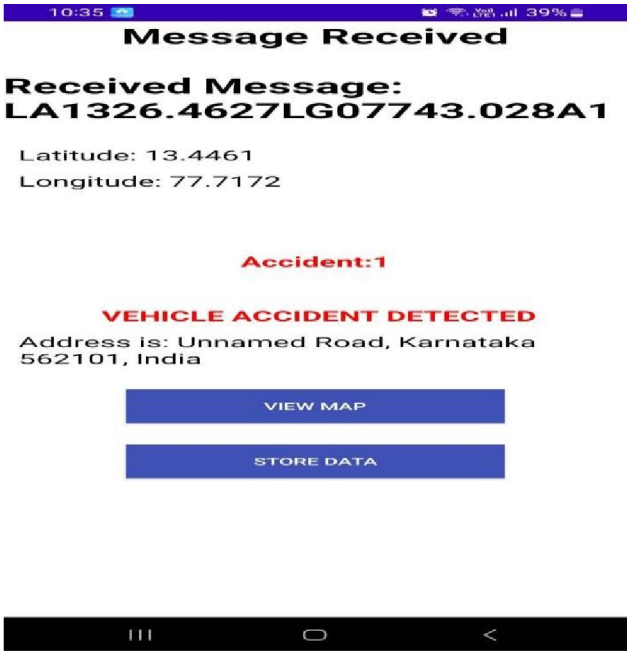

Figure 9.3: Accident Notification in application

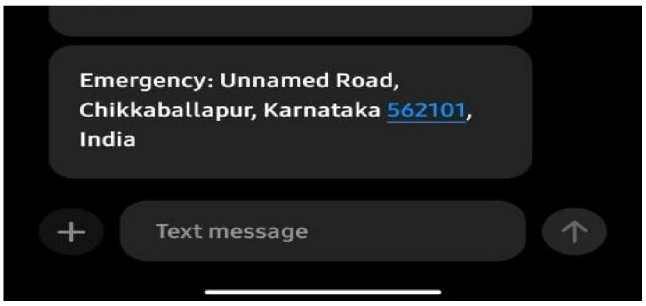

Figure 9.3: Message received by the Rescue member.

Like this a message will be received by the rescue members from the Accident detection application.

IX. CONCLUSION

A system for accident event detection has been created. The suggested system focuses on accident detection and notification. It determines the vehicle's precise latitude and longitude and transmits this data to the closest provider of emergency services. Microcontroller assists in sending the message to various system components. The direction of the collision is monitored by the accelerometer. Through the GSM module, the data is sent to the registered number. The location can be supplied through a tracking system using GPS to cover the area's geographic coordinates.

X. FUTURE ENHANCEMENT

The potential of this system can be expanded in the future by employing a wireless webcam to capture photos that will aid in offering driver assistance. By automatically locking all the brakes in the event of an accident, this can also be improved. Most often in collisions, it gets worse when the drivers lose control and can't get the car to stop. In these circumstances, the processor will process the vibrations received and will also activate the vibration sensor. The devices that, when triggered, can lock the brakes must be connected to the CPU. With this advancement, we can halt the car and lessen the force of the collision.

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