Automatic Accident Detection & AlertingMechanism using Arduino

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Abstract*—In India, there are lots of road accidents that happen daily. In which many people suffered heavy damage or lost their lives. Thus, the research for the Automatic Accident Detection system plays an important role. The proposed algorithm handles the impact of acceleration while it is true or not and if it is true then it will directly call and send SMS to the victim's relatives so that the victim's life will be saved quickly.

Keywords— ***Arduino UNO, Accident detection, Alerting Mechanism, Accelerometer, GSM, GPS***

I. INTRODUCTION

Every Year, roughly 1.3 million people die in road accidents worldwide. On an average, 3,287 deaths per day. Many of them got injured very badly. So, to solve this problem we are implementing a system which will work to detect an accident, if the accident is detected then it will call the victim's authorities and save the life of the victim by providing quick aid services.

II. IMPLEMENTATION DETAILS

Automatic Accident Detection and Alert system is made with the help of the components like Arduino UNO, GSM Module 800, GPS Module SIM28ML, Accelerometer ADXL335 and Arduino IDE Sofware.

The project is divided into two main parts one is accident detection and the another part is to send alerts and GPS location to the registered emergency mobile number.

For the detection of the accident, we are using the accelerometer ADXL335 as when the accident happens then there is a drastic change in the acceleration. For detecting the accident, we need to calculate the magnitude.

Magnitude indicates how hard the impact is. Magnitude is compared with the sensitivity variable. If it is higher than the sensitivity, then it means that the crash is detected.

If Sensitivity >, Less chances of False Crash Alerts. But cannot detect small accidents.

If Sensitivity <, More chances of False Crash Alerts. But can detect small accidents.

The impact algorithm executes after every 2 milliseconds. So, there must be some old values x, y & z axes. We have stored them in 'oldx', 'oldy' and 'oldz' variables. Then we are reading the new values of the x, y and z axes from the accelerometer. Now we have the new values and the old values, now we subtract the old values from the new values to get the deltaX, deltaY & deltaZ values, i.e. the difference between the old and the new values. The formula to calculate Magnitude is :

$$Magnitude = \sqrt{((\Delta x)^2 + (\Delta y)^2 + (\Delta z)^2)}$$

GPS Module SIM28ML is used for getting the accurate location of the accident. It gives the coordinates of the longitude and latitude which are used in the message link.

GSM Module 800 is used for the communication between the Arduino and the Emergency Contact Number. Various GSM AT commands are used for various purposes like calling the Emergency Contact and Sending the alert message with live location of the accident with the help of the google map link.

III. Literature Review

For making this project we have used different papers regarding accelerometer, Arduino, GPS**,** GSM. So that we can abstract ideas from them.

Vehicle Accident Detection and Messaging System Using Microcontroller[1] – In this paper, the authors have given detailed idea and functioning of the components used in the system. Also, he explained how accidents can be avoided using ultrasonic sensors. This paper helps us to learn about hardwares used in detail.

Accident Alert and Tracking Using Arduino[2] – In this paper, The authors have made a fast system so that immediate help canbe given. Also, they proposed the idea of alcoholic detection. To eliminate delay time between an accident occurrence and the emergency medical personnel are dispatched to the accident location. This paper helped us to understand how we can make our system faster and more efficient.

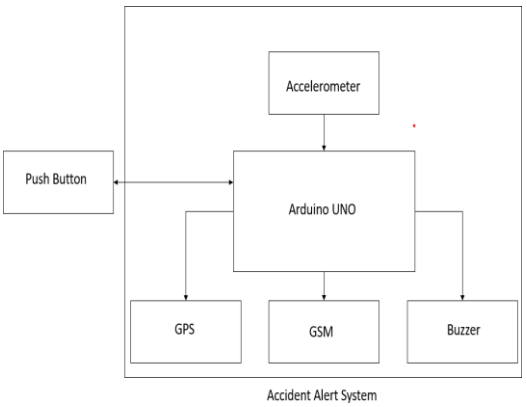
GSM Based Home Automation System using Arduino[3] – The paper describes the remotely control of the home appliances using the GSM. The paper has also described some basic coding terms used in remotely controlling. The author has addressed the problem of wastage of electricity. This paper helps me to understand the flow chart and system architecture. Got the information about various things that can be done using the GSM remotely.

An Advanced Public Transport with Tracking the Vehicle and Sending the Location Using GSM and GPS during Pandemic Situations [4] – In this paper the GPS and GSM are used as main hardware and the author gives a brief idea about it. Also the connection with Arduino is explained. The author has addressed the problem of theft and mishandling of vehicles. This paper helps us to get the information about location tracking and connections of the hardware part for it.

Improved Cash Detection Algorithm for Vehicle Crash Detection[6] – In this paper, author has proposed the crash detection algorithm for multiple scenarios. Author has addressed the issue of mishaps in a vehicle crash**.** We have implemented the crash detection algorithm in our project. So this paper helps us to calculate Magnitude of the Impact.

Development of Earthquake Early Warning System Using ADXL335 Accelerometer [7] – In this paper, the author proposed Early Warning System from earthquake with use of ADXL335 Accelerometer. We have used the same accelerometer in our project so this paper helps us to understand its function.

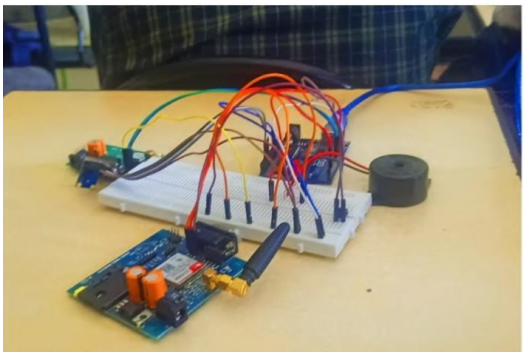
IV. System Architecture



[System Architecture]

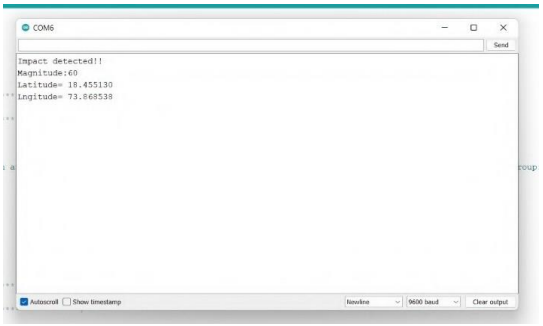
V. RESULTS AND DISCUSSION

These are the resultant components of our project which includes the components as follows, GPS Module, GSM Module, Accelerometer, Buzzer, Arduino UNO. [Image 3]



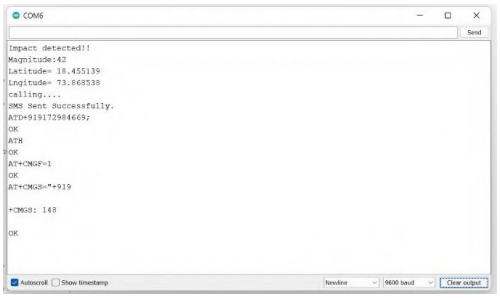
[Image 1] Components Connections

If any sudden impact is detected then the message will be displayed on the serial monitor along with the location coordinated. [Image. 1]

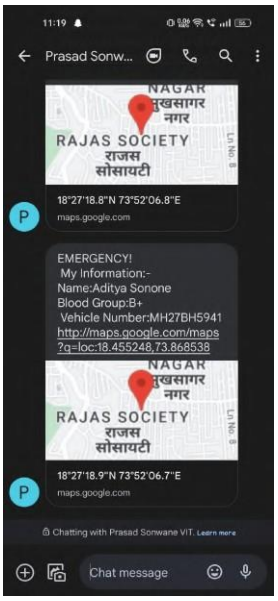


[Image. 2]Serial Monitor

If the push button is not pressed within the time limit of 30 seconds, then the first of all the buzzer will be turned off and the call on the emergency number will be sent and immediately after that alert message along with the location link will be sent on the registered emergency mobile number. [Image. 3]

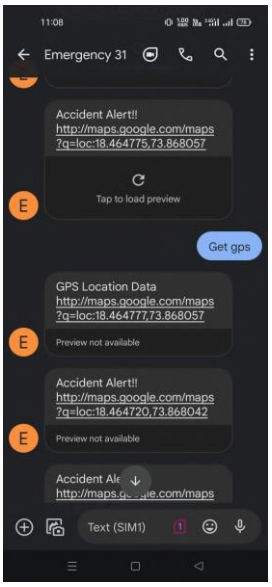


[Image. 3] Emergency Message Serial Monitor



[Image. 4] Emergency Message

If the accident happens then the message will be sent to the emergency contact number in the above format containing the Name, Blood group, Vehicle Number and Location link of the victim.



[Image 5] Location Tracking

The same system can be used as Location Tracker. When "Get gps" message is sent through the registered emergency number then the link of the current location will be sent to the emergency number. [Image. 5]

VI. CONCLUSION

We have implemented this project successfully. With the help of this project, the victim can get medical help in a short period of time and the chances of death or delay in help is reduced.

VII. FUTURE SCOPE

In the future, we can add alcohol detection along with the impact detection and deny the start of the vehicle if it senses alcohol. Along with that, another feature can be implemented by sending alerts to the nearest hospitals from the location of the accident so that help might arrive quickly.

VIII. REFERENCES

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