ACCIDENT DETECTION AND ALERT SYSTEM

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ABSTRACT

The rapid growth of technology and infrastructure has made our lives easier. The advent of technology has also increased the traffic hazards and the road accidents take place frequently which causes huge loss of life and property because of the poor emergency facilities.

Our project will provide an optimum solution to this drawback. An accelerometer can be used as a crash or rollover detector of the vehicle during and after a crash. The vibration sensor can be used in order to check the vibration rates of the car. By monitoring the data from accelerometer and the vibration sensor, a severe accident can be recognized. It then sends the alert message through the GSM Module including the latitude and longitude data provided by the GPS module to police control room or a rescue team. So the police can immediately trace the location where the accident has occurred and necessary action can be taken after receiving the emergency message.

Keywords: Arduino Uno, 16X2 LCD Display, ADXL Accelerometer, GPS Module, GSM Module, Arduino Uno Board.

I.   INTRODUCTION

Automobile has a great importance in our daily life. We utilize it to go to our workplace, keep in touch with our friends and family, and deliver our goods. But it can also bring disaster to us and even can kill us through accidents. Speed is one of the most important and basic risk factors in driving. It not only affects the severity of a crash, but also increases risk of being involved in a crash. Despite many efforts taken by different governmental and non-governmental organizations all around the world by various programs to aware against careless driving, yet accidents are taking place every now and then.

However, many lives could have been saved if the emergency service could get the crash information in time. This will help in detection and alert of the accident and can help to save the life of the injured person. The system can be the solution for accidents at isolated places where no one is around to report if an accident has occurred. The usage of auto mobiles has improved linearly over the past decade, which increased in the risk of human life. This is because due to the insufficient emergency facilities. Therefore, in order to overcome this situation, we are using an alert system which helps in improving the emergency system of the accident system.

This system sends the basic information to the medical rescue team within a few seconds of an accident. This device can detect accidents and sends an alert message to rescue teams in significantly less time which will help in saving the lives of the people. The alert message contains the geographical coordinates, time and angle in which the accident has occurred. When an accident occurs, it is detected with help of a sensor which activates the device, the sensor gives its output to the microcontroller. The microcontroller sends the alert.

We have used GPS and GSM module for our project. GPS (Global Positioning System) is a satellite navigation system used to determine the ground position of an object. It is a global navigation satellite system that provides geo location and time information to a GPS receiver anywhere on or near the Earth. Here GPS is used for both tracking and navigation. This enables a base station to keep track of the vehicles and navigation system helps the driver to reach the destination.

1.1 PROBLEM STATEMENT & SOLUTION

Accidents on roads often result in delayed emergency responses, which can be life- threatening. To address this issue, there is a need for an efficient accident detection and alert system that can quickly notify emergency services and nearby individuals about the incident.

Our project aims to develop an Accident Detection and Alert System using Arduino. The system will be equipped with sensors to detect sudden changes in vehicle movement or impact, indicating a potential accident.

Upon detectingan accident, the system will immediately trigger an alert mechanism. This alert can be sent via SMS to emergency contacts, including local authorities and predefined contacts of the vehicle owner or passengers.

1.2 OBJECTIVE

The objective of the accident detection and alert system using Arduino project is to create a reliable and efficient mechanism for detecting accidents in real-time and alerting emergency services or concerned individuals promptly. This system typically involves integrating sensors such as accelerometers or gyroscopes to detect sudden changes in acceleration or orientation thatindicate a potential accident or collision. When an accident is detected, the Arduino microcontroller processes the sensor data,triggers an alert mechanism (such as sending SMS alerts or activating sirens), and communicates the incident details to predefined emergency contacts or a centralized monitoring system. The goal is to improve response times in emergency situations, potentially saving lives by ensuring timely medical assistance or intervention.

II.   NEED OF ACCIDENT ALERT SYSTEM

An accident detection and alert system using Arduino fulfills several critical needs in modern safety and emergency response scenarios. It addresses the need for immediate detection of accidents, utilizing sensors such as accelerometers, gyroscopes, and GPS modules tomonitor vehicle dynamics and detect abrupt changes indicative of collisions or rollovers. Thiscapability ensures that accidents are identifiedswiftly and accurately, crucially improving response times for emergency services.

III.   LITERATURE REVIEW

[1] MO.Sudharsana, Mr.N. KumarClashAvoidance at Hairpin Bends using IR sensor

In this system, Arduino Uno is used as a microcontroller. It also includes components like IRsensors and LEDs. It uses two IR sensors placed on the side of roads. These sensors aremutually exclusive and are connected to ATmega328P microcontrollers through wires. Basedon the output of sensors, the position of the vehicle is detected, which is provided as input tothe microcontroller. And then LEDs placed on side warn the drivers and thus controlling the movement of vehicles at the bend.

[2] R.Keerthika, S.Atchaya, M.Bharathi, K.Hamsaleka, C.Monika Road vehicle alerting and accident detection system using IOT

In this system, a vibration sensor is used to detect an accident with an Arduino as a microcontroller. It also includes components like GSM module and GPS module. The vibration sensor and GPS module work together to give data to Arduino, which in turn sends the data to GSM module. It proposes to have Bluetooth or Wi-Fi networks in a set of clusters across the street to identify the user by a unique MAC address to identify drivers from their Smartphone application. When the vibration sensor detects the accident, the GPS module works in sync with it and provides the latitude and longitude details of the accident area. This data when sent to the GSM module, it sends to other drivers connected to Wi-Fi in a 20-meterradius.

[3] T Kalyani, S Monika, B Naresh, Mahendra Vucha Accident Detection and Alert System

In this system, Arduino is the heart of the system which helps in transferring the message to different devices in the system. Vibration sensor will be activated when the accident occurs and the information is transferred to the registered number through GSM module. Using GPS the location can be sent through a tracking system to cover the geographical coordinates over the area. The accident can be detected by a vibration sensor which is used as a major module in the system. It can be extended by providing medication to the victims at theaccident spot. By increasing the technology we can also avoid accidents by providing alerts systems thatcan stop the vehicle to overcome the accidents.

[4] Swetha Bergonda, Sushmita and Prof. Savita SomaIoT Based Vehicle Accident Detection and Tracking SystemUsing GPS Modem

The vibration sensor is used to sense the obstacle, and then it sends an interrupt to RaspberryPi. The GPS receives the location ofthe vehicle that met with an accident and gives the information back. This information will be sent to a mobile number through aWhats App message. The Raspberry Pi interfaced to GPS modem via an internet and L293D Motor Driver which allows the voltage to be flown in either direction. We can monitor

the speed of the vehicle and can find the location of the vehicle. Alert message to mobile phone for remote information. Mobile number can be changed at any time. This system can be interfaced with vehicle airbag system that prevent vehicle occupants from striking interior objects such as the steering wheel or window.

IV.   PROPOSED SYSTEM

The proposed accident detection and alert system using Arduino aims to leverage advanced sensor technology and real-time processing capabilities to enhance road safety and emergency response mechanisms. Central to the system is the Arduino microcontroller, which integrates sensors such as accelerometers and GPS modules to continuously monitor vehicle dynamics. These sensors detect sudden changes in acceleration, orientation, or GPS coordinates, indicative of accidents or collisions. This rapid alert dissemination is crucial for reducing response times and ensuring timely medical assistance, potentially saving lives.
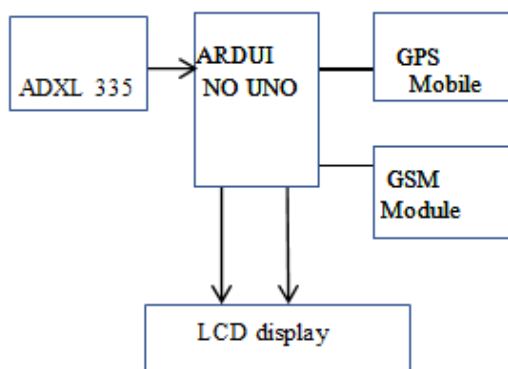
4.1. Hardware connection of system

Figure 4.1: Hardware connection of all the components

In this era of large professional growth everybody is busy with their lives. People, especially in urban areas have to move from one place to another any time of the day with much of speed. Due to this reason and sometimes due to in efficient people in the driving seats road accidents are quite common thing that can happen. Road accidents can snuff out a life if the victim is not given proper medical attention at proper time.

So, in this project we have planned to design a system that can detect road accident and identify the location through GPS. After that, through GSM interface this will be notified to the nearest emergency care unit so that the victim can get immediate medical attention.

First of all, a driver takes a driver seat. The system checks if the driver has worn the seat belt or not. If not, it displays a message, "Wear seat belt". If the driver wears the seat belt, the engine starts and gives message "Happy Journey". While moving if it detects a vehicle or any other objects it will decreases the vehicle speed, even though the accident occurred then vibration sensor will activate the GPS to locate accident area. If there is no affect to anyone then the person involved in accident has to press the safety switch. In this case no SMS will send to emergency care centre. If no one is pressed the safety switch within 40s then GSM will send the location and persons heart beat status to the emergency care centre and optional mobile number stating that ACCIDENT OCCURRED. In addition to that it will send a message to emergency care centre when the vehicle is flipped or detects the fire.
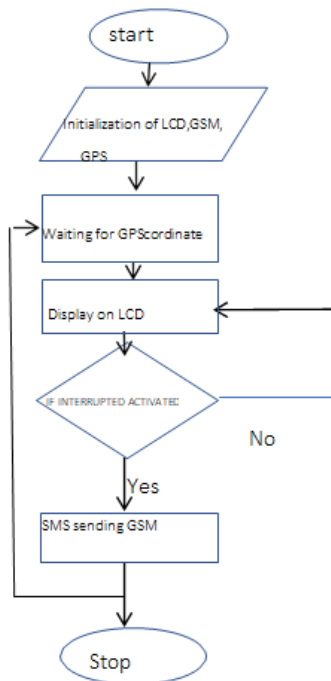
4.2 flowchart

Fig 4.2: flow chart

Component Description and Used Softwares The component requirements of hardware and software are given below.

ARDUINO UNO: The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo.

(i) GPS Module: GPS stands for Global Positioning System and is used to detect the latitude and longitude of any location on the earth, with the exact UTC time. GPS module is used in our project to track the location of the accident. This device receives the coordinates from the satellite for each and every second, with time and date. In our project, we have used GPS module SKG13BL, which is a Ultra High Sensitivity and Low Power GPS Receiver Module

(ii) GSM MODULE: GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries.

(iii) 16*2 LCD DISPLAY: LCD stands for liquid crystal display. Character and graphical LCD's are most common among hobbyist and diy electronic circuit/project makers. Since their interface serial/parallel pins are defined so it's easy to interface them with many microcontrollers. They are used to show status of the product or provide interface for inputting or selecting some process. Character LCD come in many sizes 8x1, 8x2, 10x2, 16x1, 16x2, 16x4, 20x2, 20x4, 24x2, 30x2, 32x2, 40x2 etc. We have used 16x2 LCD for our project

(iv) ADXL335 ACCELEROMETER: An accelerometer is an electromechanical device that will measure acceleration force. It shows acceleration, only due to cause of gravity i.e.,force.

V.   APPLICATION OF ACCIDENT DETECTION AND ALERT SYSTEM

- **Emergency Notifications**: Sending alerts to emergency services, providing them with precise GPS coordinates of the accident location. This accelerates response times and improves the chances of timely medical assistance.

- **Activation of Safety Features**: Automatically deploying safety measures within the vehicle, such as

activating airbags, turning off the engine, or unlocking doors to facilitate rescue operations.

- **Alerting Nearby Vehicles**: Utilizing wireless communication modules (like GSM, GPS, or Bluetooth), the system can warn nearby vehicles about the accident, promoting traffic awareness and potentially preventing further collisions.

VI.   RESULT

After all the components are connected properly, the system is put into a moving car. If accident occurs, the acceleration due to the collision occurred is sensed by the ADXL335 Accelerometer and its x, y and z-axis ADC output pins are directly connected to Arduino ADC pin A1, A2, and A3.

Figure 3: ARDUINO UNO R3 Developmentboard

After successful compiling and uploading the program on Arduino IDE, the system is initializedsuccessfully, the accelerometer is calibrated and the x,y and z samples of the vehicle are displayedon the serial monitor.

Figure 4: The successful initialization of the system is displayed in the LCD

After receiving GPS signal, the latitude and longitude of the current position of the vehicle is displayed, also the speed is displayed in knots.
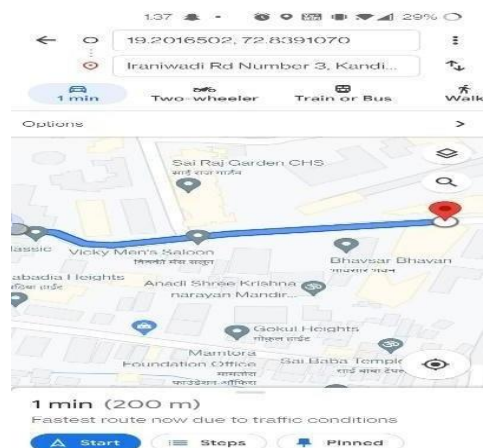

Figure 5: After receiving GPS signal, the latitude and longitude of the current positionof the vehicle is displayed.

When the accelerometer is shaken abnormally, i.e., in case of an accident when there is an abrupt change of axis, SMS is sent to the mobile number mentioned in the code and the latitude and longitude is also sent in the form of Google maps. The message is received in the specified mobile number along with the specific location.

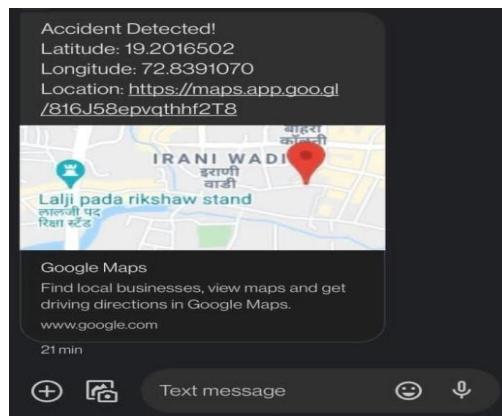**Figure 6:** Message received by the specified phone number

Figure 7: Location of the accident sent viaGoogle Map.

VII.   FUTURE SCOPE

Looking into the future, the accident detection and alert system using Arduino project holds significant potential for further advancements andapplications in enhancing road safety and emergency response systems. The future scope ofthe accident detection and alert system using Arduino project encompasses advancements in AIintegration, connectivity, sensor technology, and collaborative safety systems. These developmentsaim to further enhance the effectiveness, efficiency, and impact of the system in reducing accidents, improving emergency response times, and ultimately saving lives on the road. By employing AI, the system can improve its ability to distinguish between actual accidents and false alarms, thereby reducing the occurrence of unnecessary alerts and optimizing resource allocation for emergency responders.

VIII.   CONCLUTION

Vehicle tracking system makes better fleet management and which in turn brings large profits. Better scheduling or route planning can enable us to handle larger loads within aparticular time. Vehicle tracking both in case ofpersonal as well as business purpose improvesafety and security, communication medium, Performance monitoring and increasesproductivity. So, in the coming years it is goingto play a major role in our day to day living. Themain motto of the accident alert and detectionproject is to decrease the chances of losing life insuch accidents which we can't stop fromoccurring. Whenever accident is alerted, theparamedics can reach the particular location to increase the chances of life. This vehicle tracking and accident alert feature may play a moreimportant role in day-to-day life in the future.

IX. REFERENCES

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