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DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

A PROJECT PHASE-I REPORT ON

"Intelligent Accident Detection and Location Tracking Information System"

Submitted in partial fulfilment for the Requirements for the award of degree

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted by

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VISVESVARAYA TECHNOLOGICAL UNIVERSITY,

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

This is Certified that the project work entitled **"Intelligent Accident Detection and Location Tracking Information System"** carried out by **Vishwanath.S.Goroshi (2BL20EC114)** bonafide students of **V.P Dr P.G Halakatti College of Engineering and Technology, Vijayapura** in partial fulfilment for the award of **Bachelor of Engineering in Electronics and Communication Engineering of the Visvesvaraya Technological University, Belagavi** during the year 2023-2024. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirement in respect of Project Phase-2work prescribed for the said degree.

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DECLARATION

I am Student of Eighth semester B.E at the department of **Electronics & Communication Engineering**, hereby declare that, the Project entitled "**Intelligent Accident Detection and Location Tracking Information System**", embodies the report of our project work, carried out by me under the guidance of **Prof. Jayashree.N.C.** I also declare that, to the best of our knowledge and belief, the work reported here in does not form part of any other report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this by any student.

Place: Vijayapura
Date:

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(2BL20EC114)

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ABSTRACT

The rapid growth of technology and infrastructure has undeniably improved our lives. However, this progress has also led to an increase in traffic hazards and frequent road accidents, resulting in significant loss of life and property due to inadequate emergency facilities. Our project aims to address this drawback by developing an intelligent accident detection, location tracking, and notification system capable of immediate response when an accident occurs. The system employs a Global Positioning System (GPS) device to accurately determine the accident's exact location.

A Global System for Mobile (GSM) module is integrated to send a notification message, including a Google Maps link of the location, to the nearest police control room, hospital, and the individual's home. There is a critical need to develop a system that comprehensively addresses these issues and effectively reduces the delay time experienced by medical vehicles.

The primary goal of this paper is to introduce a framework utilizing the Internet of Things (IoT) to promptly detect car accidents and notify relevant parties. This is achieved by integrating smart sensors with a microcontroller within the vehicle, capable of triggering in real-time during an accident. Additionally, modules such as GPS and GSM are integrated into the system to obtain accurate location coordinates of accidents. The system then sends this information to registered numbers and nearby ambulance services, ensuring immediate assistance at the accident location.

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CHAPTER 1

INTRODUCTION

The High demand of automobiles has also increased the traffic hazards and the road accidents. Life of the people is under high risk. This is because of the lack of best emergency facilities available in our country. An automatic alarm device for vehicle accidents is introduced in this paper. This design is a system which can detect accidents in significantly less time and sends the basic information to first aid center within a few seconds covering geographical coordinates, the time and angle in which a vehicle accident had occurred. This alert message is sent to the rescue team in a short time, which will help in saving the valuable lives. A Switch is also provided in order to terminate the sending of a message in rare case where there is no casualty, this can save the precious time of the medical rescue team. When the accident occurs the alert message is sent automatically to the rescue team and to the police station. The message is sent through the GSM module and the location of the accident is detected with the help of the GPS module. The accident can be detected precisely with the help of vibration sensor. The Angle of the rolls over of the car can also be known by the message through the MEMS sensor. This application provides the optimum solution to poor emergency facilities provided to the road's accidents in the most feasible way. The Vision of the Internet of Things (IOT) has come out to reach unexpected bounds of today's computing world. The heart of IOT is smart sensors without which it would not have existed. This system is also can be interfaced with buttons like help alert, dashing alert, fire alert, location alerts and when pressed then the system automatically alerts through buzzer alarm. This enables it to monitor the accident situations and it can immediately alert the police/ambulance service with the location of accident.

The system can be interconnected with the car alarm system and alert the owner on his mobile phone. This tracking system is composed of a GPS receiver, PIC Microcontroller and a GSM Modem. GPS Receiver gets the location information from satellites in the form of latitude and longitude. The PIC Microcontroller processes this information and this processed information is sent to the user/owner using GSM modem. PIC Microcontroller also gets the speed of the vehicle and sends it to user/owner.

The presented application is a low-cost solution for automobile position and status, very useful in case of car theft situations, for monitoring adolescent drivers by their parents as well as in car tracking system applications. The proposed solution can be used in other types of application, where the information needed is requested rarely and at irregular period of time this project is also used to alert the owner of vehicle in case of accidents. Basic objective that our accident detection will able to perform can be noted as follow:

The main objective of this work is to design and develop an automatic accident detection and notification systems. Total work can be summarized as:

- An accelerometer and vibration sensors are used to detect the accident precisely with the rapid change of acceleration and vibration of the vehicle.
- When a vehicle meets with an accident immediately vibration sensor will detect the signal or if a car rolls over, accelerometer sensor will detect the signal and sends it to microcontroller.
- Microcontroller sends the alert message through the GSM MODEM including the location to police control room or a rescue team.

CHAPTER 2

LITERATURE SURVEY

An Approach Towards Intelligent Accident Detection, Location Tracking and Notification System [1]. Authors - Mohammad Nazmus Sakib, Supriya Sarker, Md. Sajedur Rahman. In this paper, we develop an intelligent accident detection, location tracking and notification system that detects an accident immediately when it takes place. Global Positioning System (GPS) device finds the exact location of accident. Global System for Mobile (GSM) module sends a notification message including the link of location in the google map to the nearest police control room and hospital so that they can visit the link, find out the shortest route of the accident spot and take initiatives to speed up the rescue process.

Vehicle Accident Detection & Alert System using IoT and Artificial Intelligence [2]. Authors - Akash Bhakat, Neetigya Chahar, V Vijayasherly. This paper analyses and proposes a way IoT can be used in this regard in a way that can save thousands of lives. Along with IoT, we have incorporated machine learning methods and image processing to accurately identify a road accident. The sensors like accelerometer, gyroscope, camera, etc. provide data to a microprocessor which matches the sensor data with the machine learning model and determines if there is an accident or not and if it is, the device sends the related metrics to the server through the internet. Here, instead of using a central server topology, we have incorporated Edge computing which enables us to process requests faster locally. This further optimizes response time. Once the data is reached to an edge server, it determines the nearest hospitals, police stations by looking at the GPS data and sends a notification to them and to the registered phone number by the user. This way, it becomes a life-saving technology.

An automated system for Accident Detection [3]. Authors – Asad Ali, Mohamad eid . Minor accidents may be resolved by the passengers themselves and do not require escorting to hospitals whereas major accidents where airbags are deployed require immediate attention of authorities. Automatic Smart Accident Detection (ASAD) is an auto-detection unit system that immediately notifies an Emergency Contact through a text message when an instant change in acceleration, rotation and an impact force in an end of the vehicle is 4 INTELLIGENT ACCIDENT DETECTION AND LOCATION TRACKING INFORMATION SYSTEM detected by the

system, detailing the location and time of the accident. The idea is that as soon as an accident is detected by the system, the authorities should immediately be notified to prevent further car congestion as well as allow the passengers to be escorted to the hospital in a timely fashion. The system involves the use of fuzzy logic as a decision support built into the smartphone application that analyzes the incoming data from the sensors and makes a decision based on a set of rules. The simulated results show a 98.67% accuracy of the system with failures resulting from the "gray regions" of the variable values.

Intelligent accident detection and alert system for emergency medical assistance [4]. Authors - Nicky Kattukkaran, Arun George, T.P. Mithun Haridas. Road accidents rates are very high nowadays, especially two wheelers. Timely medical aid can help in saving lives. This system aims to alert the nearby medical centre about the accident to provide immediate medical aid. The attached accelerometer in the vehicle senses the tilt of the vehicle and the heartbeat sensor on the user's body senses the abnormality of the heartbeat to understand the seriousness of the accident. Thus the systems will make the decision and sends the information to the smartphone, connected to the accelerometer and heartbeat sensor, through Bluetooth. The Android application in the mobile phone will sent text message to the nearest medical center and friends. Application also shares the exact location of the accident that can save the time.

CHAPTER 3

METHODOLOGY

3.1 Methodology with block diagram

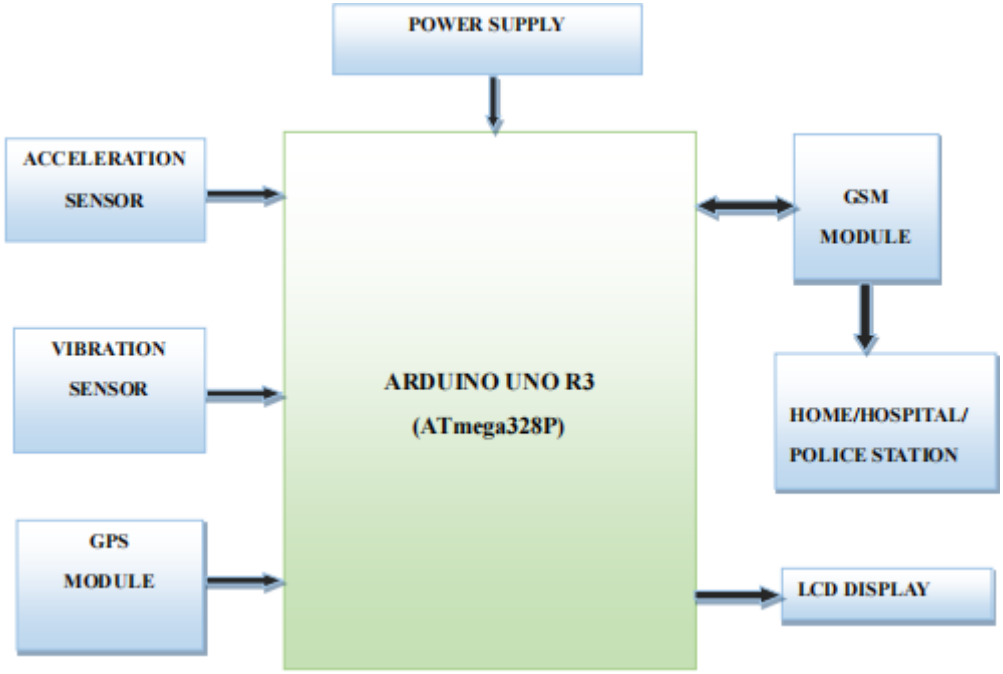

Fig.3.1 Block diagram of intelligent detection system

A general block diagram has been developed and implement according diagram Arduino this is the core unit of the entire system as it controls the flow of information between sensors. It is basically a development board which gives the flexibility of writing C programs for the sensors and later they can deployed in the flash memory of Arduino to check the functioning of sensors. Vibration Sensor This sensor can recognize vibrations in a given area. It has two values as low and high. Usually, it remains low for the scenarios where vibration impact is not that powerful. It attains high value on receiving high vibrations from the environment. Accelerometer it is a type of sensor which is designed to measure acceleration accurately. It measures acceleration in three axis which are x-direction, and z-direction.

The x-axis of the accelerometer gives the measure of positive acceleration, y-axis gives the measure of negative acceleration (retardation) and-axis indicate the angle of turnover of the device in which it is installed. Global Positioning System (GPS) A global positioning sensor is a receiver which gives position, speed and timing information of an object. On installation of this sensor, any device can be tracked to locate its position. GSM It is a component which is used for mobile to mobile communication.

CHAPTER 4

HARDWARE COMPONENTS

4.1 Hardware Requirements

1. Arduino UNO R3 (AT mega 328P)
2. GSM Module (SIM800L)
3. GPS Module (NEO-6M)
4. Accelerator Sensor (ADXL335)
5. Vibration Sensor
6. LCD Display
7. Jump wire
8. Power source

4.2 Hardware Components Description

4.2.1 Arduino UNO R3 (AT mega 328p)

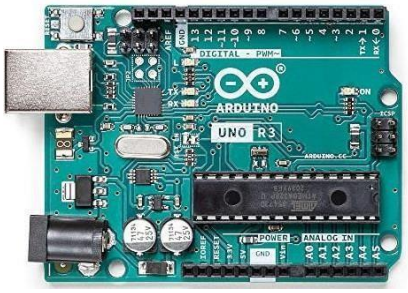

Fig.4.2.1 Arduino UNO

The Arduino Uno is an open-source microcontroller board based on Microchip ATmega328 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 and other circuits. The board has 14 digital I/O pins (6 capable of PWM Output), 6 analog input pins, and programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be

Powered by the USB cable or by an external 9-Volt Battery or 9-Volt DC Power Supply, though it accepts voltages between 7 and 20 Volts. It is similar to Arduino Nano and Leonardo. The word "UNO" means "One" in Italian and was chosen to mark the initial release of Arduino Software. The UNO board is the first in a series of USB-based Arduino boards. The Atmega328 on the board comes preprogramed with a boot loader that allows uploading new code to it without the use of an external hardware program.

Features:

- Microcontroller: Atmega328
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- SRAM: 2KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz

4.2.2 GSM Module (SIM800L)

Fig.4.2.2 GSM Module (SIM800L)

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates. There are various cell sizes in a GSM system such as macro, micro, Pico and umbrella cells. Each cell varies as per the implementation domain. There are five different cell sizes in a GSM network macro, micro, Pico and umbrella cells. The coverage area of each cell varies according to the implementation environment.

Features:

- Supply voltage: 3.8V - 4.2V
- Recommended supply voltage: 4V
- Power consumption:
  - sleep mode < 2.0mA
  - idle mode < 7.0mA
  - GSM transmission (avg): 350 mA
  - GSM transmission (peek): 2000mA
- Module size: 25 x 23 mm
- Interface: UART (max. 2.8V) and AT commands
- SIM card socket: micro SIM (bottom side)
- Supported frequencies: Quad Band (850 / 950 / 1800 /1900 MHz)
- Antenna connector: IPX
- Status signalling: LED
- Working temperature range: -40 do + 85 ° C

4.2.3 GPS Module (NEO-6M)

Fig 4.2.3 GPS Module (NEO-6M)

The NEO-6 module series is a family of stand-alone GPS receivers featuring the high performance u-box 6 positioning engine. These flexible and cost-effective receivers offer numerous connectivity options in a miniature 16 x 12.2 x 2.4 mm package. Their compact architecture and power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints. The 50- channel u-box 6 positioning engine boasts a TimeTo-First-Fix0 (TTFF) of under 1 second. The dedicated acquisition engine, with 2 million correlate's, is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. Innovative design and technology suppresses jamming sources and mitigates multipath effects, giving NEO-6 GPS receivers excellent navigation performance even in the most challenging environments.

Features:

- A complete GPS module with an active antenna integrated, and a built-in EEPROM to save configuration parameter data.
- Built-in 25 x 25 x 4mm ceramic active antenna provides strong satellite search capability.
- Equipped with power and signal indicator lights and data backup battery.
- Power supply: 3-5V; Default baud rate: 9600bps.
- Interface: RS232 TTL.

4.2.4 Accelerator Sensor (ADXL345)

Fig 4.2.4 Accelerator Sensor (ADXL345)

The ADXL335 is a small, thin, low power, a complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The user selects the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis. The ADXL335 is available in a small, low profile, 4 mm × 4 mm × 1.45 mm, 16-lead, plastic lead frame chip scale package.

4.2.5 Vibration Sensor (SW-18010P)

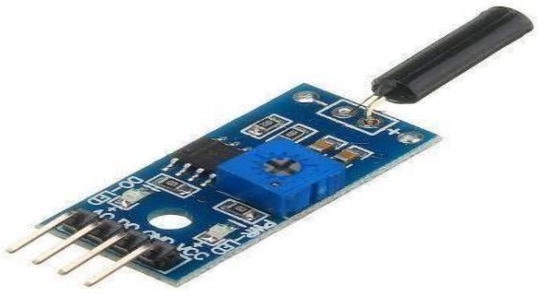

Fig 4.2.5 Vibration Sensor (SW-180101P)

Sensors for vibration are sensors that operate according to different mechanical or optical principles to detect vibrations of an observed system. The measurement of vibrations can be done using various types of sensors. Although there are no direct vibration sensors, vibrations can be measured indirectly, deducing values from classic mechanical or optical quantities. These sensors differ in some features. Among other things they can be divided based

on active and passive behaviour, there are sensors that measure relative and others absolute. Other distinctive features are frequency range, signal dynamics and the quality of the measurement data. The following sensors shown here were first structured in a contacting and a non-contacting group and within these in the sub items path, velocity and acceleration measurement.

Features:

• Battery Powered: Batteries supply the main power for the device operation. This is not for backup supply.

• Corrosion Resistant: Corrosion-resistant alloys can be formulated for a wide range of aggressive well bore conditions. However, cost generally determines the viability of any particular completion design. Alloys with high chrome content are commonly used for tubing string

• Event Triggered: Device can be set to capture/log data when an event happens.

• Self-Test / Diagnostics / Self Calibrating: The instrument has self-test or diagnostic ability.

• Self Generating: The device requires no external power supply for operation.

4.2.6 LCD Display

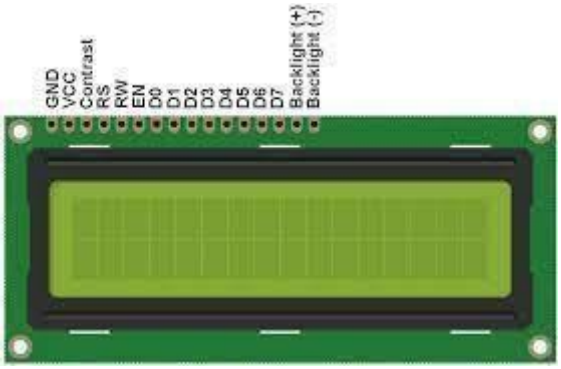

Fig 4.2.6 LCD Display

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2

Intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data. Command register stores various commands given to the display. Data register stores data to be displayed. The process of controlling the display involves putting the data that form the image of what you want to display into the data registers, then putting instructions in the instruction register. In your arduino project Liquid Crystal Library simplifies this for you so you don't need to know the low-level instructions. Contrast of the display can be adjusted by adjusting the potentiometer to be connected across VEE pin.

Features:

• Operating Voltage is 4.7 V to 5.3 V
• Current consumption is 1 mA without backlight
• Alphanumeric LCD display module meaning can display alphabets and numbers
• Consists of two rows and each row can print 16 characters.
• Each character is built by a 5×8-pixel box
• Can work on both 8-bit and 4-bit mode
• It can also display any custom generated characters
• Available in Green and Blue Backlight

CHAPTER 5

SYSTEM DESIGN

5.1 Circuit Design

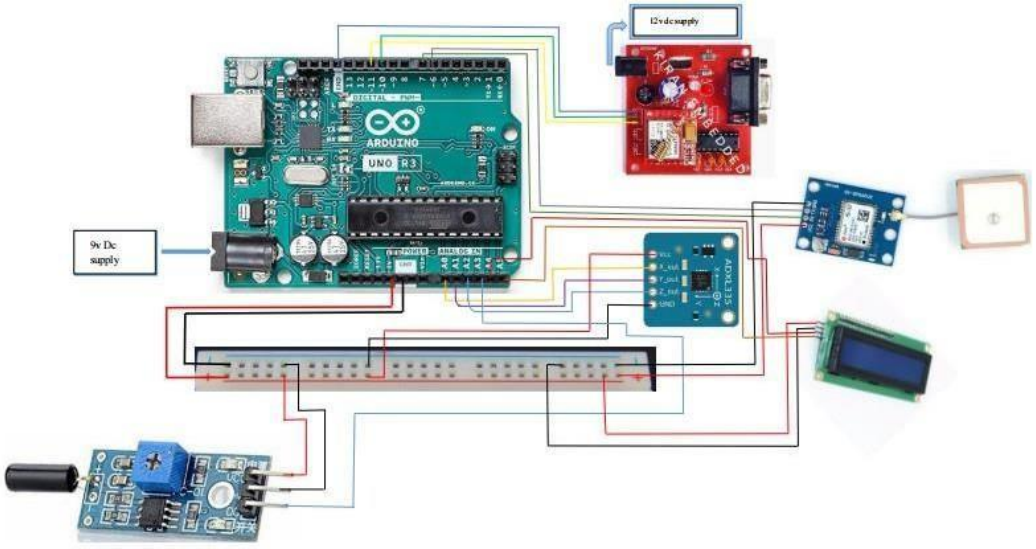

Fig 5.1 Circuit diagram of vehicle accident detection

Circuit connection for our Accident Alert System device is not so complex. Here Tx pin of GPS module is directly connected to D7 RX pin D6 of Arduino Uno. By using Software Serial Library here, we have allowed serial communication on pin RX0 andTX0, and made them Rx and Tx respectively and left the Rx pin of the GPS Module open. By default, pin 0 and 1 of Arduino are used for serial communication but by using the Software Serial library, we can allow serial communication on other digital pins of the Arduino. 5 Volt supply is used to power the GPS Module. GSM module'sTx and Rx pins of are directly connected to pin D11 and D10 of Arduino. For GSM interfacing, here we have also used software serial library. GSM module is also powered by 5v supply. An optional LCD's I2c. Command pin RS and EN of LCD are connected with pin number A4 and A4 of Arduino and RW pin is directly connected with ground. A Potentiometer is also used for setting contrast or brightness of LCD. An Accelerometer is added in this system for detecting an accident and its x,y, and z-axis ADC output pins are directly connected to Arduino ADC pin A0, A1, and A2. And vibration sensor Pin Do are connected to the Arduino A3 pin.

5.2 System Description

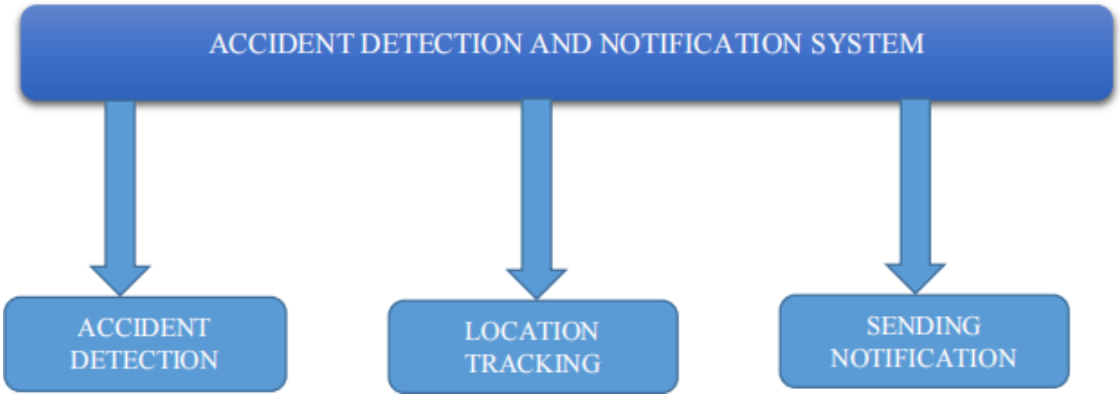

Fig5.2 system description models

The project is divided into three phases. They are.

Accident Detection:

An accelerometer sensor senses the accident when the vehicles are fallen down detection x, y, z. initially the angle of the vehicle is zero degree and it could be increase 360 degrees towards any axis. If the angle of the vehicle rises in any direction exceeds our threshold value, the accelerometer considers the situation as an accident. The threshold value in X and Y axis are 320 and 320, respectively. The sensor has sent the signal to the microcontroller. We have used two ultrasonic sensors in front and back of the vehicle. Ultrasonic sensor is always turn on when any object reaches within 5 cm of the vehicle which sometimes create false prediction of collision.

Location Tracking:

The GPS sensor can detect the current location of the vehicle. In our proposed system we use the GPS device to find the exact accident location. When microcontroller receives any signal of accident it requests for current location of accident spot to the GPS. The GPS sends the location of accident spot to the microcontroller.

Sending Notification:

With accident location link GSM sends text message to the hospital and police control room. The hospital and police control room will get a message along with the map link which will contain the exact latitude and longitude details of the location. In these a me time, nearest police station receives an accident occurs message with link Google map. With the help of these

details, the ambulance can take the shortest route to the accident location and reduce the time to save the victim.5.2 System Description Model.

5.3 Flow Chart of the System

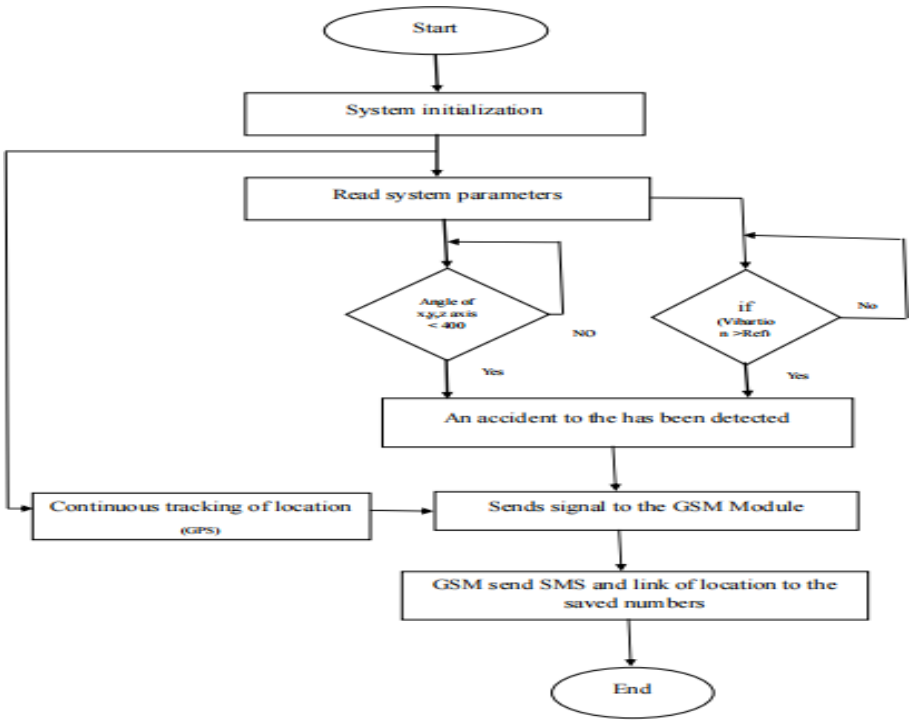

Fig 5.3 Flow Chart of the accident detection of the system

First thing first, our system being started after that all of the mechanism will be initialized that means all the functionality is being started. After the initialization of the system, all of the sensor data will be collected. Here we used three different types of sensors, those are performing different task. First of all, our system will check that the vehicle is shacked or not and it will measure by the accelerometer sensor. If the vehicle shakes much then the system makes sure thatthe accident is detected. After accident detection, our system will pass signal through the GSMmodule and GSM send SMS and the location where the accident occurs to the saved numbers. If not shake the system will follow normally. The vibration sensor response by any kind of stroke. If vehicle get stroke strongly, the vibration sensor makes sure that the accident occurred.Similarly, our system will generate signal and will pass through the GSM module and GSM send SMS and the location where the accident occurs to the saved number.

CHAPTER 6

RESULT

6.1 Results and Discussions

The results include the successful operation of an automatic accident detection and notification systems. This system can detect the accident and then alert the nearest police station and medical assist center to provide emergency medical aid to accident victim.

The project "Online tool to detect accident location and Report to nearest control room" was designed such that the location and the position of the vehicle is transmitted to the owner on his mobile phone as a short message (SMS) at his request using GPS and GSM modems. Innovative way of protecting automobiles also safeguarding them. The system permits localization of the automobile and transmitting the position to the owner on his mobile phone as a short message (SMS) at his request

Limitations of the System. It does not work without network.

6.2 Hardware Result

All the components were connected as per the circuit diagram. The figure below shows the hardware connections and prototype of the project.

Step1: Project prototype

Fig 6.2.1 Prototype of the project

Step2: Power supply into the device and showing Automatic Vehicle Accident Detection and messaging system using GPS and GSM module ready.

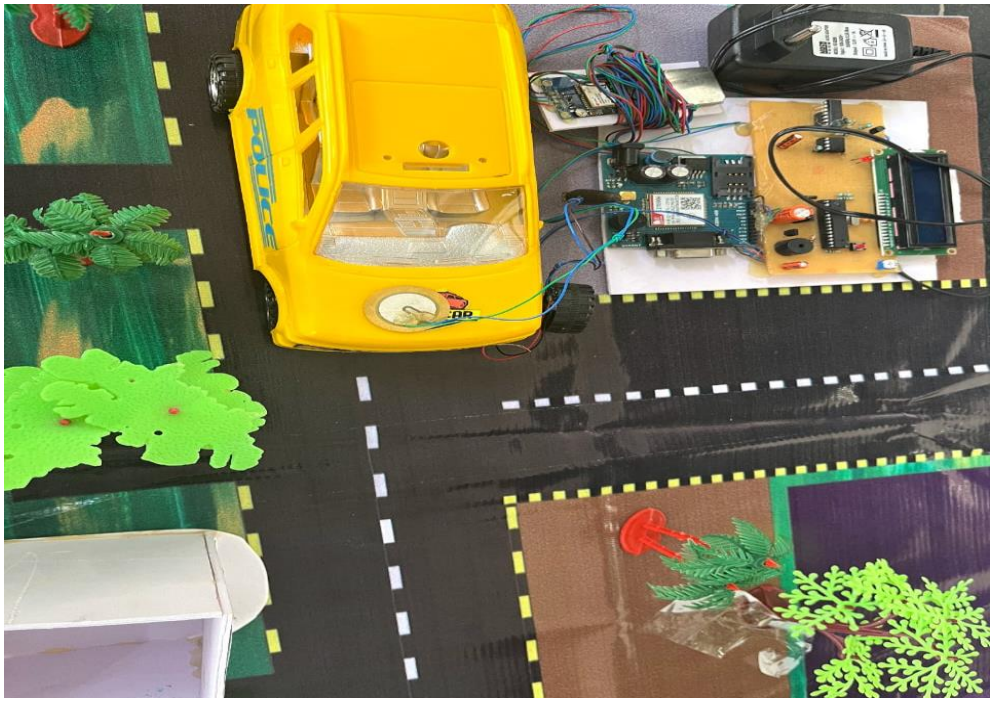

Fig 6.2.2 Power supply into the device

Step3: Calling, sending message and Location tracking.

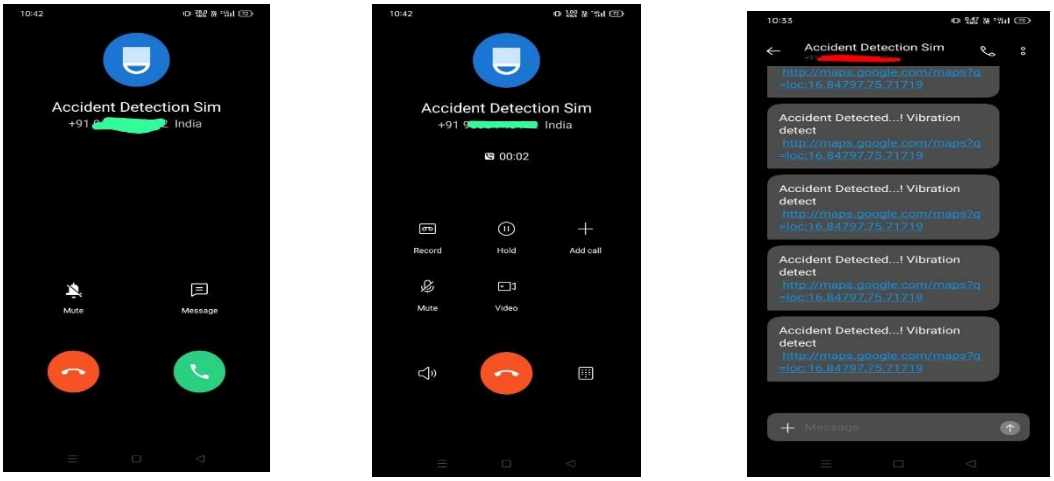

Fig 6.2.3 Calling Sending message

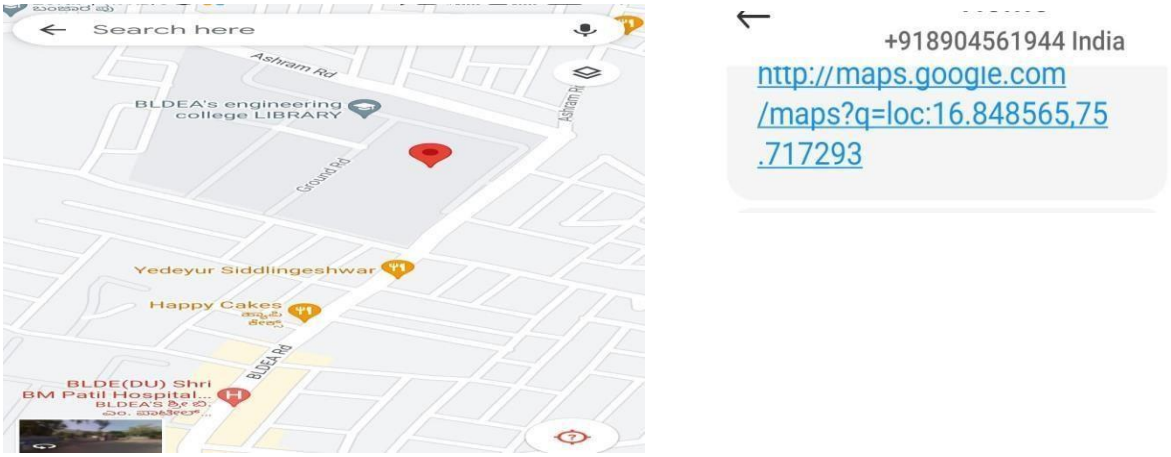

Fig 6.2.4 location tracking

CHAPTER 7

ADVANTAGES AND DISADVANTAGES

7.1 Advantages

1. Low power consumption.

2. Location of the vehicle/office cab can be known GPS.

3. Works anywhere in the world (GSM availability).

4. In case of emergency intimation (accident) can be sent to predefined numbers.

5. Remote communication using GSM modem from anywhere in world.

6. Sends location in the form of latitude and longitude.

7. Detection of Dangerous driving can be detected using switches

8. Implementation of REAL TIME embedded system which involves hardware and interaction.

7.2 Disadvantages

1. Modem should be properly installed for proper working of the system.

2. Poor network signal can decrease the performance of system.

3. GPS takes time to get the signal from satellite, when the system is switched ON.

CHAPTER 8

APPLICATION

- It can be widely used in all types of vehicles for automatic accident detection andnotification to the nearest police station and medical assist center.
- It can be used to track the stolen vehicle
- Route Monitoring.
- Regional Transport office.

CHAPTER 9

FUTURE SCOPE

Our project "Online tool to detect accident location and Report to nearest control room" is mainly intended to find the location and the position of the vehicle is transmitted to the owner on his mobile phone as a short message (SMS) at his request using GPS and GSM modems and also alerts when there is an accident occurred. This system also enables to monitor the accident situations and it can immediately alert the police/ambulance service with the location of accident.

The presented application is a low cost solution for automobile position and status, very useful in case of car theft situations, for monitoring adolescent drivers by their parents as well as in car tracking system applications. The proposed solution can be used in other types of application, where the information needed is requested rarely and at irregular period of time (when requested). This project is also used to alert the owner of vehicle in case of accidents. This system is also can be interfaced with buttons like help alert, dashing alert, fire alert, location alerts and when pressed then the system automatically alerts through buzzer alarm.

This enable it to monitor the accident situations and it can immediately alerts the police/ambulance service with the location of accident. This project can be extended using high efficiency GPS receiver and a GSM module. The GSM module gives the intimation of the person with this system through SMS.

CONCLUSION

Integrating features of all the hardware components used have been developed in it. of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced ICs with the help of growing technology, the project has been successfully implemented. Thus, the project has been successfully designed and tested.

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