

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
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**PROJECT REPORT ON
ACCIDENT DETECTION SYSTEM FOR TWO-WHEELERS USING TILT
SENSOR**

Submitted in the partial fulfilment of the requirement for the award of

**BACHELOR OF ENGINEERING DEGREE
IN
MECHANICAL ENGINEERING**

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MOODBIDRI- 574225
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DEPARTMENT OF MECHANICAL ENGINEERING

CERTIFICATE

This is to certify that the Mini project work entitled **“Accident Detection for Two-Wheelers Using Tilt Sensor”** is a Project work carried out by **SOURABHA M (4DM19ME078), STENY JOSEPH (4DM19ME078), MITHUN RAGUNATH (4DM20ME401) and SHREYAS (4DM20ME403)** in partial fulfilment for the award of **Bachelor of Engineering Degree in Mechanical Engineering** by the Visvesvarayya Technological University, Belagavi during the academic year 2021 – 2022. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report deposited in the department library. The project report has been approved as it satisfies the academic requirements in respect with the mini project work prescribed for the said degree.

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ABSTRACT

Accidents endanger people's lives more frequently these days, with road accidents being the most common. No one knows when or how it will happen. Accidents occur even when one vehicle is stationary and another is moving. Accident Alert System (AAS) research is relatively new. To avoid such collisions, we created the "Tilt sensor-based accident detection system". This project describes an automotive localization system that makes use of GPS and SMS services. Many lives could have been saved if the necessary care had been provided at the time of need. The victim can receive the necessary attention with the help of this system, as the smart accelerometer and GSM built into the system alerts hospitals or Ambulance And dears. The system allows for the localization of a vehicle and the transmission of its location to loved ones via GSM technology at his/her request. This system also includes an emergency switch which can be manually deactivated if the victim no longer requires help and support.

CHAPTER - 1

INTRODUCTION

The new generation of cars has been developed to reduce the number of accidents. In order to lessen the chance of an accident, innovative ideas have been applied and created for cars. Some accident detection systems and intelligent controlled devices have been devised and developed in recent years in order to improve the safety of automobiles and reduce the number of deaths caused by accidents. This system describes a design of effective accident detection system that can monitor a two-wheeler if accident occur while travelling. This system is designed to prevent the deaths due to accident and to inform emergency about an accident that has occurred. According to a recent World Health Organization (WHO) estimate, 1.35 million people die each year, and 50 million people are injured. Road accidents are the eighth largest cause of mortality, with the Association for Safe International Road Travel (ASIRT) forecasting that unless substantial improvements are made, they would soon move to the fifth major cause of death. According to ASIRT, road accidents account for one to two percent of each country's annual budget. Road traffic accidents, which are the tenth leading cause of mortality worldwide and the tenth leading cause of all deaths, now account for a shockingly considerable portion of the global burden of disease. Every year, an estimated 1.2 million people are killed in traffic accidents! and up to 50 million more individuals are injured, accounting for 30 percent to 70 percent of orthopedic beds in hospitals in underdeveloped nations [1]-[3]. The majority of motorcycle accidents, according to the In-Depth Investigation of Motorcycle Accidents (MAIDS) initiative, occurred in urban settings. In motorcycle accidents, fractures to the lower and upper limbs were the most prevalent injuries. Thoracic (50%) and head (44%) injuries were the most common major injuries in a study of 11,800 injured motorcyclists in France, and 90% of the injuries were to the internal organs.

The most common type of collision was with a passenger automobile (64 percent), and over half of all incidents involved the PTW's frontal portion [2]. The system's primary objective is to provide help to two-wheeler users and, if an accident occurs, to detect it and notify the appropriate authorities using wireless technologies such as GSM and GPS. The vehicle crash alerting system is designed to locate the collision and make it easier to get there. For the ambulance, every second counts. When a collision occurs, the sensors are immediately activated.

There has been no loss of life as a result of the ambulance's late arrival. The goal of the project is to locate the vehicle by sending a message through a system that is installed inside the vehicle. We may not be able to locate the accident site since we do not know where the accident will occur. To provide treatment for injured persons, we must first determine the location of the accident using GPS tracking and delivering a message to loved ones while a siren is activated.

1.1 Relevance of the Project

The accidental detection and alert system are designed to detect the accidents and alert rescue team in time. Arduino is major control unit to communicate between devices when an accident occurs, which helps in transferring messages to different devices in the system. Receiving pin of GSM module and transmitting pin of GPS module are used to communication. GPS module will find the location of the vehicle and the information is fetched by the receiver through the coordinates and the received data is sent to Arduino and the alert to rescue team by GSM module. The accelerometer detects the accident occurrence by the reading produced by the movements of the vehicle.

1.2 Block Diagram

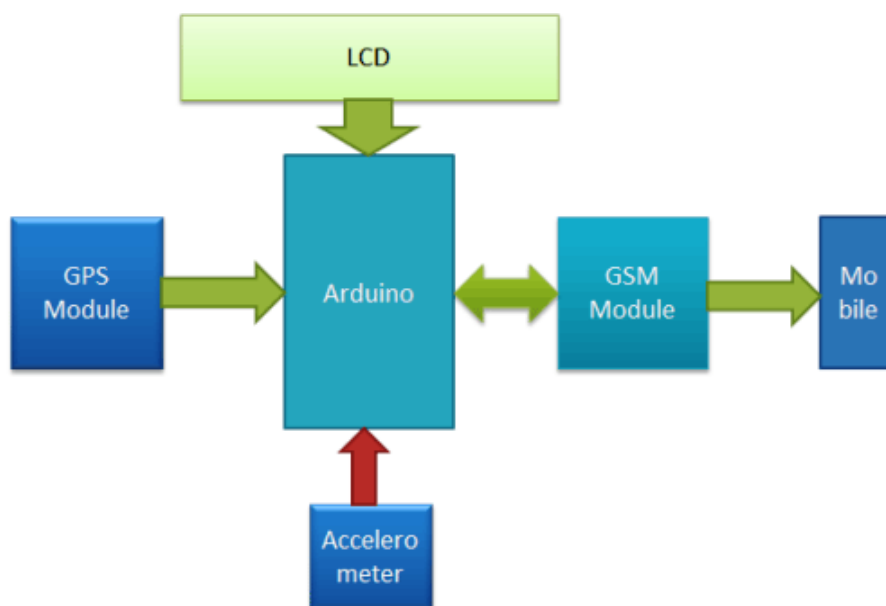


Fig 1.1 Block diagram of device

1.3 Agile Methodology or Summary of approaches

Story ID	Requirements Description	User Stories/task	Description
1.	Confirmation of Accident	Getting alerts through accelerometer data one should confirm whether accident occurred or not	Switches
2.	GPS Co-ordinates	Upon the confirmation of accident, it should get the GPS co-ordinates from module	Trilateration
3.	SMS through GSM	Sends the GPS coordinates to nearby hospitals through GSM module	Cellular Technology

Table 1.1 Summery of approaches

CHAPTER - 2

2.1 LITERATURE REVIEW

Praveen Kaur et al. worked on a project vehicle safety using Arduino which can be used to make human driving safer and to overcome the accidents this project is developed by integrating the vibration sensor, alcohol sensor and ultrasonic sensor with Arduino board the system also make use of GPS and GSM for real-time analysis [1]

Khushal p et al. worked on project accident detection and reporting system in this topic, a customized android application is developed to collect information regarding speed, attraction, pressure, sound, and location Speed is one of the factor which is used to improve the identification of the accidents. The information collected is again further processed to detect road incidents [2]

Eric abbot et al. worked on the project land vehicle navigation using GPS The Global Positioning System (GPS) has made navigation systems practical for a number of land-vehicle navigation applications. Today show that the accuracy of the GPS position fixes has a significant impact on the relative contributions that each dead-reckoning navigation sensor error makes. The implications of these results for navigation system design and sensor design are discussed [3]

Muruganandam et al. worked on the real time web based vehicle tracking using GPS Tracking systems were first developed for the shipping industry because they wanted to determine where each vehicle was at any given time to achive this Real time vehicular tracking system incorporates a hardware device installed in the vehicle (In-Vehicle Unit) and a remote Tracking server [4]

Saed Tarapaih et al. worked on a project smart On-Board Transportation Management System using GPS/GSM/GPRS Technologies to Reduce Traffic Violation in Developing Countries which can be used in In case of traffic speed violation, a GPRS message containing information about the vehicle such as location and maximum speed is sent to a hosting server located in an authorized office so that the violated vehicle is ticketed. [5]

Kader H.A et al. worked on a project Automatic Vehicle Accident Detection Based on GSM System s. In this paper, a cost-effective approach based on GSM system for automatic traffic incident detection proposed. Sensors are installed into the vehicles on each side of the vehicle. An SMS will be sent to the user after the accident. This system will assist in search and rescue vehicle involved in the accident [6]

B Sumathy et al. worked on a project Vehicle Accident Emergency Alert System which is used when an accident occurs the vibration sensor or the accelerometer present in the system, transmits the signals to Arduino controller. Latitudes and longitudes data are collected from the GPS system, passed using the GSM module to the emergency centre, and sends a text message to all the people listed in the emergency List [7]

M. Krause et al. worked on a project Large area piezoelectric impact sensors which is used when The piezoelectric coefficients of the printed ferroelectric polymer film are typically 25 pC/N, sufficient for impact detection in car crash situations. The sensor speed is very fast, enabling efficient protection mechanisms to safe the life of pedestrians. [8]

Kalyanaraman B et al. worked on a project Accident Prevention, Detection and Reporting for Two Wheeler Safety System, This paper manages the improvement of a security framework which is coordinated with the keen protective cap and shrewd bicycle to lessen mishaps and other alcoholic and drive cases for bikes At whatever point the rider crashes, the head protector hits the ground and the sensor recognizes the movement and reports the mishap case data to the relatives of the rider through IoT [9]

Aswin M et al. worked on a project Accident Prevention and Alert System using Arduino In this proposed project they are going to control the speed of the vehicle according to the respected zones using Arduino using vibration sensor to detect accidents and report it to the nearest available emergency responding stations. We are also using touch sensor to detect whether someone is trying to steal it while it is locked. [10]

Gowshika et al. worked on a project It is Arduino Based Vehicle Accident Alert System using GPS, GSM and Accelerometer. Accelerometer detects the sudden change in the axes of vehicle and GSM module send the alert message on your Mobile Phone with the location of the accident. [11]

Jayati Routh et al. worked on a project Automatic Vehicle Accident Detection and Messaging System Using GPS and GSM Module when a vehicle meets with an accident, the Micro electro mechanical system (MEMS) sensor will detect the signal and this signal will be analysed by Arduino. n. The aim of this work is to automatically detect an accident and alert the nearest hospital or medical services about the exact location of the accident.[12]

Jessica saini et al. worked on a project Android App Based Vehicle Tracking Using GPS And GSM This vehicle-tracking device can be installed in any vehicle to prevent thefts or to monitor the route of the vehicle. Whenever a vehicle is stolen or is lost, the device will send the coordinates of latitudes and longitudes that will help to locate the vehicle on user's mobile. The tracking system covers most of the highways, major cities, towns and most of the accessible villages and works efficiently in areas with better mobile connectivity.[13]

S.Madhuri et al. worked on a project GPS Based Passive Vehicle Tracking Using Arduino This vehicle tracking system may be installed in all official vehicles. This has applications in cutting down fuel expenses and to reduce misuse of official vehicles. Further this system also offers easy availability, compact, low power consumption, and cost effective solution [14]

Bhagyashree Bharat wagh et al. worked on a project Iot based Vehicle Navigation System using GPS and GSM A vehicle tracking system is a device put in a vehicle which is used by owner of vehicle to trace the vehicle's location and detect accident. Tracking device offer a cost effective and reliable solution to vehicle theft problem. This technique provides minute by minute update concerning vehicle location by SMS through GSM electronic equipment. [15]

Ni Ni san Hlaing et al. worked on a project GPS and GSM Based Vehicle Tracking System A vehicle tracking system is very useful for tracking the movement of a vehicle from any location at any time. An efficient vehicle tracking system is designed and implemented for tracking the movement of any equipped vehicle from any location at any time. The proposed system made good use of popular technology that combines a smartphone with an Arduino UNO. [16]

June Myint Mo Khin et al. worked on a project Real-Time Vehicle Tracking System Using Arduino, GPS, GSM and Web-Based Technologies In this paper a real time tracking system is proposed. It is going to design a system which is used for tracking and positioning of any vehicle by using Global Positioning System and Global System for Mobile Communication[17]

Weimeng Niu et al. worked on a project Summary of Research Status and Application of MEMS Accelerometers The research status of MEMS accelerometers is introduced, and MEMS are analysed. The application of accelerometers in real-world environments, and the development trend of MEMS accelerometers in the future. More scholars will invest in MEMS accelerometer research, pursuing high performance, low power consumption, high precision, multi-function, and interaction. Strong MEMS accelerometers will be ubiquitous in the future. [18]

Akash Singh et al. worked on a project Two-Wheeler Accident Detection and Alert System with Anti-Theft Control. An automatic accident detection system process that initiates itself and alerts the medical teams whenever an accident occurs and also provides the live location of the vehicle .This system will be making a decision of whether an accident has occurred or not on the basis of very strict conditions to reduce false alarms. An android application is developed that detects and sends alerts message to the concerned authorities and relatives[19]

Jayati Routh et al. worked on a project Automatic Vehicle Accident Detection and Messaging System Using GPS and GSM Module According to this project, when a vehicle meets with an accident, the Micro electro mechanical system (MEMS) sensor will detect the signal and this signal will be analysed by Arduino. The Arduino sends the alert message through the GSM Module including the location to police control room or a rescue team. [20]

George Rechnitzer et al. Worked on a project The Effect of Vehicle Roadworthiness on Crash Incidence and Severity There was significant variation in study findings regarding the role of vehicle defects in crash causation and the effectiveness of Periodic Motor Vehicle Inspections (PMVI) programs in reducing defects and crashes. Overall, it would appear that vehicle defects are a contributing factor in over 6% of crashes. [21]

Nicolas Dubos et al. Worked on a project A better knowledge of powered two wheelers accidents This study has shown how specific were PTWs in terms of dynamics or other

factors such as alcohol impairment, speed, short practice of vehicle. The study shows a great potential that could be grasped by road managers to improve the safety of PTW users [22]

Masahito Hitosugi et al. Worked on a project Hit-and-runs more common with pedestrians lying on the road: Analysis of a nationwide database in Japan : To determine the trends with fatally or otherwise injured pedestrians lying on the road and the relationship to hit-and-run incidents in Japan [23]

Yashaswini Rajendra bhat et al. Worked on a project Reasons And Solutions For The Road Traffic Accidents In India y. This paper deals with reasons and solutions for the road traffic accidents in India in the form of a review article using the available statistics in the literature [24]

2.2 PROBLEM STATEMENT

The goal of the project is to detect accidents and alert the rescue team in time. The gap between the existing systems in place and the ideal system is that automated system is used once the accident occurs which can give latitude and longitude of accident occurred area without delay. More Human life can be saved using this system.

CHAPTER - 3

OBJECTIVES

- To fabricate a smart accident detection system using with tilt sensor and accelerometer to detect the accident.
- To inform the important numbers and rescue services about the accident and save the life.
- To implement in the bike to check the viability of the system in real conditions.

CHAPTER - 4

METHODOLOGY ADOPTED

Arduino NANO is used as controlling unit, it reads the values from accelerometer. Accelerometer detects if there is any fall in axis. If Arduino observes any drastic change in the speed of the vehicle. It reads the current location from GPS module and sends it to the mobile number through SMS by using GSM module. Before sending the SMS Arduino activates the buzzer, after thirty seconds of beeping it goes off and the SMS will be sent. But if the passenger is not in danger, he can press the button. This is done to prevent the situations where it would lead false accident rescue.

4.1 Existing System

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 current traffic information gathered from a variety of detectors, including induction loops, infrared detectors, cameras, etc. While studies on traffic incident detection are focused on the change in traffic conditions following an incident, real-time traffic accident prediction focuses on the change in traffic conditions before an accident occurs. However, the number of monitoring sensors, the amount of funding available, the algorithms used to validate an accident, the weather, traffic flow, etc. all significantly impact how well these detection and prediction systems function.

4.2 Proposed System

Arduino Nano serves as the controlling element, facilitating communication between modules to improve information transformation over time. From tri-lateral axis motions, an accelerometer can be utilized to determine the collision direction. After that, a buzzer is offered to prevent the passenger from receiving a false accident detection. The GPS module obtains the coordinates from the GPS Module within a finite amount of time after the buzzer signal. When a passenger requests an emergency rescue, this coordinates local hospitals to receive the call. The hospital confirms the accident by verifying it occurred at the designated location. Through the GSM module, the family members who were saved are informed of the accident.

CHAPTER – 5

SYSTEM REQUIREMENTS AND ITS SPECIFICATION

The prerequisites are described in this chapter. It specifies the hardware and software specifications necessary for the system to function effectively. A thorough explanation of the Hardware Requirement Specification is provided, along with an overview of the functional and non-functional criteria.

5.1 Functional Requirements

Functional Requirements defines the function of the system and gives the outline of what the system does. Auto detection mode is the identifier it holds the purpose of automatically detects when the accident occurs and it also sends the alert. The pre-condition is that turning on the vehicle for the system to start and the post-condition is on detection of accident and alert message will be sent. Adding emergency contacts in the program, it specifies the contacts that has to be saved in program, the purpose of doing so helps in sending the alert message when the accident occurs.

5.2 Non-Functional Requirements

Non-functional requirements are those that have no direct bearing on the particular function that the system provides. In place of specific behaviors, they define the standards that can be used to evaluate how a system works.

The proposed approach of this project is used by the designed system to identify accidents. The detection relies on GPS speed to locate the accident site and send an alarm to medical emergency using the GSM module.

5.3 Hardware Requirements

- Arduino
- GPS module
- GSM module
- Accelerometer
- Power Supply
- Connecting Wires
- Breadboard or PCB

5.4 Working of Arduino

A popular open-source microcontroller board called the Arduino NANO was created by Arduino.cc and is based on the ATmega328P microprocessor. The main control system for detecting or warning when an accident happens is the Arduino. It gathers information Accelerometers, GPS, and GSM modules and outputs it either through a message or a display system. Here, the Accelerometers sensor is crucial. A GSM module is used by Arduino to transmit the message to the receiver after collecting data from all other modules.

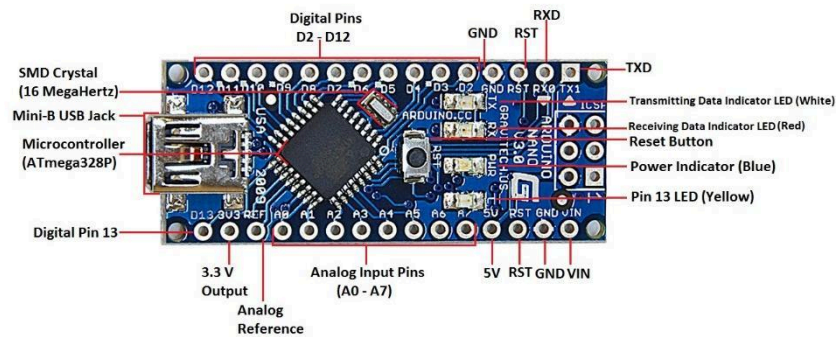


Fig 6.1 Arduino

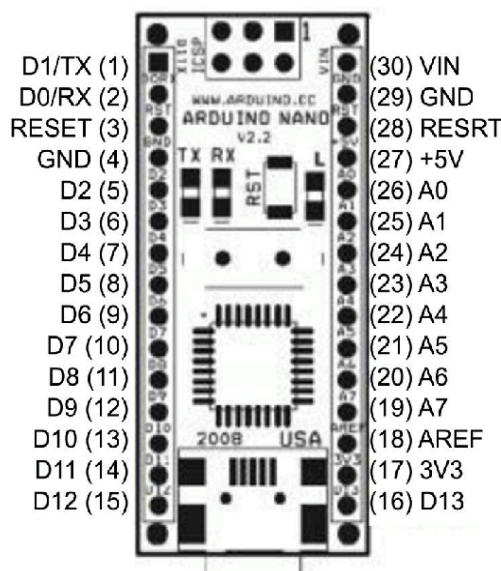


Fig 6.2 Arduino pin numbers

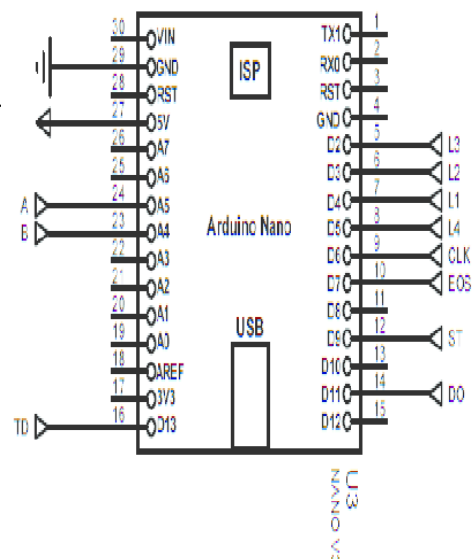


Fig 6.3 Arduino ports

5.5 Working of Accelerometer

An accelerometer is a device that senses the different types of accelerations or vibrations. Acceleration is the change in velocity caused by the movements of a body. An accelerometer absorbs the vibrations created by the body and uses it to know the orientation of the body. A piezoelectric accelerometer has two types which are high impedance output accelerometer and low impedance output accelerometer. On the basis of the working mode, it is mainly of three types. The compression mode, the capacitive mode, and the shear mode. All of them work on sensing the vibrations.

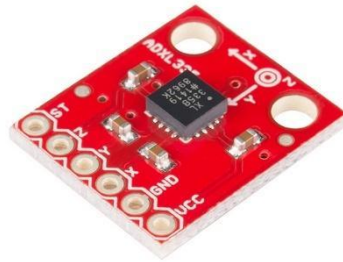


Fig 6.4 Accelerometer

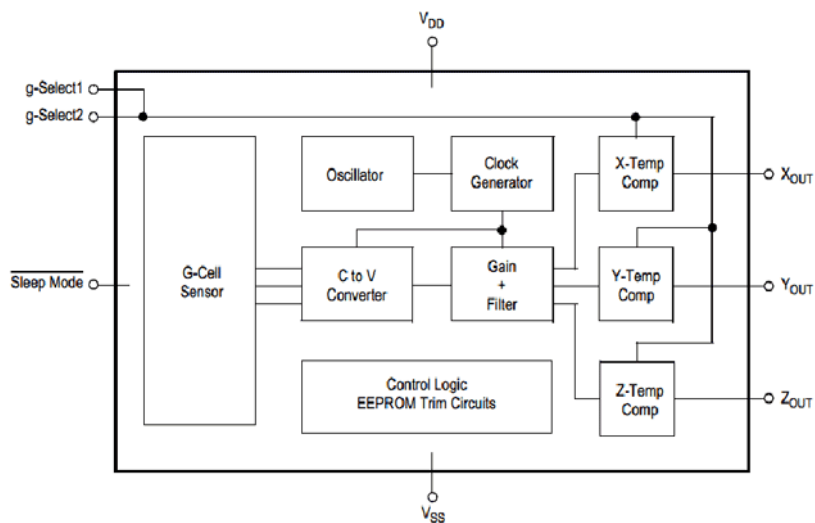
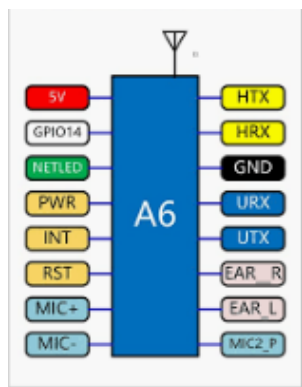


Fig 6.5 Accelerometer circuit diagram

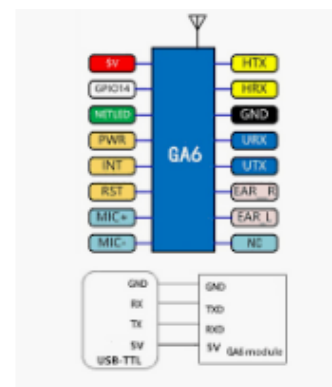
5.6 Working of GSM

For providing communication between the GPS, GSM and the allocated mobile number GSM SIM900 module is preferred. The name SIM900 says that, it is a tri

band work ranging a frequency of 900MHz to 1900 MHz such as EGSM900 MHz, PCS 1900 MHz and DSC 100 MHz Receiving pin of GSM module and transmitting pin of GPS module are used for communication between the modules and the mobile phone.



A6 gprs/gsm



ga6 5v mini gprs / gsm mod...

Fig 6.6 GSM

Fig 6.7 GSM ports

5.7 Software Requirements

An open-source electronics platform called Arduino is built on simple hardware and software. A motor can be started, an LED can be turned on, and anything may be published online by using an Arduino board to receive inputs like light on a sensor, a finger on a button, or a tweet. Sending a set of instructions to the board's microcontroller will instruct your board what to do. You achieve this by using the Arduino Software (IDE), which is based on Processing, and the Wiring-based Arduino Programming Language.

Over the years, countless of projects, ranging from simple household items to intricate scientific equipment, have used Arduino as their brain. Around this open-source platform, a global community of makers—students, amateurs, artists, programmers, and professionals—has assembled. Their contributions have added up to an astounding quantity of accessible information that may be very helpful to both beginners and specialists.

The Ivrea Interaction Design Institute is where Arduino was created as a simple tool for quick prototyping, targeted for students without a background in electronics or programming. The Arduino board began altering as soon as it gained a larger audience in order to meet new demands and difficulties, distinguishing its product offering from straightforward 8-bit boards to items for Internet of Things applications, wearable technology, 3D printing, and embedded settings. Since every Arduino board is entirely open-source, users may construct them on their own and eventually customize them to suit their own needs. The program is also open-source, and it is expanding thanks to donations from people

all around the world.

CHAPTER – 6

SYSTEM ANALYSIS AND DESIGN

6.1 System Design:

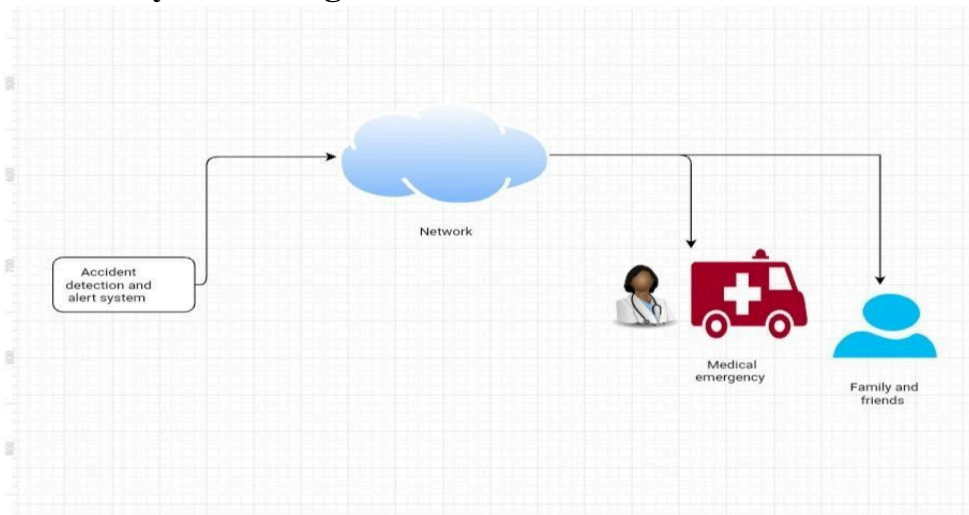
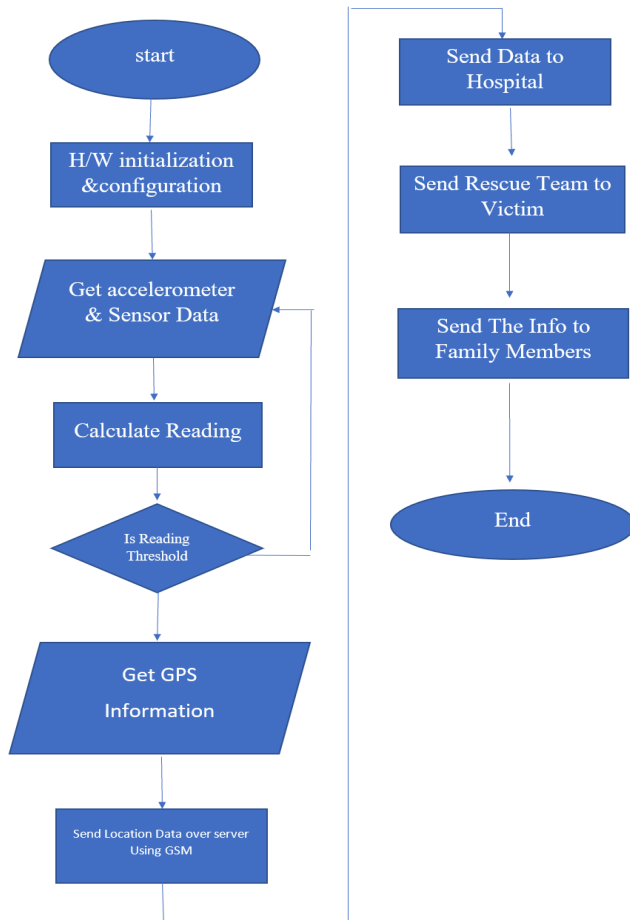


Fig 7.1 System design

6.2 Flow Chart:

Accident detection system for two-wheelers using tilt sensor



- At start the hardware will be initialized and it takes the reading from hardware every second.
- If the reading overcomes the threshold reading of sensors, then Arduino sends the GPS co-ordinates to nearest hospitals and friends via GSM.
- After the hospital approval the rescue team reaches the location of accident and upon confirmation it informs their family members.

6.3 Use case Diagram:

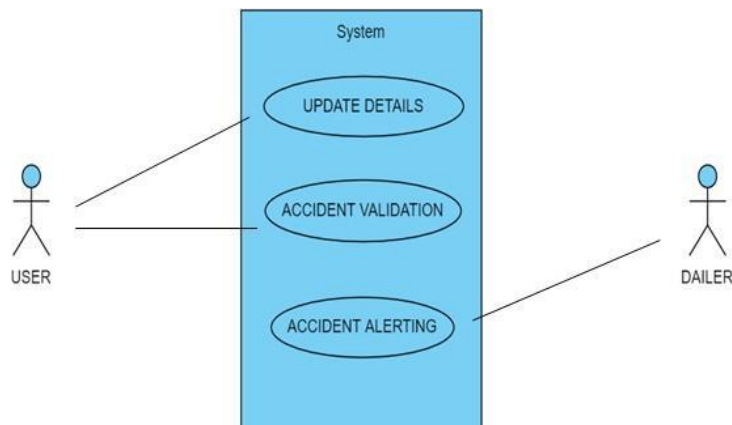


Fig 7.3 Case diagram

- The user has the facility to update details of him and emergency contacts in the program.
- The user has the facility to abort the emergency SMS to responder by using control switch.
- The dialer/responder is the one who awaits for the accident alert designed from the system.

6.4 Calculation for critical angle:

Weight of the Vehicle = 200 Kg

Moment of inertia of Engine $I_E = 0.3 \text{ Kg m}^2$

Moment of inertia of Flywheel $I_w = 1 \text{ Kg m}^2$

Speed of vehicle $v = 80 \text{ Km/hour}$

$$v = (80 * 1000) / 3600 = 22.22 \text{ m/s}$$

Wheel Radius $r_w = 0.457 \text{ m}$

Centre of Gravity of Rider with Vehicle $h = 0.7 \text{ m}$

Speed of Engine Flywheel $W_E = 5W_w$

$$W_w = v/r = 22.22/0.457 = 48.62$$

$$W_w = 5*48.62 = 243.3$$

$$\text{Gear Ratio } G = W_e/W_w = 5.0$$

W.K.T Gyroscopic Couple

$$\begin{aligned} C_1 &= 2 \frac{v^2}{Rr_w} (2I_w + GI_E) \cos\theta \\ &= \frac{22.22^2}{30*0.457} (2 * 1 + 5 * 0.3) \\ &= 125.8 \cos\theta \text{ N-m} \end{aligned}$$

Centrifugal Couple

$$\begin{aligned} C_2 &= \frac{mv^2}{R} h \cos\theta \\ &= \frac{200*22.22^2}{30} * 0.7 * \cos\theta \end{aligned}$$

$$C_2 = 2299.9 \cos\theta \text{ N-m}$$

Total overturning Couple

$$\begin{aligned} C_o &= C_1 + C_2 \\ &= 125.8 \cos\theta + 2299.9 \cos\theta \end{aligned}$$

$$C_o = 2425.7 \cos\theta$$

W.K.T Balancing Couple

$$\begin{aligned} &= m g h \sin\theta \\ &= 200*9.81*0.7 \sin\theta \\ &= 1373.4 \sin\theta \end{aligned}$$

Since overturning Couple must be equal to the balancing Couple

$$2425.7 \cos\theta = 1373.4 \sin\theta$$

$$\theta = \tan^{-1}\left(\frac{2425.7}{1373.4}\right)$$

$$\theta = 61.4^\circ$$

CHAPTER - 7

IMPLEMENTATION

7.1 Proposed Algorithm

The **Step1: Start**

Step2: Set threshold values for sensors

Step3: Calculate Sensor values

If (sensor values < threshold values)

go to step 3

else

go to step 4

Step4: Get GPS co-ordinates

Step5: Send the information to help centre

Step6: Help centre contacts the nearest hospital by GPS co-ordinates

Step7: If (Hospital approves)

go to step 8

else

go to step 6

Step8: Send an ambulance or rescue team to location

Step9: Stop

Arduino Nano serves as the controlling element, facilitating communication between modules to improve information transformation over time. From tri-lateral axis motions, an accelerometer may be utilized to determine the collision direction. The gadget also uses accelerometer sensors to validate the angle following a change in angle. The passenger's erroneous accident detection is then stopped with the aid of a buzzer. The GPS module gathers the coordinates from the Google Module within the buzzer's allotted time. These coordinates notify local hospitals when a passenger has to be rescued in an emergency. The hospital validates the accident and certifies it by

proving it occurred at the designated place. Through the GSM module, the family members who were saved are informed of the accident.

7.2 Code used:

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(2, 3, 4, 5, 6, 7);

String inputString = "";    // a string to hold incoming data
char d;
int switchstatus = 0;
//int temp;

//===motor pins=====

const int buzzerPin = 11;   // the number of the pushbutton pin
int buzzerState = 0;

const int impactPin = 10;
int impactState = 0;

const int switchPin = 8;
int switchState = 0;

const int switch1Pin = 9;
int switch1State = 0;

const int xpin = A2;        // x-axis of the accelerometer
const int ypin = A1;        // y-axis of the accelerometer
const int zpin = A0;        // z-axis of the accelerometer
int x;
int y;
int z;

int count = 0;
//=====
char str[70];
String gpsString = "";
char *test = "$GPGGA";
String latitude = "No Range  ";
```

```
String longitude = "No Range  ";
int temp = 0, i;
int countstate = 0;

boolean gps_status = 0;
String stringOne = "this", stringTwo;
//String inputString = ""; // a string to hold incoming data
//boolean stringComplete = false;
//=====
void setup()
{
  Serial.begin(9600);
  pinMode(impactPin, INPUT);
  pinMode(switchPin, INPUT_PULLUP);
  pinMode(switch1Pin, INPUT_PULLUP);
  pinMode(buzzerPin, OUTPUT);
  buzzerState = LOW;
  digitalWrite(buzzerPin, buzzerState);
  lcd.begin(16, 2);
  lcd.print(" ACCIDENT ");
  lcd.setCursor(0, 1);
  lcd.print("DETECTION SYSTEM");
  delay(3000);
  Serial.println("AT"); //Sets the GSM Module in Text Mode
  delay(1000);
  Serial.println("AT+CMGF=1"); //Sets the GSM Module in Text Mode
  delay(1000);
  Serial.println("AT+CMGD=1"); //Sets the GSM Module in Text Mode
  delay(1000);
  Serial.println("AT+CMGD=2"); //Sets the GSM Module in Text Mode
  delay(1000);
  Serial.println("AT+CSMS=1"); //Sets the GSM Module in Text Mode
  delay(1000);
  Serial.print("AT+CSCS="); //Sets the GSM Module in Text Mode
  Serial.print((char)34); //Sets the GSM Module in Text Mode
  Serial.print("GSM"); //Sets the GSM Module in Text Mode
  Serial.println((char)34); //Sets the GSM Module in Text Mode
  delay(2000);
  Serial.println("AT+CNMI=2,2,0,0,0"); //Sets the GSM Module in Text Mode
  delay(1000);
  delay(1000);
  Serial.println("AT+CSMP=17,167,0,0"); //Sets the GSM Module in Text Mode
  delay(1000);
```

```
    lcd.clear();
    lcd.print("System Ready");
    delay(2000);
}

void loop()
{
    //=====
    label0:
    label1:
    count = 0;
    lcd.clear();
    lcd.print("Checking Data...");
    // delay(50);
    x = analogRead(xpin);
    y = analogRead(ypin);
    z = analogRead(zpin);
    lcd.setCursor(0, 1);
    lcd.print("X:");
    lcd.print(x);
    lcd.print("Y:");
    lcd.print(y);
    lcd.print("Z:");
    lcd.print(z);

    impactState = digitalRead(impactPin);
    // if (impactState == LOW && (x > 300))
    if (x > 290)
    {
    label2:
        count++;
        lcd.clear();
        lcd.print(count);
        buzzerState = HIGH;
        digitalWrite(buzzerPin, buzzerState);
        delay(50);
        if (count > 200)
        {
            buzzerState = LOW;
            digitalWrite(buzzerPin, buzzerState);
            count = 0;
            goto skipswitch;
        }
    }
```

```
switchState = digitalRead(switchPin);
if (switchState == LOW)
{
  buzzerState = LOW;
  digitalWrite(buzzerPin, buzzerState);
  lcd.clear();
  lcd.print("Rider is OK!!!");
  delay(2000);
  goto label1;
}
goto label2;
```

skipswitch:

```
  lcd.clear();
  lcd.print("Accident Occured!!!");
  lcd.setCursor(0, 1);
  lcd.print("Vehicle OFF");
  delay(2000);
  //=====
  get_gps();
  lcd.clear();
  lcd.print(latitude);
  lcd.setCursor(0, 1);
  lcd.print(longitude);
  delay(1000);
  Serial.println("AT+CMGF=1"); //Sets the Serial Module in Text Mode
  delay(1000); // Delay of 1000 milli seconds or 1 second
  Serial.println("AT+CMGS="+917510703391+"\r"); // Replace x with mobile number
  delay(1000);
  Serial.print("Accident occured!!! Current Location: ");// The SMS text you want to
  send
  Serial.print(latitude);
  Serial.println(longitude);
  delay(1000);
  Serial.println((char)26);// ASCII code of CTRL+Z
  delay(1000);
  lcd.clear();
  lcd.println("SMS Sent !!!");
  //=====
  delay(3000);
  goto label0;
}
```

```
switch1State = digitalRead(switch1Pin);
if (switch1State == LOW)
{
  lcd.clear();
  lcd.print(" Emergency  ");
  lcd.setCursor(0, 1);
  lcd.print("Switch Pressed!!!");
  delay(2000);
  Serial.println("AT+CMGF=1"); //Sets the GSM Module in Text Mode
  delay(1000); // Delay of 1000 milli seconds or 1 second
  Serial.println("AT+CMGS="+917510703391+"\r"); // Replace x with mobile number
  delay(1000);
  Serial.print("Emergency Switch Pressed!!! Help needed. "); // The SMS text you want
  to send
  delay(1000);
  Serial.println((char)26); // ASCII code of CTRL+Z
  delay(2000);
  lcd.clear();
  lcd.println("SMS Sent !!!");
  delay(3000);
  goto label0;
}

delay(200);
goto label1;

}

//=====

//-----GPS FUNCTION-----
void gpsEvent()
{
  gpsString = "";
  while (1)
  {
    while (Serial.available() > 0) //checking serial data from GPS
    {
      char inChar = (char)Serial.read();
      gpsString += inChar; //store data from GPS into gpsString
      i++;
      if (i < 7)
    }
  }
}
```

Accident detection system for two-wheelers using tilt sensor

```
{
  if (gpsString[i - 1] != test[i - 1]) //checking for $GPGGA sentence
  {
    i = 0;
    gpsString = "";
  }
}
if (inChar == '\r')
{
  if (i > 65)
  {
    gps_status = 1;
    break;
  }
  else
  {
    i = 0;
  }
}
}
if (gps_status)
  break;
}
}
//=====GPS FUNCTION TILL
  HERE=====
```

```
//=====GET GPS FUNCTION=====
void get_gps()
{
  gps_status = 0;
  int x = 0;
  while (gps_status == 0)
  {
    gpsEvent();
    int str_lenth = i;
    latitude = "";
    longitude = "";
    int comma = 0;
    while (x < str_lenth)
    {
      if (gpsString[x] == ',')
        comma++;
    }
  }
}
```

Accident detection system for two-wheelers using tilt sensor

```
    if (comma == 2) //extract latitude from string
        latitude += gpsString[x + 1];
    else if (comma == 4) //extract longitude from string
        longitude += gpsString[x + 1];
    x++;
}
int l1 = latitude.length();
latitude[l1 - 1] = ' ';
l1 = longitude.length();
longitude[l1 - 1] = ' ';
// lcd.clear();
//lcd.print("Lat:");
//lcd.print(latitude);
//lcd.setCursor(0, 1);
// lcd.print("Long:");
// lcd.print(longitude);
i = 0; x = 0;
str_lenth = 0;
delay(2000);
}
}

//=====GET GPS FUNCTION TILL HERE=====
```

CHAPTER - 8

RESULT



Fig 8.1 Starting screen

The device will automatically turn on when bike starts and it will show the name of system as Accident detection system



Fig 8.2 Measuring screen

The gadget will begin measuring the angle in the X, Y, Z directions as illustrated by the accident detection system in fig. The device's whole operation is based on the angle measurements presented in fig above but we are taking only y axis values when the angle exceeds the critical angle the system will detect as accident

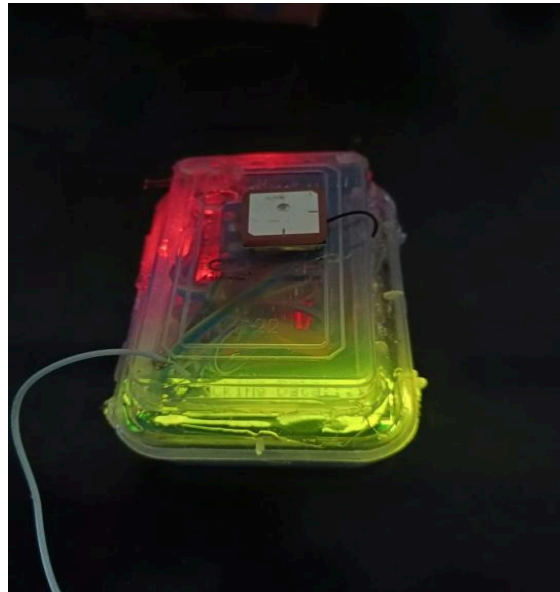


Fig 8.3 Device

The above image shows the image of the device

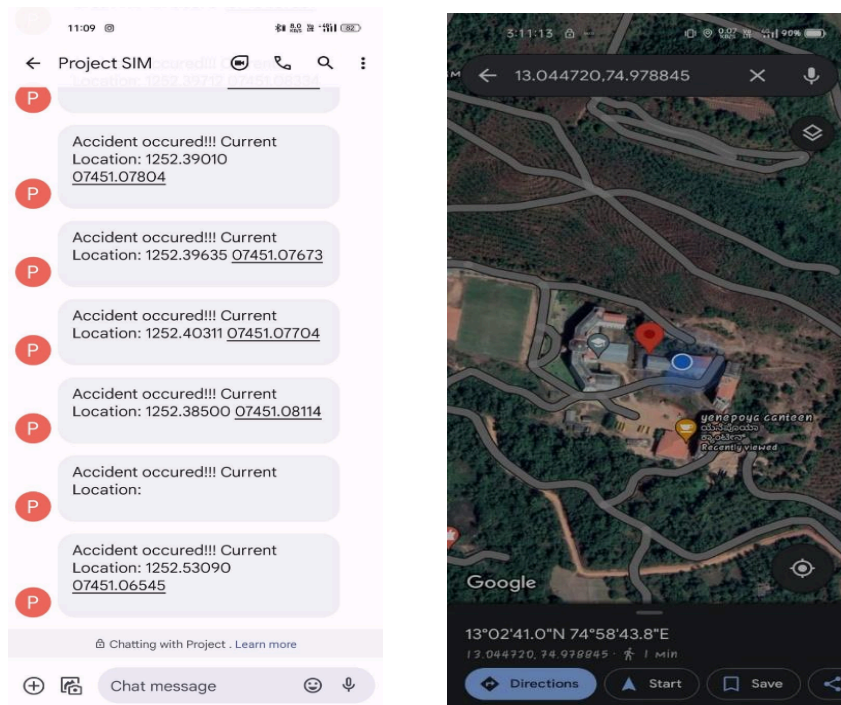


Fig 8.4 SMS and Location

After the accident the device will send the SMS along GPS location as shown in above figure, we can type that coordinates in any coordinate changing app to change into location

CHAPTER - 9

CONCLUSION AND FUTURE SCOPE

9.1 Conclusion

System for accident event detection has been created. The suggested system focuses on the alerting and identification of accidents. It determines the precise latitude and longitude of the accident-related vehicle and transmits this data to the closest emergency response provider. Arduino assists in sending the message to various system components. The direction of the accident is tracked 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.

9.2 Contribution

The proposed system helps to reduce the number of fatalities brought on by accidents. It uses the suggested methodology to identify accidents that have occurred, retrieves the accident's position using a GPS module, and sends an alarm message to a medical emergency so that it may reach the accident site in time to save lives. This feature can help to lower the number of fatal accidents.

9.3 Future Scope

We have shown that a variety of different types of sensors can help in a more accurate and effective manner. recognizing a car accident. There aren't any precise or trustworthy techniques for two-wheeler accidents, though. The suggested system rapidly locates the accident scene and contacts the appropriate hospital department and ambulance with an emergency request for assistance. Based on data obtained from the tilt sensor module about the position and state of the vehicle, this system takes decisions. The suggested system focuses on accident detection. However, this might be prolonged by giving the accident victims medicine on the scene. By increasing the technology, we can also avoid accidents by providing alerts systems that can stop the vehicle to overcome the accidents.

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