CHAPTER 1

INTRODUCTION

In an era marked by technological innovation and a growing emphasis on public safety, the need for effective measures to combat drunk driving has never been more urgent. Every year, countless lives are lost due to the reckless decisions of individuals who operate vehicles under the influence of alcohol. In response to this pressing issue, we present a groundbreaking solution aimed at early detection and alert of dangerous vehicle maneuvers typically associated with drunk driving.

Our proposed system represents a paradigm shift in the approach to addressing this societal concern. Leveraging cutting-edge technology and a minimalist design, our solution requires nothing more than a device equipped with an accelerometer and Bluetooth, seamlessly integrated into the user's footwear. This unobtrusive yet powerful device serves as a silent sentinel, constantly monitoring the wearer's movements and transmitting crucial data to their mobile phone.

The key to our system's effectiveness lies in its ability to analyze accelerometer readings in real-time, providing invaluable insights into the user's physical state. By discerning subtle differences in movement patterns, our solution can accurately determine whether an individual is standing, walking, or exhibiting signs of intoxication. This sophisticated analysis forms the foundation of our early detection and alert mechanism, enabling timely intervention to prevent potentially catastrophic consequences.

Beyond merely detecting signs of impairment, our system empowers users with the knowledge and awareness needed to make informed decisions about their own safety. By seamlessly integrating with their mobile phone, individuals can access real-time updates on their current status, allowing them to gauge their level of impairment and take appropriate action. Whether it be refraining from driving, seeking assistance, or simply exercising caution, our solution provides users with the tools they need to protect themselves and others from the dangers of drunk driving.

In essence, our proposed system represents a convergence of technology and responsibility, offering a proactive approach to mitigating the risks associated with intoxicated driving. By harnessing the power of data and connectivity, we aim to save lives, prevent tragedy, and create a safer, more responsible future for all.

Fig 1.1: Accelerometer-based alcohol drinking alert system

1.1: Problem Statement:

Every year, thousands of lives are lost and countless others are injured due to the devastating consequences of drunk driving. Despite widespread awareness campaigns and strict legal consequences, intoxicated individuals continue to operate vehicles, endangering not only their own lives but also those of innocent bystanders. The dire need for an effective early detection and alert system for dangerous vehicle maneuvers associated with drunk driving has never been more apparent.

According to the World Health Organization (WHO), globally, approximately 1.35 million people die each year as a result of road traffic crashes, with alcohol being a significant contributing factor. In the United States alone, the National Highway Traffic Safety Administration (NHTSA) reports that alcohol-impaired driving fatalities accounted for 28% of all traffic-related deaths in 2019, equating to more than 10,000 lives lost. Furthermore, it is estimated that for every drunk-driving fatality, there are approximately 50 to 100 non-fatal injuries, many of which result in long-term disabilities.

The current methods for detecting and preventing drunk driving rely heavily on law enforcement intervention, such as sobriety checkpoints and breathalyzer tests. While these measures have proven effective to some extent, they are reactive rather than proactive and often occur after the potential harm has already been done.

To address this critical issue, we propose the development and implementation of a highly efficient early detection and alert system. This system utilizes a device integrated into the individual's shoes, equipped with an accelerometer and Bluetooth technology. By analyzing accelerometer readings, the system can determine the user's status, distinguishing between normal activities such as standing and walking, and the impaired coordination associated with drunkenness.

Fig 1.2

By providing real-time alerts to both the user and designated contacts through their mobile phones, this system has the potential to prevent accidents before they occur, potentially saving countless lives and reducing the immense societal and economic burden associated with drunk driving-related incidents.

The urgency of developing and implementing this solution cannot be overstated. The statistics speak for themselves, highlighting the devastating impact of drunk driving on communities worldwide. It is imperative that we take proactive measures to address this issue and implement innovative solutions that have the potential to save lives and prevent unnecessary tragedies.

1.2: Problem Scope:

Despite numerous efforts to combat drunk driving, it remains a significant cause of accidents and fatalities worldwide. The lack of real-time monitoring and early detection systems contributes to the persistence of this problem. To address this issue, we propose a highly efficient system aimed at early detection and alert of dangerous vehicle maneuvers typically related to drunk driving. The system aims to prevent fatalities caused by overconsumption of alcohol by providing timely alerts and intervention measures.

1. Detection Accuracy: Ensuring the reliability and accuracy of the system in differentiating between normal activities and signs of intoxication is crucial. This involves robust data analysis algorithms capable of discerning subtle changes in accelerometer readings indicative of drunk behavior.
2. User Experience: The solution should be user-friendly and non-intrusive to encourage widespread adoption. Factors such as device comfort, battery life, and ease of connectivity with mobile phones are essential considerations.
3. Privacy and Security: Safeguarding user data and ensuring privacy is paramount. The system should adhere to strict privacy regulations and employ robust security measures to protect sensitive information transmitted between devices.
4. Scalability and Accessibility: The solution should be scalable to accommodate varying user needs and accessible across different demographics and regions. Considerations such as cost-effectiveness and compatibility with existing mobile devices should be taken into account.
5. Collaboration and Implementation: Collaborating with relevant stakeholders, including law enforcement agencies, policymakers, and technology providers, is essential for successful implementation and widespread adoption of the solution.

By addressing these aspects within the proposed system, we aim to develop a comprehensive solution capable of significantly reducing the incidence of drunk driving-related accidents and fatalities.

1.3: Advantages of using Accelerometer based alcohol drinking alert system

The proposed system for early detection and alert of dangerous vehicle maneuvers related to drunk driving, utilizing a device with an accelerometer integrated into a person's shoes and connected to their mobile phone via Bluetooth, offers several advantages:

1. Early Detection: By monitoring the accelerometer readings, the system can detect signs of impairment associated with drunk driving at an early stage. This allows for intervention or alert before the person gets behind the wheel, potentially preventing accidents.

2. Real-time Monitoring: The system provides real-time monitoring of the person's movements and status. This means that any sudden changes indicating impairment can be detected immediately, enabling prompt action.

3. Cost-effectiveness: The solution requires only a device with an accelerometer and Bluetooth, which can be integrated into existing footwear. This makes it a cost-effective option compared to other alcohol detection systems that may require more complex equipment or installation.

4. User-Friendly: Since the device is integrated into the person's shoes and communicates with their mobile phone, it is non-intrusive and convenient to use. Users do not have to remember to carry or wear additional equipment, increasing the likelihood of adoption.

5. Privacy Preservation: Unlike traditional breathalyzer tests or invasive monitoring systems, this solution respects the user's privacy. The data collected is processed locally on the user's mobile phone, reducing concerns about data privacy and security.

6. Potential for Preventing Fatalities: By providing alerts or interventions when signs of impairment are detected, the system has the potential to prevent accidents and fatalities caused by drunk driving. This can contribute to saving lives and reducing the societal impact of alcohol-related accidents.

7. Scalability and Accessibility: The simplicity of the device and its integration with widely used mobile phones make it scalable and accessible to a larger population. It can be easily distributed and adopted by individuals across different demographics and geographical locations.

8. Customizable Alerts: Depending on the level of impairment detected, the system can be programmed to deliver customizable alerts or notifications to the user or designated contacts, allowing for tailored responses based on the severity of the situation.

Overall, the proposed system offers a practical and effective solution for early detection and prevention of drunk driving incidents, with the potential to save lives and improve road safety.

1.4 Proposed Solution:

The proposed solution for early detection and alert of dangerous vehicle maneuvers, particularly associated with drunk driving, is a highly efficient system that hinges on a simple yet effective device integrated into the user's shoes. This device incorporates an accelerometer and Bluetooth technology, enabling seamless communication with the user's mobile phone. By leveraging accelerometer readings, the system can discern the user's status, distinguishing between standing, walking, and indicators of intoxication. This real-time data is relayed to the user's mobile phone, where it is processed to assess the individual's level of impairment. Should the system detect signs of intoxication, it triggers alerts to both the user and designated contacts, preempting the potential for accidents or fatalities caused by impaired driving. By providing a discreet and proactive monitoring solution, this innovation has the potential to save lives and mitigate the risks associated with overconsumption of alcohol.

Fig:1.3

1.5 Aim and Objectives

Aim:

The aim of the proposed system is to develop a highly efficient early detection and alert system for dangerous vehicle maneuvers associated with drunk driving. By utilizing a device integrated into the user's shoes, equipped with an accelerometer and Bluetooth technology, the system aims to prevent accidents and potential fatalities resulting from alcohol consumption.

Objectives:

1. Early Detection: Utilize accelerometer readings to detect abnormal movements and behaviors indicative of intoxication, such as unsteady gait or loss of balance.

2. Real-time Monitoring: Continuously monitor the user's movements and status through the accelerometer data transmitted to the user's mobile phone via Bluetooth.

3. Alert System: Implement an alert mechanism on the mobile phone to notify the user when potentially dangerous behaviors associated with drunk driving are detected.

4. Prevention: Enable timely intervention by providing alerts to both the user and designated contacts or authorities, aiming to prevent accidents and protect the safety of the user and others on the road.

5. Accessibility and Integration: Develop a user-friendly mobile application interface that allows easy access to the device's functionalities, status monitoring, and alert management.

6. Efficiency and Reliability: Design the system to operate efficiently with minimal power consumption while ensuring reliable detection and alert mechanisms.

7. Compliance and Privacy: Ensure compliance with relevant regulations and standards regarding data privacy and user consent, providing users with control over their data and privacy settings.

By achieving these objectives, the proposed system aims to contribute to the reduction of drunk driving incidents, thereby enhancing road safety and potentially saving lives.

CHAPTER 2
LITERATURE SURVEY

The proposal outlines a novel system designed for early detection and alert of dangerous vehicle maneuvers associated with drunk driving, with the potential to prevent fatalities resulting from alcohol overconsumption. Utilizing a simple yet effective approach, the system integrates an accelerometer and Bluetooth technology within the user's shoes. This unobtrusive device communicates with the user's mobile phone, which serves as the central hub for monitoring and analyzing the individual's physical state. By leveraging accelerometer data, the system can discern crucial behavioral indicators such as standing, walking, or exhibiting signs of intoxication.

The proposed system represents a significant advancement in the field of drunk driving prevention by offering a non-invasive solution that seamlessly integrates into everyday life. Traditional methods of detecting intoxication often rely on intrusive breathalyzer tests or subjective observations by law enforcement officers, which can be impractical and prone to human error. In contrast, the use of accelerometer technology provides a discreet and reliable means of monitoring subtle changes in the user's movement patterns, allowing for early intervention before the individual poses a risk to themselves or others on the road.

Moreover, the system's reliance on Bluetooth connectivity enables real-time monitoring and intervention capabilities through the user's mobile phone. By leveraging the ubiquitous nature of smartphones, the proposed solution ensures widespread accessibility and ease of use for individuals seeking to mitigate the risks associated with alcohol consumption and driving. Furthermore, the integration of this technology with existing mobile applications could facilitate additional features such as automated alerts to designated contacts or integration with ride-sharing services, further enhancing its effectiveness in preventing drunk driving incidents and potentially saving lives.

CHAPTER 3

METHODOLOGY

The proposed system is designed to detect and alert dangerous vehicle maneuvers associated with drunk driving in order to prevent accidents and save lives. It utilizes a compact and efficient solution that requires only a device equipped with an accelerometer and Bluetooth technology, which is integrated into the user's shoes. This device communicates with the user's mobile phone, allowing for real-time monitoring of the individual's status and movements.

The methodology begins with the integration of the accelerometer-equipped device into the user's shoes. The device is designed to accurately measure various aspects of motion and acceleration, providing valuable data regarding the user's movements and behavior.

Once integrated, the device continuously collects accelerometer data, which is transmitted to the user's mobile phone via Bluetooth connectivity. This data includes information such as the user's posture, gait patterns, and overall motion characteristics.

On the mobile phone, a dedicated application processes the incoming accelerometer data in real-time. Advanced algorithms analyze this data to determine the user's current status, distinguishing between normal activities such as standing and walking, and potentially dangerous behaviors associated with intoxication, such as impaired coordination and balance.

Based on the analysis of accelerometer readings, the application assesses the likelihood of the user being intoxicated and potentially engaging in drunk driving. If the system detects signs of impairment, such as erratic movements or unusual patterns, it triggers an alert mechanism to notify the user and relevant authorities.

Alerts can be delivered through various channels, including visual notifications on the mobile phone screen, audible alarms, and even automated messages to designated contacts or emergency services. This prompt notification enables timely intervention to prevent the individual from engaging in unsafe behaviors, thereby reducing the risk of accidents and fatalities caused by drunk driving.

In summary, the proposed methodology leverages accelerometer technology integrated into the user's shoes, coupled with real-time data analysis on a mobile phone application, to detect and alert dangerous vehicle maneuvers associated with drunk driving. By providing timely warnings and interventions, this system aims to save lives and promote safer roads for all motorists and pedestrians.

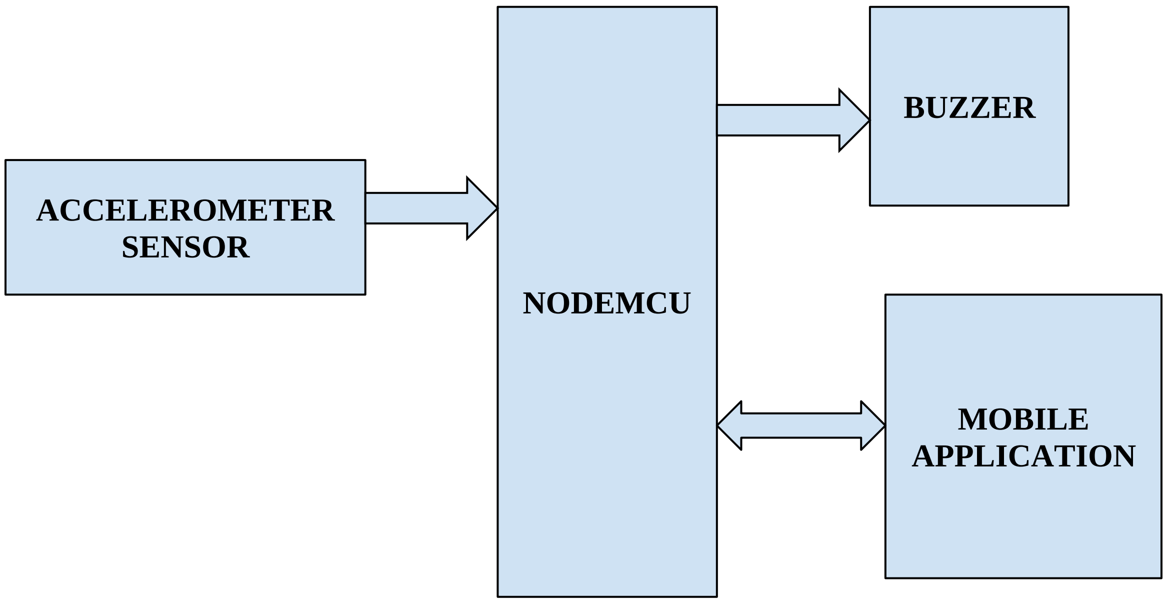


Fig.3.1:Block diagram for Accelerometer based alcohol drinking alert system

3.1 NodeMCU (ESP8266)

The NodeMCU ESP8266 is a powerful and versatile platform designed for Internet of Things (IoT) development. The ESP8266 is a cost-effective Wi-Fi microchip known for its capability to enable wireless communication in IoT applications. NodeMCU, on the other hand, is an open-source firmware and development kit that simplifies the process of prototyping and programming the ESP8266. With built-in Wi-Fi connectivity, the NodeMCU ESP8266 allows devices to connect to the internet wirelessly, making it suitable for a wide range of IoT projects. One notable feature is its support for the Lua scripting language, providing a high-level programming environment for developers. Additionally, it is compatible with the Arduino IDE, allowing those familiar with Arduino to use the NodeMCU platform. Equipped with General Purpose Input/Output (GPIO) pins, the ESP8266 facilitates interfacing with various electronic components, making it ideal for applications such as home automation and sensor networks. The NodeMCU ESP8266 has garnered significant community support, resulting in an extensive collection of libraries and documentation, making it a popular choice for rapid IoT prototyping and development.

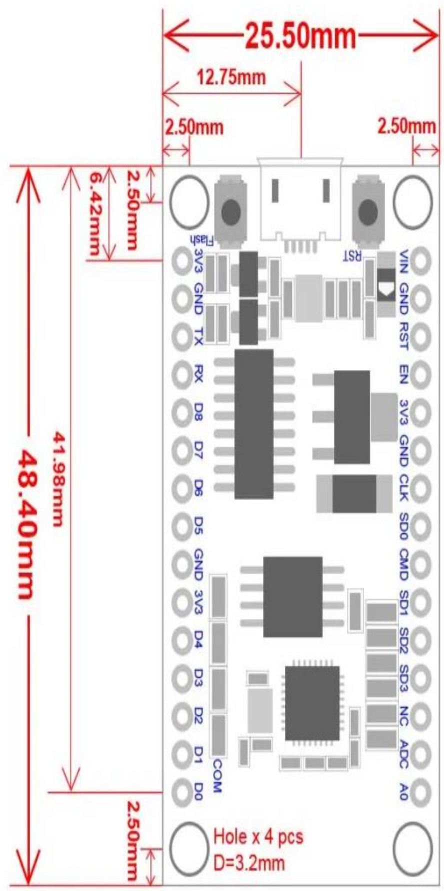


Figure 3.2 NodeMCU 2D View

NodeMCU Specification:

The NodeMCU development board is based on the ESP8266 microcontroller, and different versions of NodeMCU boards may have slight variations in specifications. As of my knowledge cutoff in January 2022, here are the general specifications for the NodeMCU ESP8266 development board:

1. Microcontroller: ESP8266 Wi-Fi microcontroller with 32-bit architecture.

2. Processor: Tensilica L106 32-bit microcontroller.

3. Clock Frequency: Typically operates at 80 MHz.

4. Flash Memory:

- Built-in Flash memory for program storage.
- Common configurations include 4MB or 16MB of Flash memory.

5. RAM: Typically equipped with 80 KB of RAM.

6. Wireless Connectivity:

- Integrated Wi-Fi (802.11 b/g/n) for wireless communication.
- Supports Station, SoftAP, and SoftAP + Station modes.

7. GPIO Pins: Multiple General Purpose Input/Output (GPIO) pins for interfacing with sensors, actuators, and other electronic components.

8. Analog Pins: Analog-to-digital converter (ADC) pins for reading analog sensor values.

9. USB-to-Serial Converter: Built-in USB-to-Serial converter for programming and debugging.

10. Operating Voltage: Typically operates at 3.3V (Note: It is crucial to connect external components accordingly to avoid damage).

11. Programming Interface: Programmable using the Arduino IDE, Lua scripting language, or other compatible frameworks.

12. Voltage Regulator: Onboard voltage regulator for stable operation.

13. Reset Button: Reset button for restarting the board.

14. Dimensions: Standard NodeMCU boards often have dimensions around 49mm x 24mm.

15. Power Consumption: Low power consumption, making it suitable for battery-operated applications.

16. Community Support: Active community support with extensive documentation and libraries.

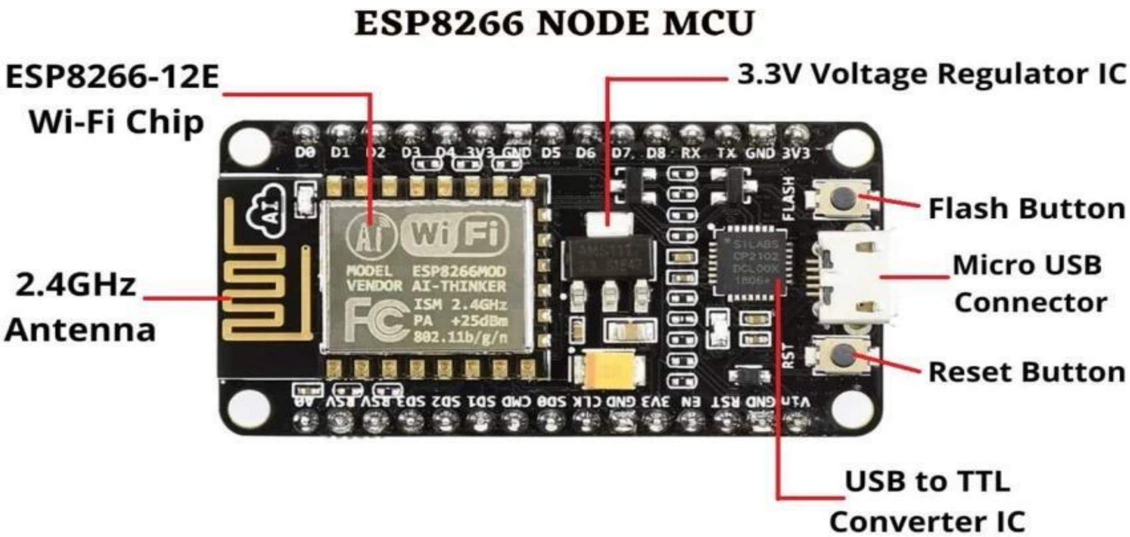


Figure 3.3: NodeMCU Parts

The NodeMCU ESP8266 development board typically has GPIO (General Purpose Input/Output) pins that can be used for various purposes, including interfacing with sensors, actuators, and other electronic components. Below is a common pinout configuration for the NodeMCU development board

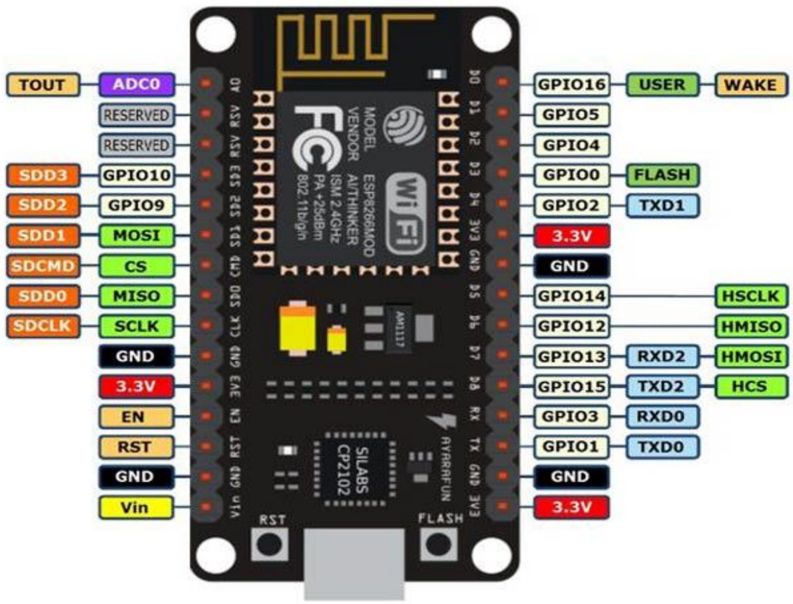


Figure 3.4: NodeMCU ESP8266 Pinout

ADC | A0 | GPIO16

EN | Enable | GPIO14

D0 | GPIO16 | GPIO12

D1 | GPIO5 | GPIO13

D2 | GPIO4 | GPIO15

D3 | GPIO0 | GPIO2

D4 | GPIO2 | GPIO9

D5 | GPIO14 | GPIO10

D6 | GPIO12 | GPIO3

D7 | GPIO13 | GPIO1

D8 | GPIO15 | TX (GPIO1)

D9 | GPIO3 (RX) | RX (GPIO3)

D10 | GPIO1 (TX) | D11 (MOSI)

D11 | MOSI | D12 (MISO)

D12 | MISO | D13 (SCK

ADC: Analog-to-Digital Converter pin for reading analog sensor values.

EN (Enable): Enable pin.

D0-D8: Digital GPIO pins.

D9 (RX) and D10 (TX): Serial communication pins for programming and debugging.

D11 (MOSI), D12 (MISO), D13 (SCK): Pins used for SPI communication.

D14 (SDA) and D15 (SCL): Pins used for I2C communication.

It's important to note that GPIO pins labeled as "D" (Digital) are typically used for general-purpose digital input/output. Additionally, GPIO pins labeled as "A" (Analog) can be used as analog inputs with the ADC. GPIO pins 6, 7, 8, 9, 10, and 11 have additional functions, so it's advised to refer to the specific NodeMCU documentation for detailed information on pin functionality and capabilities.

3.2 : Accelerometer sensor

The rate of change of velocity of the body with respect to time is called acceleration. According to relative theory, depending upon the relative object taken to measure acceleration, there are two types of acceleration. The proper acceleration, which is the physical acceleration of the body relative to inertia or the observer who is at rest relative to the object being measured.

The coordinate acceleration depends upon the choice of coordinate system and choice of observers. This is not equal to proper acceleration. Accelerometer sensor is the electromechanical device used to measure the proper acceleration of the object.

Working Principle

The basic underlying working principle of an accelerometer is such as a dumped mass on a spring. When acceleration is experienced by this device, the mass gets displaced till the spring can easily move the mass, with the same rate equal to the acceleration it sensed. Then this displacement value is used to measure the acceleration.

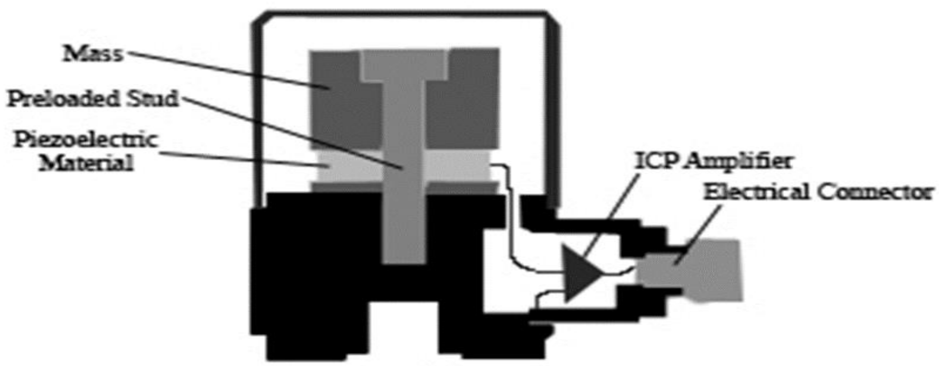


Fig 3.5:PiezoAccelerometer-sensor

Accelerometers are available as digital devices and analog devices. Accelerometers are designed using different methods. Piezoelectric, piezoresistive and capacitive components are generally used to convert the mechanical motion caused in an accelerometer into an electrical signal.

Piezoelectric accelerometers are made up of single crystals. These use the piezoelectric effect to measure the acceleration. When applied to stress, these crystals generate a voltage which is interpreted to determine the velocity and orientation.

Capacitive accelerometers use a silicon micro-machined element. Here capacitance is generated when acceleration is sensed and this capacitance is translated into a voltage to measure the velocity values.

Modern accelerometers are the smallest MEMS, consisting of a cantilever beam with proof mass. Accelerometers are available as two-dimensional and three-dimensional forms to measure velocity along with orientation. When the upper-frequency range, high-temperature range, and low packaged weight are required, piezoelectric accelerometers are the best choice.

Applications

The Applications of Accelerometer sensor are as follows:

- To detect and monitor vibrations in rotating machinery.
- To display images in an upright position on screens of digital cameras.
- For flight stabilization in drones.
- Accelerometers are used to sense orientation, coordinate acceleration, vibration, shock.
- Used to detect the position of the device in laptops and mobiles.
- High-frequency recording of biaxial and triaxial acceleration in biological applications for discrimination of behavioral patterns of animals.
- Machinery health monitoring.
- To detect faults in rotator machines.
- These are also used for building and structural monitoring to measure the motion and vibration of the structure when exposed to dynamic loads.
- To measure the depth of CPR chest compressions.
- Navigation systems make use of accelerometer sensors for knowing the direction.
- Remote sensing devices also use accelerometers to monitor active volcanoes.

3.3 Buzzer

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

Fig. 3.6: Buzzer Pin Configuration

Pin configuration

The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-'symbol or short terminal and it is connected to the GND terminal.

Types of Buzzer

A buzzer is available in different types which include the following.

- Piezoelectric
- Electromagnetic
- Mechanical
- Electromechanical
- Magnetic

Working Principle

The working principle of a buzzer depends on the theory that, once the voltage is given across a piezoelectric material, then a pressure difference is produced. A piezo type includes piezo crystals among two conductors.

Once a potential disparity is given across these crystals, then they thrust one conductor & drag the additional conductor through their internal property. So this continuous action will produce a sharp sound signal.

Advantages

The advantages of a buzzer include the following.

- Simply Compatible
- Frequency Response is Good
- Size is small
- Energy Consumption is less
- The Range of Voltage usage is Large

- Sound Pressure is high

Disadvantages

The disadvantages of the buzzer include the following.

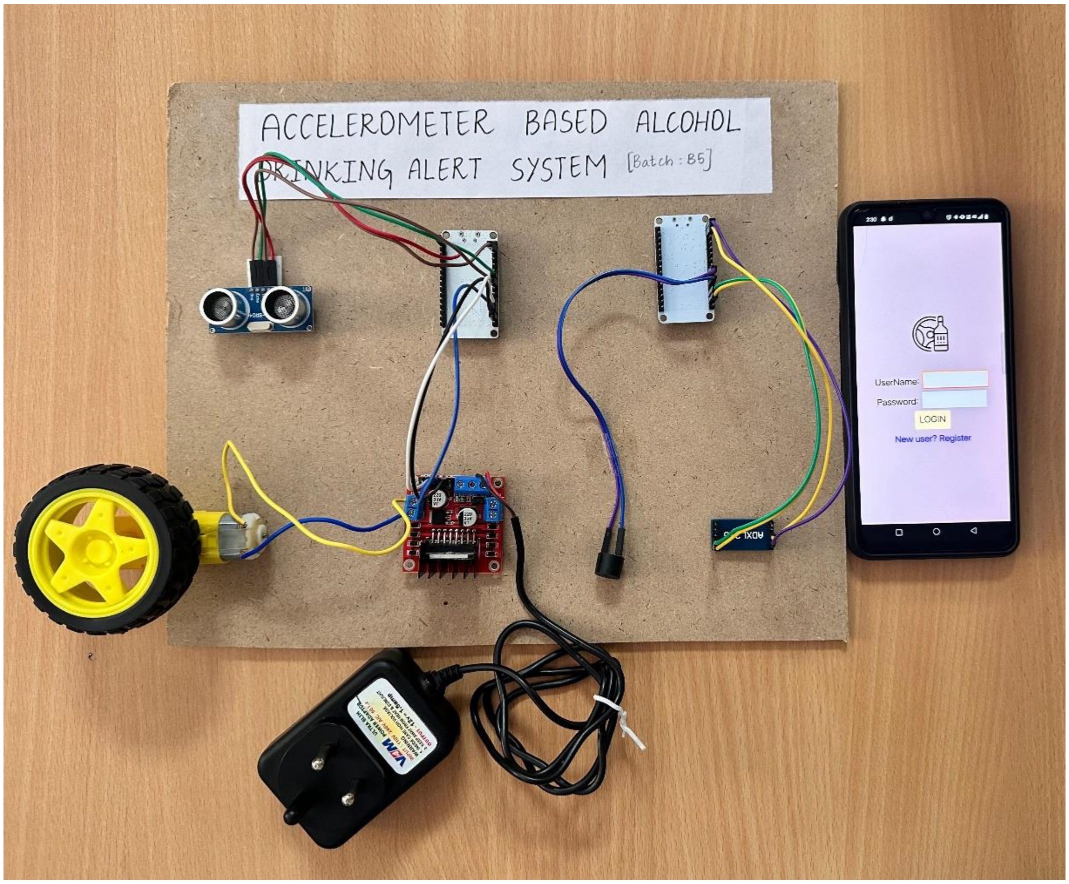
- Controlling is a little hard
- Generates Annoying Sound
- Training is necessary to know how to repair the condition without just turning off.

Applications

The applications of the buzzer include the following.

- Communication Devices
- Electronics used in Automobiles
- Alarm Circuits
- Portable Devices
- Security Systems
- Timers
- Household Appliances
- Electronic Metronomes
- Sporting Events
- Annunciator Panels

CHAPTER 4
DESIGN AND CODING



Code:

```
#include <ESP8266WiFi.h>

#include <Firebase_ESP_Client.h>

#include "addons/TokenHelper.h"

#include "addons/RTDBHelper.h"

#include <Wire.h>

#include <U8g2lib.h>
```

```
#define ADXL335_X A0

#define ADXL335_Y A0

#define ADXL335_Z A0


#define BUZZER_PIN D4


#define SHAKING_THRESHOLD 470 // Adjust this threshold according to your needs


U8G2_SH1106_128X64_NONAME_F_HW_I2C u8g2(U8G2_R0, /* reset=*/
U8X8_PIN_NONE);


#define WIFI_SSID "123456789"

#define WIFI_PASSWORD "123456789"

#define API_KEY "AIzaSyC0gPSHesz3RxIsbFM48OkKK_zCBhfbtmc"

#define DATABASE_URL "https://test-26075-default-rtdb.firebaseio.com/"


FirebaseData fbdo;

FirebaseAuth auth;

FirebaseConfig config;


unsigned long sendDataPrevMillis = 0;

bool signupOK = false;

String intValue;


void setup() {
```

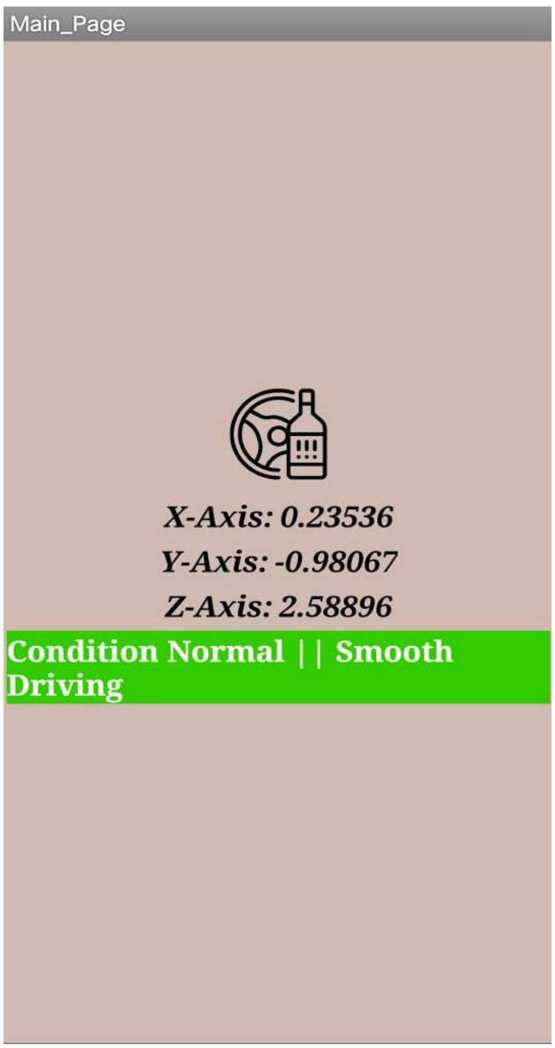
```
Serial.begin(115200);
u8g2.begin();
pinMode(BUZZER_PIN, OUTPUT);
WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
Serial.print("Connecting to Wi-Fi");
while (WiFi.status() != WL_CONNECTED){
  Serial.print(".");
  delay(300);
}
Serial.println();
Serial.print("Connected with IP: ");
Serial.println(WiFi.localIP());
Serial.println();
config.api_key = API_KEY;
config.database_url = DATABASE_URL;
if (Firebase.signUp(&config, &auth, "", "")){
  Serial.println("ok");
  signupOK = true;
}
else{
  Serial.printf("%s\n", config.signer.signupError.message.c_str());
}
config.token_status_callback = tokenStatusCallback; //see addons/TokenHelper.h
Firebase.begin(&config, &auth);
Firebase.reconnectWiFi(true);
```

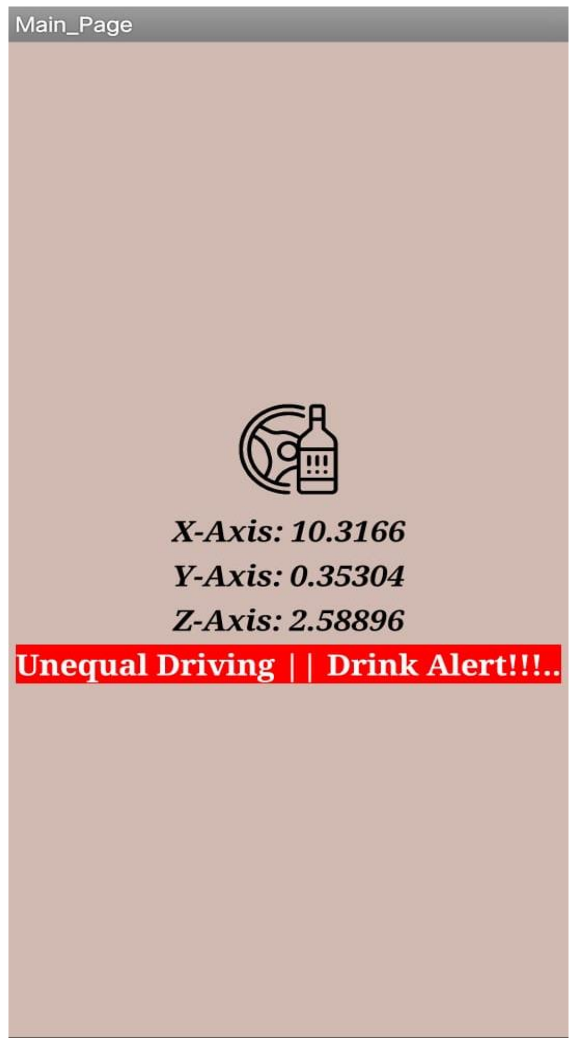
```
}

void loop() {
  int xAccel = analogRead(ADXL335_X);
  int yAccel = analogRead(ADXL335_Y) + 30;
  int zAccel = analogRead(ADXL335_Z) + 28;

  Serial.print("X: "); Serial.print(xAccel);
  Serial.print("\t");
  Serial.print("Y: "); Serial.print(yAccel);
  Serial.print("\t");
  Serial.print("Z: "); Serial.println(zAccel);

  u8g2.clearBuffer();
  u8g2.setFont(u8g2_font_ncenB08_tr);
  u8g2.setCursor(0, 13);
  u8g2.print("X: "); u8g2.print(xAccel);
  u8g2.setCursor(0, 23);
  u8g2.print("Y: "); u8g2.print(yAccel);
  u8g2.setCursor(0, 33);
  u8g2.print("Z: "); u8g2.print(zAccel);
  u8g2.sendBuffer();
  delay(800); // Adjust delay according to your requirements

  // Check if any of the axis values are above the shaking threshold
```

```
  if ((xAccel < SHAKING_THRESHOLD) || (yAccel < SHAKING_THRESHOLD) || (zAccel <
SHAKING_THRESHOLD)) {

    // If shaking detected, turn on the buzzer

    digitalWrite(BUZZER_PIN, HIGH);

    Serial.println("Drinking Alert!!!....");

    u8g2.setFont(u8g2_font_ncenB08_tr);

    u8g2.setCursor(0, 44);

    u8g2.print("Drinking Alert!!!....");

    u8g2.sendBuffer();

  } else {

    digitalWrite(BUZZER_PIN, LOW);

    Serial.println("Condition Normal!!!...");

    u8g2.setFont(u8g2_font_ncenB08_tr);

    u8g2.setCursor(0, 40);

    u8g2.print("Condition Normal!!!...");

    u8g2.sendBuffer();

  }

  delay(50);



   if (Firebase.ready() && signupOK && (millis() - sendDataPrevMillis > 1000 ||
sendDataPrevMillis == 0)){

    sendDataPrevMillis = millis();



    if (Firebase.RTDB.setFloat(&fbdo, "mainbucket/xAccel",xAccel)){

      Serial.println("PATH: " + fbdo.dataPath());

      Serial.println("TYPE: " + fbdo.dataType());
```

```
}
else {
  Serial.println("Failed REASON: " + fbdo.errorReason());
}
delay(100);
if (Firebase.RTDB.setFloat(&fbdo, "mainbucket/xAccel",xAccel)){
  Serial.println("PATH: " + fbdo.dataPath());
  Serial.println("TYPE: " + fbdo.dataType());
}
else {
  Serial.println("Failed REASON: " + fbdo.errorReason());
}
delay(100);
if (Firebase.RTDB.setFloat(&fbdo, "mainbucket/yAccel",yAccel)){
  Serial.println("PATH: " + fbdo.dataPath());
  Serial.println("TYPE: " + fbdo.dataType());
}
else {
  Serial.println("Failed REASON: " + fbdo.errorReason());
}
delay(100);
if (Firebase.RTDB.setFloat(&fbdo, "mainbucket/zAccel",zAccel)){
  Serial.println("PATH: " + fbdo.dataPath());
  Serial.println("TYPE: " + fbdo.dataType());
}
```

```
    else {
      Serial.println("Failed REASON: " + fbdo.errorReason());
    }
    delay(1000);
}
}
```





CHAPTER 5
CONCLUSION

An accelerometer-based drinking alert system aims to monitor and detect excessive alcohol consumption by measuring hand movements and patterns associated with drinking behaviors. The system can identify specific gestures such as the lifting of a glass or bottle, helping to alert individuals or authorities when the person reaches a predefined limit or exhibits signs of high-risk drinking.

1. Effective Monitoring: The system efficiently tracks hand movements using accelerometer data, providing real-time insights into drinking patterns.

2. Timely Alerts: It offers timely notifications to prevent over-consumption, contributing to safer drinking habits and reducing the risk of alcohol-related harm.

3. User-Friendly: With advancements in wearable technology, the system can be easily integrated into devices like smartwatches or wristbands, making it a practical solution.

4. Future Potential: This technology holds great promise for health monitoring, especially when combined with other sensors like heart rate monitors, and can help prevent accidents due to excessive alcohol intake.

5. Limitations: The system may encounter false positives due to other similar hand movements or gestures unrelated to drinking, and further refinement in algorithms is necessary for accuracy.

Overall, this accelerometer-based system can contribute to better health management and raise awareness of drinking limits, promoting responsible alcohol consumption.