ISSN: 2583-5637 (Online)
International journal of Inventive Research in Science and Technology
Volume 3 Issue 3 March 2024

Accident Preventive Glasses: A Drowsiness Detection System for Drivers

Ankit[1], Abhishek Dubey[2], Nitish Kumar[3] Rahul Ahirwar[4,] Sugandha Soni[5]

[1]BTech Student, Department of Electrical and Electronics Engineering, Technocrats Institute of Technology, Bhopal, India

[2]BTech Student Professor, Department of Electrical & Electronics Engineering, Technocrats Institute of Technology, Bhopal, India

[3]BTech Student r, Department of Electrical & Electronics Engineering, Technocrats Institute of Technology, Bhopal, India

[4]BTech Student, Department of Electrical & Electronics Engineering, Technocrats Institute of Technology, Bhopal, India

[5]Btech Student, Department of Electrical & Electronics Engineering, Technocrats Institute of Technology, Bhopal, India

Abstract

According to the Royal Society for the Prevention of Accidents, nearly 1.3 million people die in road accidents each year worldwide, averaging 3,287 deaths per day, with an additional 20-50 million injured or disabled due to road accidents [1]. Fatigue or dizziness among drivers is a major cause of these accidents. To address this issue, we propose a cost-effective and efficient anti-sleep alarm system integrated into glasses, utilizing an eye blink sensor and Arduino Nano (esp8366). The system detects drowsiness by monitoring eye blink patterns and alerts the driver through a buzzer. This paper discusses the design, implementation, advantages, and applications of the proposed system, highlighting its potential to significantly reduce accidents caused by driver fatigue.

1. Introduction

1.1. Motivation and Purpose

Driver drowsiness is a leading cause of road accidents, often resulting in fatalities and severe injuries. Traditional anti-sleep systems are either expensive or complex, limiting their accessibility. The goal of this project is to develop an affordable and easy-to-use drowsiness detection system embedded in glasses. The system uses infrared (IR) technology to monitor eye blink patterns and triggers an alarm when prolonged eye closure is detected, thereby preventing accidents caused by drowsy driving.

1.2. Functions and Features

The proposed system offers the following features:

1. **Eye Blink Detection**: Uses an IR sensor to detect open and closed eye states.
2. **Real-Time Processing**: Processes data in real-time to ensure timely alerts.
3. **Day and Night Operation**: Functions effectively in varying lighting conditions.
4. **Alert Mechanism**: Employs a buzzer and LED to warn the driver.

2. Related Work

Several drowsiness detection systems exist, but they suffer from drawbacks such as high cost, complexity, or low accuracy. For instance:

- **Attention Assist**: Uses steering input patterns to detect drowsiness but is costly and proprietary, available only in luxury cars [2].
- **Anti-Sleep Pilot**: Relies on psychological and physical behavior analysis but requires extensive driver data [3].
- **Drive Awake**: An iPhone app that uses eye-tracking but depends on smartphone availability [4].
- **Motion Sensor Alarms**: Placed over the ear, these systems often trigger false alarms due to head movements [5].

The proposed system overcomes these limitations by being affordable, accurate, and easy to implement using open-source components.

3. System Design

3.1. Hardware Components

The system comprises the following components:

1. **Arduino Nano**: Acts as the microcontroller for processing sensor data.
2. **Eye Blink Sensor**: Uses IR technology to detect eye blinks.
3. **RF Transceiver Module**: Enables wireless communication between the sensor and the alarm system.
4. **Buzzer**: Produces audible alerts when drowsiness is detected.
5. **9V Battery**: Powers the system.

3.2. Circuit Diagram

The system consists of a transmitter and receiver section:

- **Transmitter Side**: The eye blink sensor and RF transmitter are powered by a 9V battery, stepped down to 5V using a voltage regulator.
- **Receiver Side**: The RF receiver sends data to the Arduino, which triggers the buzzer if drowsiness is detected.

3.3. Working Principle

1. The IR transmitter emits rays that reflect off the driver's eyelids.
2. The receiver detects the reflected rays, with voltage varying based on eye state (open or closed).
3. The Arduino processes this data and activates the buzzer if the eyes remain closed for more than a predefined duration (e.g., 1 second).

4. Implementation

4.1. Programming the Arduino Nano

The Arduino code reads analog input from the RF receiver and uses conditional statements to determine drowsiness:

cpp
Copy
Download

```cpp
int flag = 0;
int t1 = 0;
int t2 = 0;

void setup() {
  Serial.begin(9600);
  pinMode(2, OUTPUT);
}

void loop() {
  int x = analogRead(A0);
  Serial.println(x);

  if (x < 400 && flag == 0) {
    flag = 1;
    t1 = millis();
  } else if (x > 400 && flag == 1) {
    flag = 0;
    t2 = millis();
    Serial.println(t2 - t1);
```

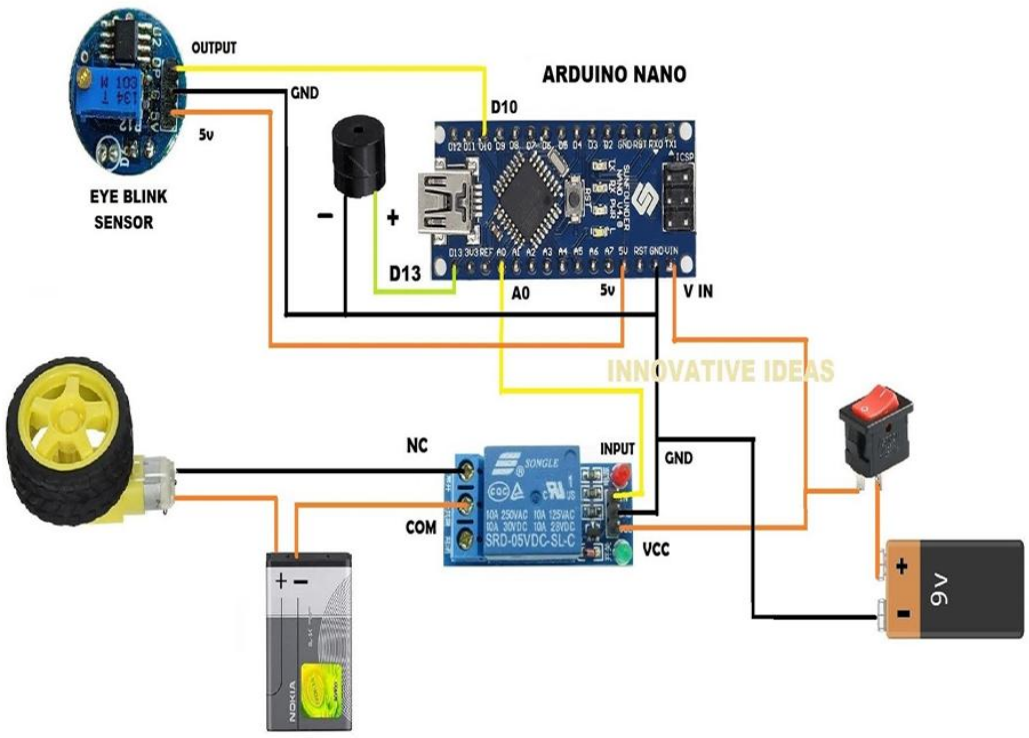
ISSN: 2583-5637 (Online)
International journal of Inventive Research in Science and Technology
Volume 3 Issue 3 March 2024

```
  if ((t2 - t1) > 1000) {
    digitalWrite(2, HIGH);
    Serial.println("Alert!!!!!!!!!!!!!!");
    delay(2000);
    digitalWrite(2, LOW);
   }
 }
}
```

4.2. Calibration

The system is calibrated to ignore normal blinks (lasting less than 1 second) and only trigger the alarm for prolonged eye closure, indicating drowsiness.

4.3 Circuit Diagram



5. Advantages and Applications

5.1. Advantages

- **Cost-Effective**: Uses affordable, open-source components.
- **Real-Time Detection**: Provides immediate alerts to the driver.
- **Easy Integration**: Can be embedded into glasses for seamless use.
- **High Accuracy**: Minimizes false alarms compared to motion-based systems.

5.2. Applications

- **Vehicles**: Prevents accidents caused by drowsy driving.
- **Factories**: Monitors machine operators for fatigue.
- **Railways**: Ensures the alertness of train drivers.
- **Extended Systems**: Can be combined with alcohol detection for enhanced safety.

6. Future Scope

The system can be improved by:

1. Integrating a camera module for advanced image processing.
2. Adding GPS to log drowsiness incidents.
3. Developing a mobile app for real-time monitoring and alerts.

7. Conclusion

The proposed accident preventive glasses offer a practical and affordable solution to combat drowsy driving. By leveraging IR technology and open-source hardware, the system provides accurate and real-time drowsiness detection, significantly reducing the risk of road accidents. Future enhancements can further expand its applicability and functionality.

References

1. Royal Society for the Prevention of Accidents (RoSPA), "Road Accident Statistics," 2023.
2. Mercedes-Benz, "Attention Assist: Driver Drowsiness Detection," 2022.
3. Anti-Sleep Pilot, "Fatigue Detection System," 2021.
4. Drive Awake, "iPhone App for Drowsiness Detection," 2020.
5. Motion Sensor Alarms, "Head Movement-Based Alarms," 2019.
6. Arduino, "Arduino Nano Technical Specifications," 2023.
7. IEEE, "Infrared Sensor Applications in Safety Systems," 2022.