Driver Drowsiness Alert System

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Mid Term Project

Industrial Applications of Microcontrollers

Drowsiness while driving is one of the major causes of road accidents, particularly in truck, bus, and long-route drivers. Detecting driver drowsiness early can help avoid accidents and save lives. This project aims to design a simple, low-cost system that can detect signs of drowsiness by detecting eye closure duration, and provide a reactionary immediate alert through a buzzer and LED.

i) Problem statement

To design a microcontroller-based system that detects driver drowsiness using an IR sensor and provides real-time alerts (buzzer and LED) to prevent potential accidents.

ii) Scope of the Solution

This system is aimed at enhancing driver safety by monitoring eye closure duration. If the eyes remain closed for more than 2 seconds, the system activates visual (LED) and audio (buzzer) alerts.

- **Microcontroller-based**: Uses Arduino Uno.
- **Portable & Affordable**: Minimal, cost-effective hardware.
- **Expandable**: Can be integrated with vehicle electronics.
- **PCB Ready**: Designed for compact, deployable layout.

iii) Software & IDE:

Arduino IDE (for coding and uploading firmware)
TinkerCad (for simulation)
EasyEDA (for PCB design and Gerber file generation)

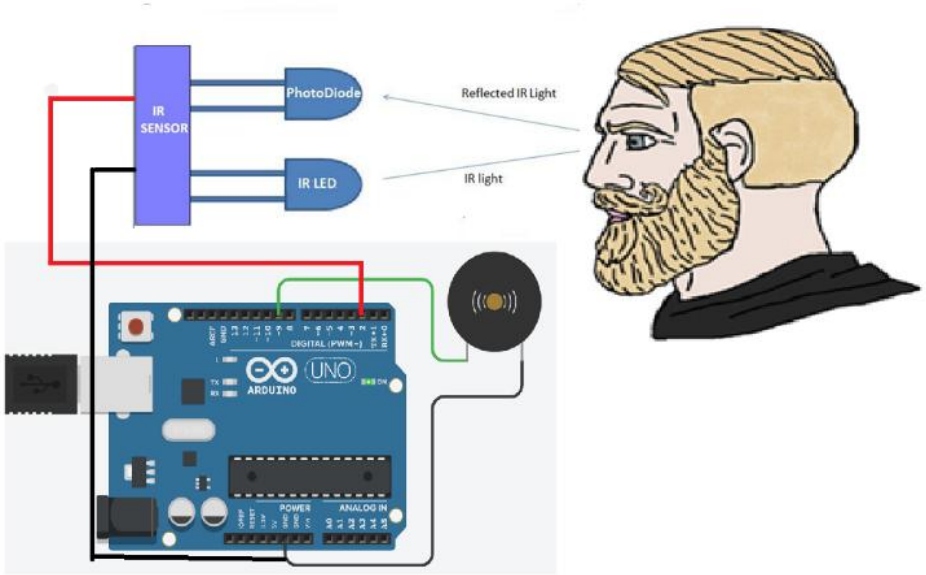
Hardware:

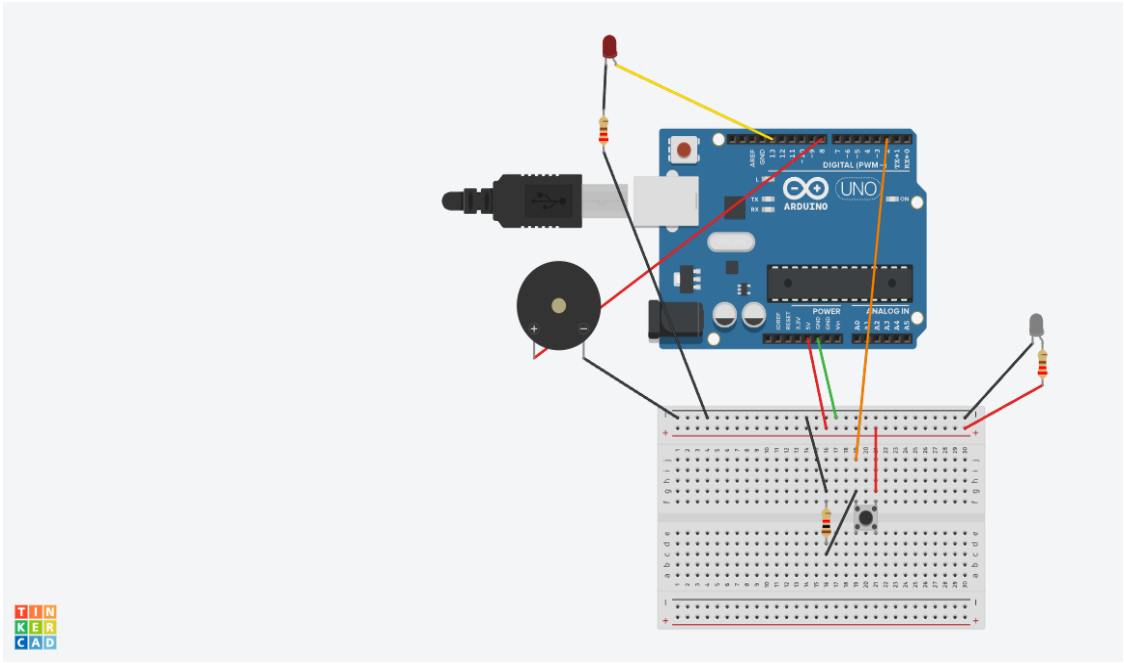
Component	Quantity
Arduino Uno	1
IR Sensor Module	1
LED	2 (1 IR)
Buzzer	1
Resistors (220Ω)	2–3
Breadboard / PCB	1
Jumper Wires	As needed

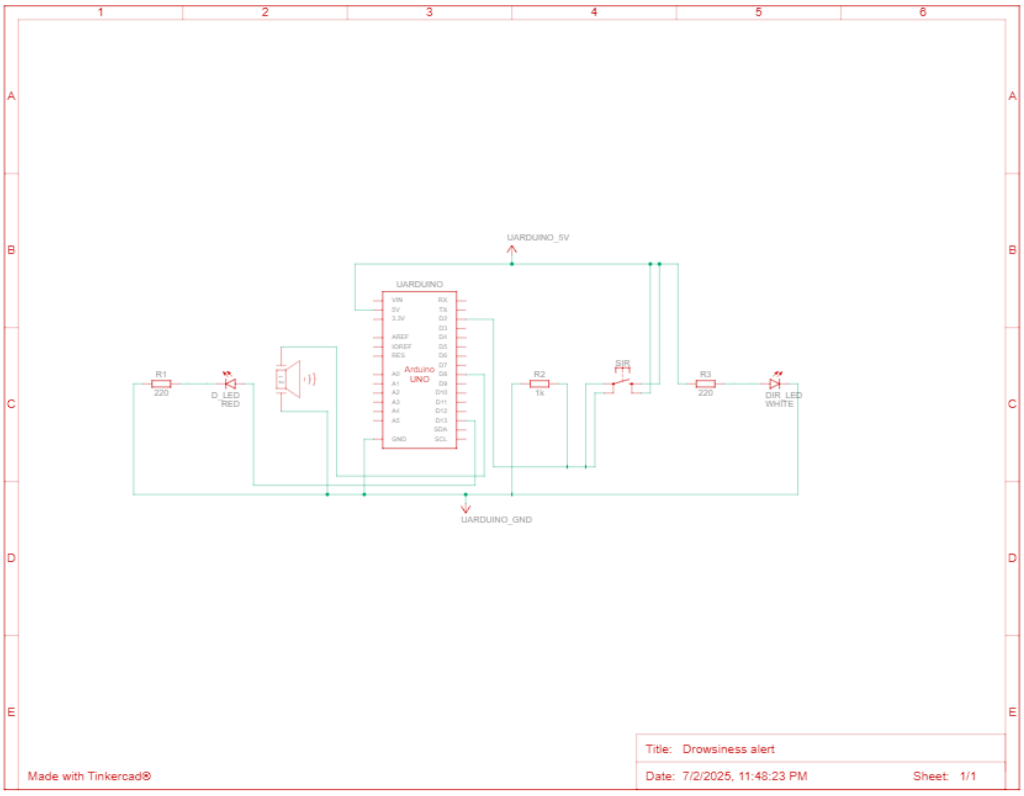
iv) Simulated Circuit

Simulated using **TinkerCad**.

- IR Sensor connected to **D2**
- LED to **D13**, Buzzer to **D8**
- Logic: If eye closed (IR sensor = LOW) for 2 sec → alert triggered



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A
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UARDUINO_5V
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v) Video of the Demo

Uploaded on Github.

vi) Gerber File

Files like .GTL, .GBL, .GKO, .GTS, .TXT, etc., have been successfully generated using EasyEDA, zipped and uploaded on Github.

vii) Code for the Solution

Below is the Arduino code for detecting eye closure and triggering alerts

```
const int IR = 2;
const int buzz = 8;
const int led = 13;
unsigned long eyeCloseStart = 0;
bool eyeClosed = false;
unsigned long threshold = 2000;

void setup() {
  pinMode(2, INPUT_PULLUP);
  Serial.begin(9600);
  pinMode(IR, INPUT_PULLUP);
  pinMode(buzz, OUTPUT);
  pinMode(led, OUTPUT);
  Serial.begin(9600);
}

void loop() {
  int sensorValue = digitalRead(IR);

  if (sensorValue == LOW) { // IR reflects = eye closed
    if (!eyeClosed) {
      eyeClosed = true;
      eyeCloseStart = millis();
    } else if (millis() - eyeCloseStart > threshold) {
      digitalWrite(buzz, HIGH);
      digitalWrite(led, HIGH);
    }
  } else { // eye open
    eyeClosed = false;
    digitalWrite(buzz, LOW);
    digitalWrite(led, LOW);
  }
  Serial.println(digitalRead(2));
  delay(200);
}
```