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Industrial Applications of Microcontrollers – A Practice Based Approach

Drowsiness Detection System

BATCH 8

Submitted by:

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Problem Statement

The primary aim of this project is to develop a simple Microcontroller based system that can detect the drowsiness of drivers and can alert the driver.

Vehicle accidents can result in severe injuries or fatalities. This project aims to enhance safety by detecting the state of the driver and alerts the driver if he is drowsy.

The requirement is to develop a system which monitors the eye blink of the driver and alerts the driver if no eye blink is detected, i.e. if the driver is drowsy and to develop a circuit using Arduino Uno and design a code using Arduino IDE.

Scope of Solution

The objectives of this project can be summarized as follows:

1. Designing and building a prototype for monitoring the state of the driver.
2. Employ sensors to detect drowsiness and to alert the driver
3. To develop a circuit using Arduino Uno and design a code using Arduino IDE.

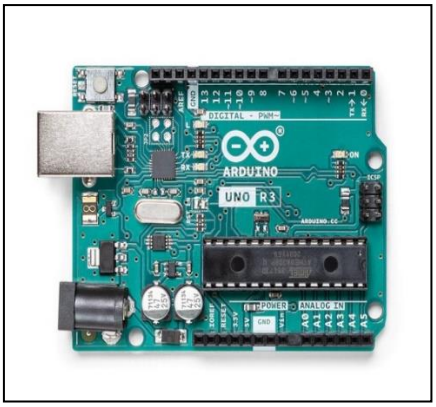
By achieving these objectives, we aim to create a system that can alert the driver if drowsiness is detected and hence can avoid accidents.

Components Description

S.no	Hardware Component
1	Arduino Uno R3
2	Buzzer
3	Eyeblink Sensor
4	Jumper wires
5	Bread Board
6	Power Supply (USB A – B cable)

S.no	Software Components
1	Arduino IDE
2	Embedded C

1. Arduino Uno R3



Hardware pictures of Arduino Uno R3

The Arduino Uno R3 board serves as the central processing unit of the system. It is a microcontroller that is responsible for collecting data from various sensors, processing the data, and executing programmed logic. It is relatively inexpensive, and it has cross-platform compatibility which means a wide range of users can make use of it either in Windows, Linux and macOS. In this project it is used as the main controlling device which on detecting drowsiness triggers the buzzer.

2. Buzzer

Hardware pictures of Buzzer

A buzzer is an audio signalling device that can be mechanical, electromechanical, or piezoelectric. It produces sound when powered by an electrical signal, commonly used in alarms, timers, and confirmation of user inputs like mouse clicks or keystrokes. Here Buzzer is used to alert the driver when drowsiness is detected.

3. Eyeblink Sensor

Hardware pictures of Eyeblink Sensor

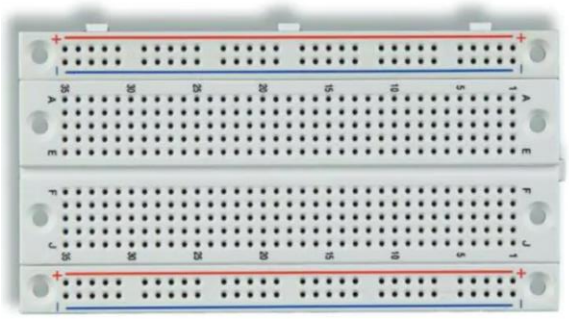
The eye–blink sensor works by illuminating the eye and eyelid area with infrared light, then monitoring the changes in the reflected light using a phototransistor and differentiator circuit. The Variation Across the eye will vary as per eye blink. If the eye is open the output is high otherwise the output is low.

4. Jumper Wire

Hardware pictures of Jumper wire

Jumper wires are electrical wires with connector pins at each end, used to connect two points in a circuit without soldering. They are commonly used with breadboards and other prototyping tools to facilitate easy circuit modifications. They are used to connect the sensors to the Arduino board

5. Breadboard



Hardware pictures of bread board

A breadboard, also known as a solderless breadboard or protoboard, is a construction base used to build and test electronic circuits. It allows components to be inserted and connected without soldering, making it reusable and ideal for prototyping.

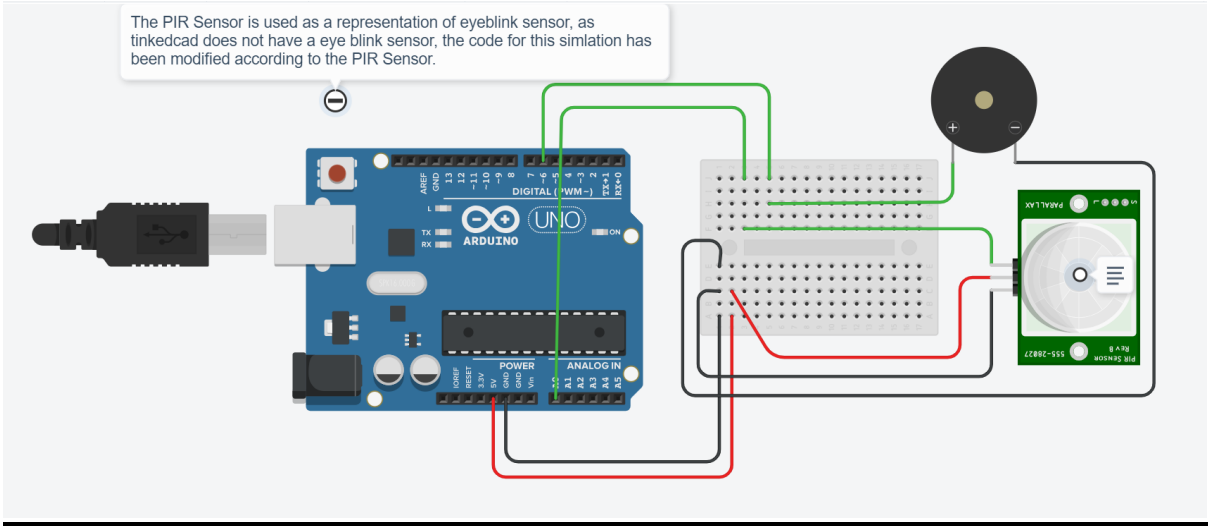
6. Power Supply (USB A-B cable)

Hardware pictures of USB A – B cable

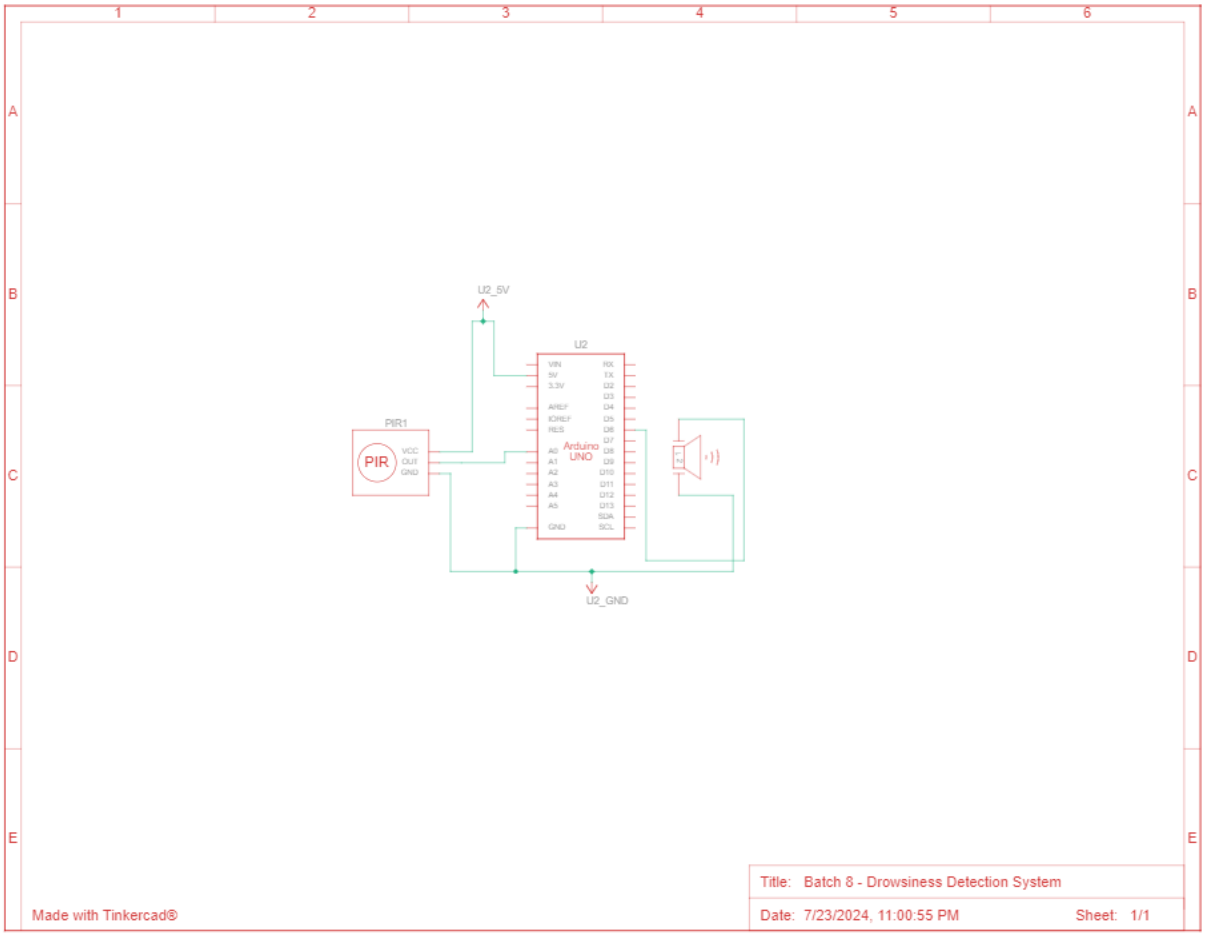
The USB A – B cable is used to provide serial communication between the Arduino uno board, with the help of this cable the embedded C code is uploaded to the Arduino uno board from the Arduino IDE software. It is also used as a power supply to power the Arduino uno microcontroller.

Simulated Circuit / Circuit Diagram

Circuit Diagram:



Schematic View:



Circuit Connections:

1. Eyeblink sensor:

   i) 5V – 5V power supply pin of Arduino
   ii) G – GND pin of Arduino
   iii) OP – Analog Pin A0 of Arduino

2. Buzzer:

   i) Positive (+) – resistor and then to Digital Pin 6 of Arduino
   ii) Negative (-) – GND pin of Arduino

Video Of Demo

The video of the demo for this project has been shared in the google drive link given below:

GOOGLE DRIVE LINK:

https://drive.google.com/file/d/1DxUfsF1GJZiglPgoiq4iI84G8WDgVYTr/view?usp=sharing

Gerber File

A Gerber file is not applicable in this project.

Code for the Solution

```
int sensorState = 0;  // Defining the Eyeblink sensor state to low
# define eyeBlink A0  // Defining the pin connected to the eyeblink sensor
const int buzzer = 6; // Defining the pin connected to the buzzer

void setup()
{
  pinMode(eyeBlink, INPUT); // Defining the eyeblink sensor pin as input
  pinMode(buzzer, OUTPUT); // Defining the buzzer pin as output
  Serial.begin(9600); // Initiating serial communication with the serial monitor
 }

void loop()
{
  sensorState = analogRead(eyeBlink); // Checks the eyeblink sensor output
  noTone(buzzer); // Buzzer does not rings
  delay(1000); // Delay a little bit to improve simulation performance
  Serial.println(sensorState); // print the value
  if (sensorState<400){
    delay(1000); // wait 1 second to see if the person is drowsy
    tone(buzzer, 500); // Buzzer rings to wake the person
    delay(3000); // Buzzerrings for 3 seconds
  }
}
```

References

Tinkercad Simulation link:

https://www.tinkercad.com/things/ieBzzACJ8Eq-batch-8-drowsiness-detection-system-?sharecode=oz8_C_9Gs-zuViO9fof9e5uhVWBQAo-7i0hdtuo9Dfs

Google drive link (video of simulation and project presentation):

https://drive.google.com/file/d/1DxUfsF1GJZiglPgoiq4iI84G8WDgVYTr/view?usp=sharing