

EYE BLINK SENSOR

Submitted in partial fulfilment of the requirements for the award of
bachelor of Technology degree in Biotechnology

by

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(DEEMED TO BE UNIVERSITY)

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the BONAFIDE work of **NOEL RICHARD PRAKASH. L (39230030), SIVASHANKARAN. V (39230044), M. VALLABA (39230055), V. VINOTH KUMAAR (39230057)** who carried out the project entitled “**Eye blink sensor**” under our supervision from 1st April 2022 to 29th April 2022.

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DECLARATION

We, NOEL RICHARD PRAKASH. L (39230030), SIVASHANKARAN. V (39230044), M. VALLABA (39230055) and V. VINOTH KUMAR (39230057), hereby declare that the project entitled **“Eye blink sensor”** is a project work carried out by us under the guidance of **DR. L. INBATHAMIZH** (Internal) Department of Biotechnology and **DR. ALBERT** (External) Department of Computer Science Engineering, Sathyabama Institute of Science and Technology. This dissertation submitted to **SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY** in the partial fulfilment of the requirements for the award of **BACHELOR OF TECHNOLOGY DEGREE IN BIOTECHNOLOGY.**

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ABSTRACT

Accidents due to drowsiness can be controlled and prevented with the help of eye blink sensor using IR rays. It consists of IR transmitter and an IR receiver. The transmitter transmits IR rays into the eye. If the eye is shut, then the output is high. This project involves measure and controls the eye blink using IR sensor otherwise the IR receiver output is low. The outcome is that the buzzer attached to eye blink sensor's frame make sound if the driver falls asleep. The eye blink sensor also used for paralysis patient, railway engine drivers.

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INTRODUCTION

1. INTRODUCTION

For any vehicle accidents driver's faults are the most accountable aspects to cause dangerous problem to the society. Many drivers cannot control the vehicles due to different reasons it may cause severe accidents and sometimes death.

For vehicle accidents various factors involved such as drunk driving, over speeding, many distractions like texting while driving, talking with others, playing with children etc.

One of the important factor is sleeping on the wheel. People know the dangerous of alcohol consumption and run the vehicles but they not understand the seriousness of fatigue driving. In India, Ministry of Road Transport and Highway released a report in 2015, every day around 1,374 accidents may happen and almost 400 people deaths occur.

Every hour because of vehicle accidents approximately 57 road accidents and 17 people died. In that 54.1 % people are in the age group of 15 to 34 years are killed in vehicle accident. The Government of India, Ministry of Road Transport and Highway Government of India prepare a strategy to diminish the amount of motorway accidents and losses by 50 % by 2020.

Globally vehicle accidents have seemed one of the major community health problems. In India almost 5 lakh road accidents happened in the year 2015. A fatigue Driver those who falls asleep at the move fails to control the vehicle, not possible to take immediate action and result in a crash so it is necessary to monitor the drowsiness of the driver to prevent accidents.

The eye blink sensor illuminates the eye with infrared light and monitors the changes in the reflected light. The infrared light reflected from the eye is used to determine the results. The sensor output is active high for eye close and can be given directly to microcontroller for interfacing application.

The eye blink sensor constantly sends infrared waves which are reflected and detected by the receiver. As soon as the eye blinks the output of the sensor goes high. This output is sent to the Arduino board.

The Arduino sends the signal to the buzzer to make the noise.

1.1 Various technologies can be used to try to detect driver drowsiness are

- 1. Steering pattern monitoring**
- 2. Vehicle position in lane monitoring**
- 3. Driver eye/face monitoring**
- 4. Physiological measurements**

This sensor module consists of the eye blink sensor frame, the IR sensor and a relay. The buzzer is connected to the eye blink sensor frame which is to be worn by the driver. This buzzer produces sound whenever the driver falls asleep.

The frame consists of the IR transmitter which transmits the IR rays towards the driver's eyes and an IR receiver which receives the reflected rays when the eyes are closed.

Thus driver is continuously monitored and check they are not drowsy, such act can avoid a lot of accidents.

Not only drivers benefit from this but also paralysis patient can gain benefit out of it. With little modifications paralysis patient who has

loss of ability to move some or all of their body can use this device as a tool to communicate with their closed ones, Doctors or caretakers.

MATERIALS USED

2. MATERIALS USED

The materials used in the project are detailed hereunder.

2.1 BUZZER

An audio signalling 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.



Fig1.1 Buzzer 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.

2.1.1 Specifications

The specifications of the buzzer include the following.

- Colour is black
- The frequency range is 3,300Hz
- Operating Temperature ranges from – 20° C to +60°C
- Operating voltage ranges from 3V to 24V DC
- The sound pressure level is 85dBA or 10cm
- The supply current is below 15Ma

2.1.2 Types of Buzzer

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

- Piezoelectric
- Electromagnetic

- Mechanical
- Electromechanical
- Magnetic

Piezoelectric

As the name suggests, the piezoelectric type uses the piezoelectric ceramic's piezoelectric effect & pulse current to make the metal plate vibrate & generate sound. This kind of buzzer is made with a resonance box, multi resonator, piezoelectric plate, housing, impedance matcher, etc. Some of the buzzers are also designed with LEDs.

The multi resonator of this mainly includes ICs and transistors. Once the supply is given to this resonator, it will oscillate and generates an audio signal with 1.5 to 2 kHz

Electromagnetic

This type of buzzer is made with a magnet, solenoid coil, oscillator, housing, vibration diaphragm, and magnet. Once the power supply is given, the oscillator which produces the audio signal current will supply throughout the solenoid coil to generate a magnetic field. Sometimes, the vibration diaphragm will vibrate & generates sound under the magnet & solenoid coil interaction. The frequency range of this ranges from 2 kHz to 4kHz.

Mechanical

These types of buzzers are subtypes of electromagnetic, so the components used in this type are also similar. But the main difference is that the vibrating buzzer is placed on the outside instead of the inside.

Electromechanical

The designing of these types of buzzers can be done with a bare metal disc & an electromagnet. The working principle of this is similar to magnetic and electromagnetic. It generates sound throughout the disc movement & magnetism.

Magnetic

Like a piezo type, magnetic is also used to generate a sound but they are different due to core functionality. The magnetic type is more fixed as compared to the piezo type because they work through a magnetic field. Magnetic buzzers utilize an electric charge instead of depending on piezo materials to generate a magnetic field, after that it permits another element of the buzzer to vibrate and generate sound. The applications of magnetic buzzers are similar to the piezo type in household devices, alarms such as watches, clocks & keyboards.

2.1.3 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.

2.1.4 Mounting Configurations

The mounting configurations of buzzers include the following.

- Panel Mount
- Wire Leads
- Screw Terminals
- Through Hole
- Spring Contact
- Surface Mount

2.1.5 Buzzer Circuit Diagram

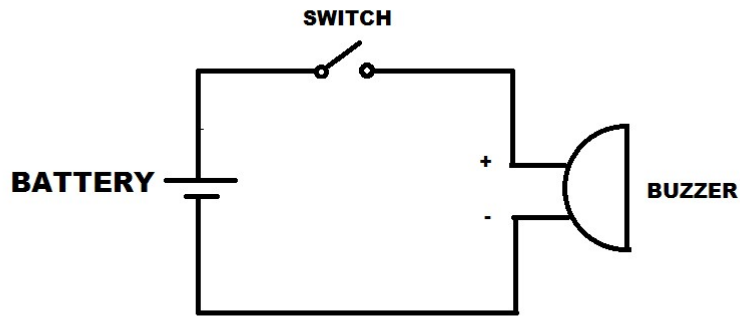


Fig 1.2 Simple buzzer circuit diagram

2.1.6 How to Choose a Buzzer?

While choosing a buzzer or speaker, many principles need to consider like the following.

- Size of the product
- Consumption of Current
- Type of terminal
- Frequency Voltage
- Volume
- Type
- AC/DC Voltage
- The tone is Continuous/Pulsed
- Fixing – Pins, Leads/Surface Mount
- Output of Sound
- Feedback Option
- Piezo Elements

2.1.7 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

2.1.8 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.

2.1.9 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
- Game Shows

2.2 ARDUINO NANO

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove.

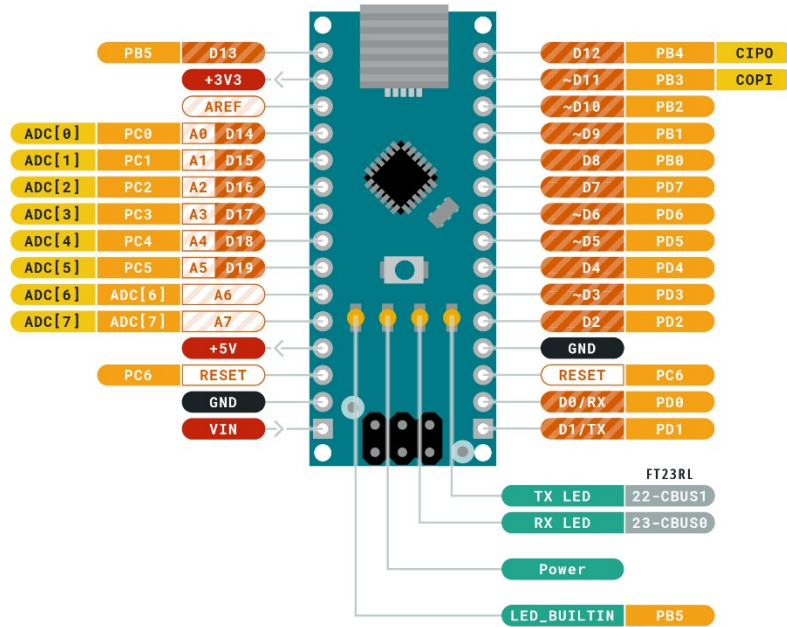
2.2.1 Tech specs

MICROCONTROLLER	ATmega328
ARCHITECTURE	AVR
OPERATING VOLTAGE	5 V
FLASH MEMORY	32 KB of which 2 KB used by bootloader
SRAM	2 KB
CLOCK SPEED	16 MHz
ANALOG IN PINS	8

EEPROM	1 KB
DC CURRENT PER I/O PINS	40 mA (I/O Pins)
INPUT VOLTAGE	7-12V
DIGITAL I/O PINS	22 (6 of which are PWM)
PWM OUTPUT	6
POWER CONSUMPTION	19 mA
PCB SIZE	18 x 45 mm
WEIGHT	7 g
PRODUCT CODE	A000005

Table 1.1

2.2.2 Pinout Diagram



	Ground		Internal Pin		Digital Pin		Microcontroller's Port
	Power		SWD Pin		Analog Pin		
	LED		Other Pin		Default		



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Fig 2.1

2.2.3 Power

The Arduino Nano can be powered via the Mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulated external power

supply (pin 27). The power source is automatically selected to the highest voltage source.

2.2.4 Memory

The ATmega328 has 32 KB, (also with 2 KB used for the bootloader. The ATmega328 has 2 KB of SRAM and 1 KB of EEPROM.

2.2.5 Input and Output

Each of the 14 digital pins on the Nano can be used as an input or output, using `pinMode()`, `digitalWrite()`, and `digitalRead()` functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

- **Serial:** 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the FTDI USB-to-TTL Serial chip.
- **External Interrupts:** 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the `attachInterrupt()` function for details.
- **PWM:** 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the `analogWrite()` function.

- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language.
- LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The Nano has 8 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though it is possible to change the upper end of their range using the `analogReference()` function. Analog pins 6 and 7 cannot be used as digital pins. Additionally, some pins have specialized functionality:

- I2C: A4 (SDA) and A5 (SCL). Support I2C (TWI) communication using the Wire library (documentation on the Wiring website).

There are a couple of other pins on the board:

- AREF. Reference voltage for the analog inputs. Used with `analogReference()`.
- Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

2.2.6 Communication

The Arduino Nano has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provide

UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An FTDI FT232RL on the board channels this serial communication over USB and the FTDI drivers (included with the Arduino software) provide a virtual com port to software on the computer.

The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the FTDI chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

A Software Serial library allows for serial communication on any of the Nano's digital pins. The ATmega328 also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus. To use the SPI communication, please see ATmega328 datasheet.

2.2.7 Programming

The Arduino Nano can be programmed with the Arduino software (download). Select "Arduino Duemilanove or Nano w/ ATmega328" from the Tools > Board menu (according to the microcontroller on your board). The ATmega328 on the Arduino Nano comes preburned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer.

It communicates using the original STK500 protocol. You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header using Arduino ISP or similar.

2.2.8 Automatic (Software) Reset

Rather than requiring a physical press of the reset button before an upload, the Arduino Nano is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the FT232RL is connected to the reset line of the ATmega328 via a 100 nanofarad capacitor.

When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the bootloader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

This setup has other implications. When the Nano is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half-second or so, the bootloader is running on the Nano. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened.

If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending this data.

2.3 MICROCONTROLLER

The **ATmega328** is a single-chip microcontroller created by Atmel in the megaAVR family. It has modified Harvard architecture 8-bit RISC processor core.

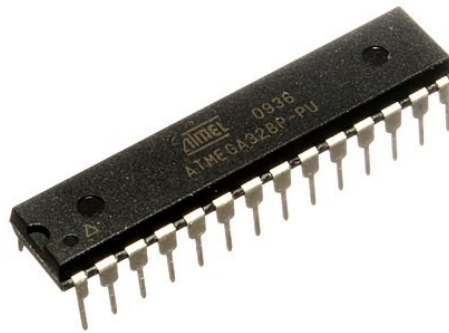


Fig 3.1 ATmega328P in 28-pin narrow dual in-line package (DIP-28N)



Fig 3.2 ATmega328P in 32-pin thin quad flat pack (TQFP-32)

2.3.1 Specifications

The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general-purpose I/O lines, 32 general-purpose working registers, 3 flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter, programmable watchdog timer with internal oscillator and 5 software-selectable power-saving modes. The device operates between 1.8 and 5.5 volts. The device achieves throughput approaching

1 MIPS/MHz

2.3.2 Applications

ATmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed. Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno, Arduino Pro Mini and Arduino Nano models.

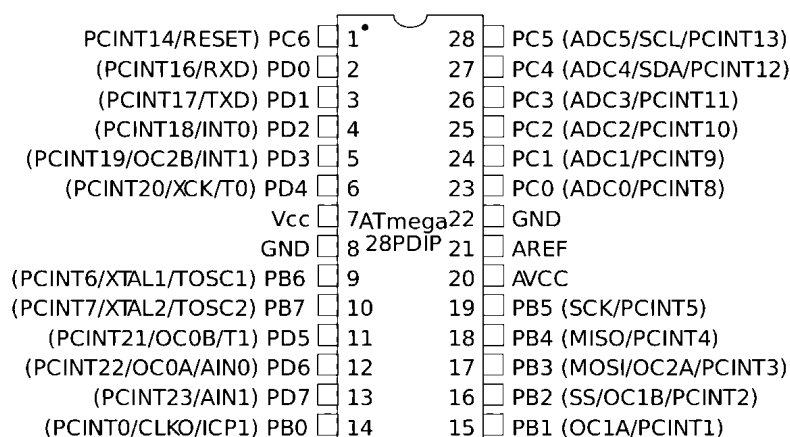


Fig 3.3 ATmega 48A/PA/88A

2.3.3 Programming

(i) series program model

Symbo l	Pins	I/O	Description
MOSI	PB3	I	Serial data in
MISO	PB4	O	Serial Data out
SCK	PB5	I	Serial Clock

Table 2.1

(ii) parallel program model

Programming signal	Pin Name	I/O	Function
RDY/BSY	PD1	O	High means the MCU is ready for a new command, otherwise busy.
OE	PD2	I	Output enable (active low)
WR	PD3	I	Write pulse (active low)
BS1	PD4	I	Byte select 1 ("0" = Low byte, "1" = High byte)
XA0	PD5	I	XTAL action bit 0
XA1	PD6	I	XTAL action bit 1
PAGEL	PD7	I	Program memory and EEPROM data page load
BS2	PC2	I	Byte select 2 ("0" = low byte, "1" = 2nd high byte)

Table 2.2

2.3.4 Features

Parameter	Value
CPU type	8-bit AVR

Maximum CPU speed	20 MHz
Performance	20 MIPS at 20 MHz ^[2]
Flash memory	32 KB
SRAM	2 KB
EEPROM	1 KB
Package pin count	28 or 32
Capacitive touch sensing channels	16
Maximum I/O pins	23
External interrupts	2
USB interface	No

Table 2.3

2.4 EYEBLINK SENSOR



Fig 4.1 Eye blink sensor attached to test goggles

The eye blink sensor is an infrared sensor. It contains two parts a transmitter and a receiver. The transmitter continuously emits infrared waves onto the eye. While the receiver continuously looks for variations in the reflected waves which indicates that the eye has blinked.

If the eye is closed that means it will give high output. If the eye is open then it will give a low output.

This sensor can be used in a very different variety of robotics and mechantronics projects as it provides excellent results and is very economical.

2.5 HW BATTERY



Fig 5.1

Voltage	9W
Brand	Hi-Watt
Battery Type	Lithium-Ion
Usage/Application	DJ Products
Capacity	600 mAh
Size	6F22 006P
Colour	White, Blue
Power Source	DC
Feature	High Quality long durability
Discharge Resistance	620 Ohm
Minimum Order Quantity	10

Table 3.1

2.6 TOGGLE SWITCH

Toggle switches are mechanical devices that make or break electrical connections in a circuit by the closing or opening electrical contacts when the protruding actuator is manually moved from one position to another. Toggle switches are defined by their number of poles and throws.



Fig 6.1 Toggle switch

2.6.1 Working

In a toggle switch you have a lever that you turn to one side or to the other to make the current flow to one side or to other or to not flow at all.

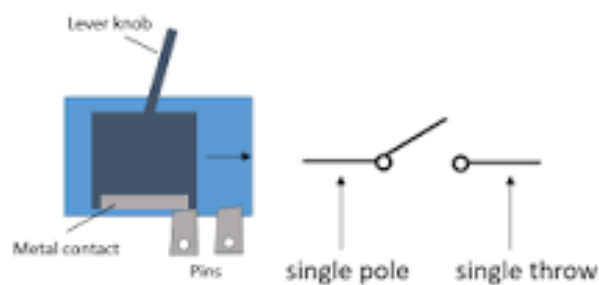


Fig 6.2 Single pole single throw toggle switch

METHOD

3. METHOD

Steps involved in construction of the device are

Step – 1:

Firstly, stick the Arduino Nano onto the glasses with the help of the glue gun.



Fig 7.1

Step – 2:

Stick the buzzer onto the glasses.



Fig 7.2

Step – 3:

Connect the VCC to the Arduino Nano 5V pin.

Step – 4:

Connect the GND pin to the GND pin connector on Arduino.

Step – 5:

Connect the signal pin of the buzzer to the Arduino digital pin 2.

Step – 6:

Stick the 9V Battery to the other side of the glasses.



Fig 7.3

Step – 7:

Connect the negative terminal of the battery to the GND pin on Arduino.

Step – 8:

Connect the positive terminal of the battery to the VCC pin on Arduino.

Step – 9:

Add a toggled switch between the power supply and Arduino.

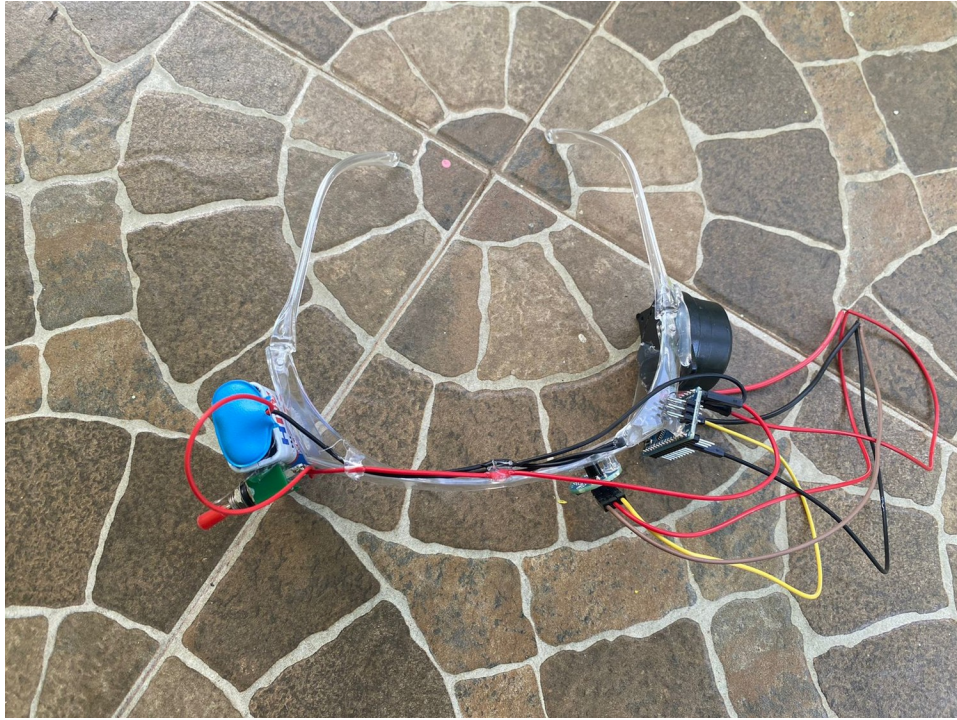


Fig 7.4



Fig 7.5

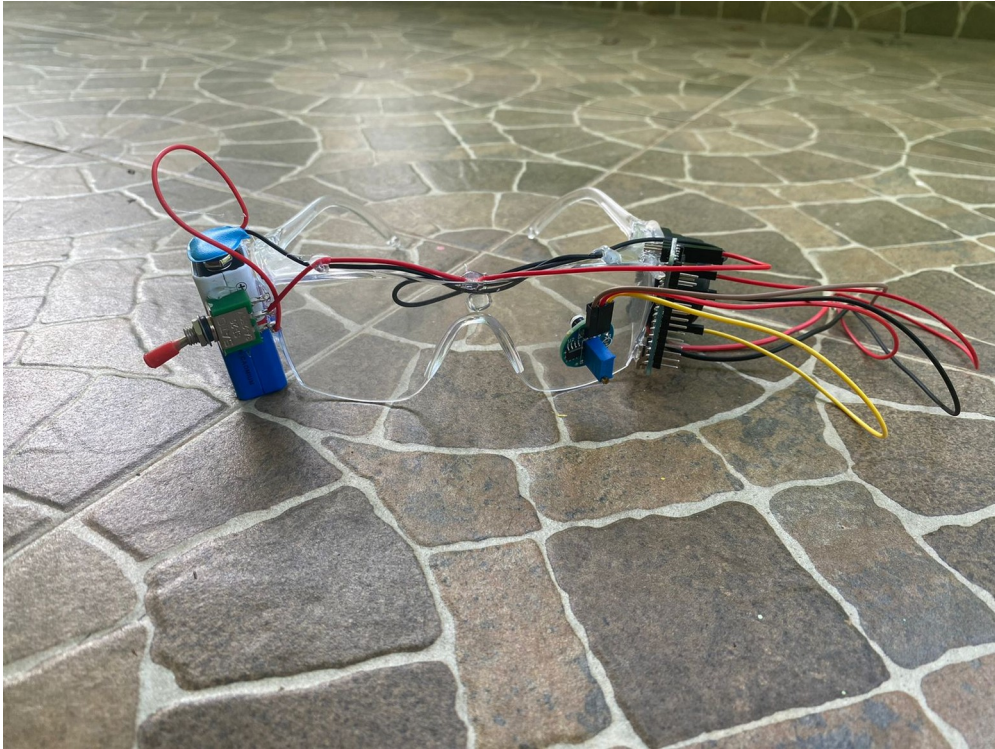


Fig 7.6

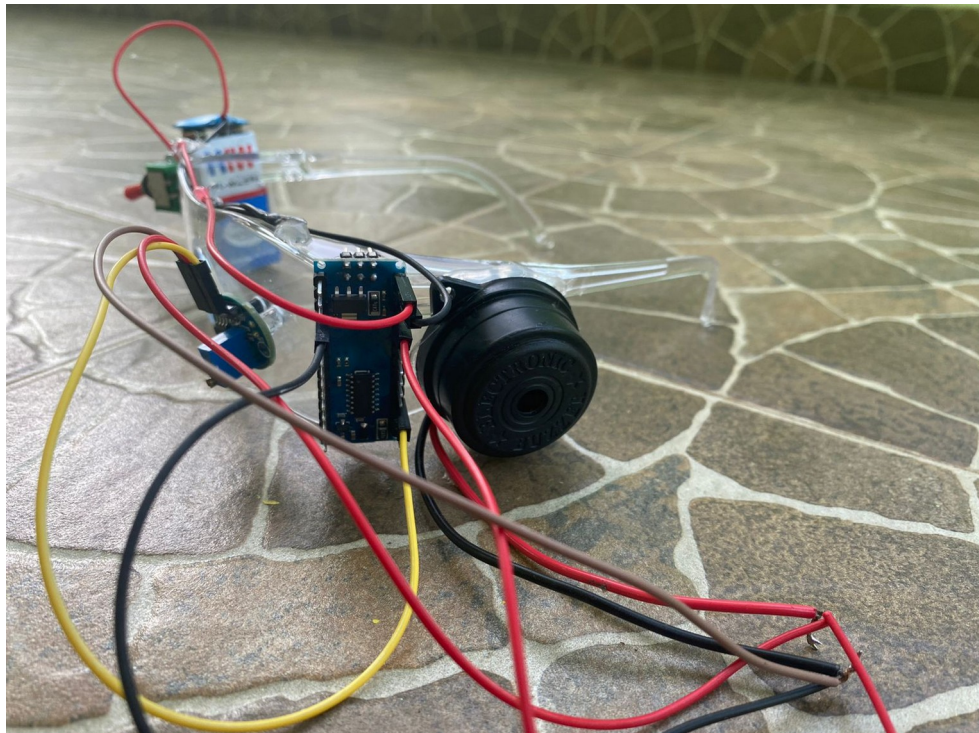


Fig 7.7

CIRCUIT DIAGRAM

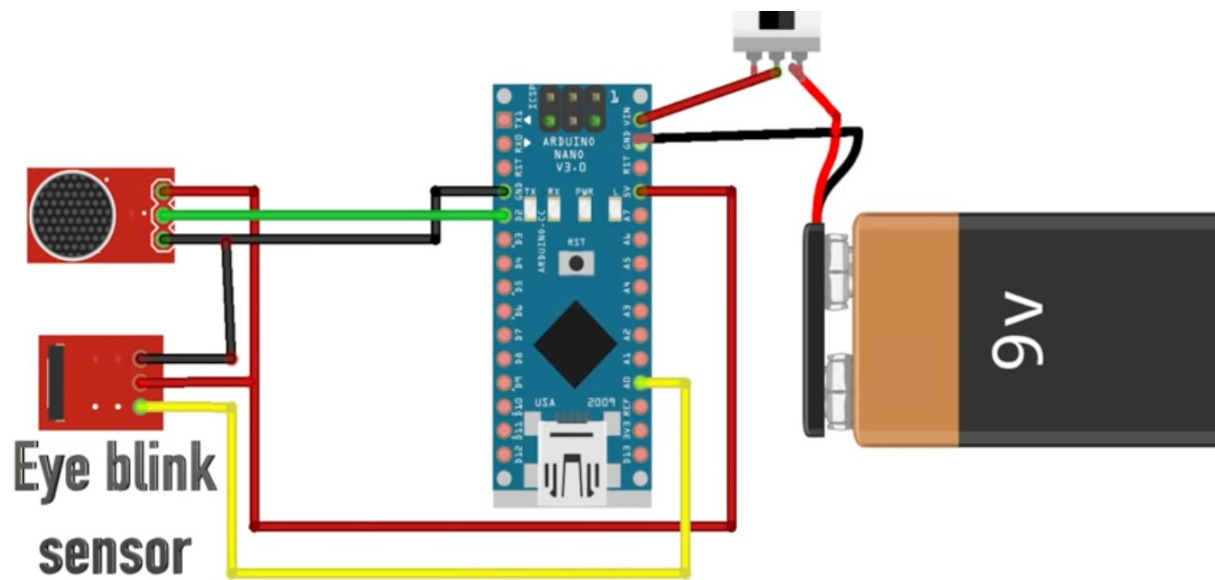


Fig 8.1

WORKING

&

APPLICATIONS

4.1 Working principle

The eye blinking system can be used for different purposes. First, let's look at the blink sensing system.

The eye blink sensor constantly sends infrared waves which are reflected and detected by the receiver. As soon as the eye blinks, the output of the sensor goes high. This output is sent to the Arduino board.

Another purpose for which this system can be used is called the driver drowsiness system. This system can be used to check if the driver might sleep during driving. This can be done with some minor changes in the Arduino code.

Instead of detecting blinks the Arduino should give the command to buzz when the eyes of the driver are closed for more than 2-3 seconds depending upon your preference.

This system can be used with all modes of transports be it trains, ships, planes, cars, etc. This can be very useful to avoid accidents.

Another purpose of this system it can be used in hospitals to check when patients gain consciousness.

A patient when unconscious, has the eyes closed. So whenever they open their eyes the buzzing sound can inform the nurse that the patients is awake. This can also be done with the help of some minor tweaks in the Arduino code.

The output of the sensor has to be constantly high in this case as the patients is unconscious. When the output goes low i.e, when the eyes of the patient open, that is when the Arduino should command the buzzer to ring.

This works best for patients who are in a coma. The nurses can be easily informed with the help of this system.

4.2 APPLICATIONS

It can be used to count the blinking of a person. It can be used to keep a check on the driver and make sure the driver is not drowsy, this can help avoid a lot of accidents.

It can be used for paralysis patient. Paralysis is the loss of the ability to move some or all of your body.

CODING

5.1 CODE 1

eye_Blink_1.ino

```
#define SENSE A0

void setup()
{
  pinMode(SENSE, INPUT);
  pinMode(2, OUTPUT);

  pinMode(LED_BUILTIN, OUTPUT);
}

void loop()
{
  if(digitalRead(SENSE))
  {
    digitalWrite(LED_BUILTIN, LOW);
    pinMode(2, LOW);
  }
  else
  {
    digitalWrite(LED_BUILTIN, HIGH);
    pinMode(2, HIGH);
  }
}
```

5.2 CODE 2

eye_Blink_2.ino

```
#define SENSE A0

void setup()
{
  pinMode(SENSE, INPUT);
  pinMode(2, OUTPUT);

  pinMode(LED_BUILTIN, OUTPUT);
}

void loop()
{
  if(digitalRead(SENSE))
  {
    digitalWrite(LED_BUILTIN, LOW);
    pinMode(2, LOW);
  }
  else
  {
    delay (2000);
    if(digitalRead(SENSE))
    {
      digitalWrite(LED_BUILTIN, LOW);
      pinMode(2, LOW);
    }
    else
    digitalWrite(LED_BUILTIN, HIGH);
    pinMode(2, HIGH);
  }
}
```

RESULT

&

DISCUSSION

6. RESULT AND DISCUSSION

The outcome of this project is the transmitter transmits IR rays into the eye. If the eye is shut, then the output is high otherwise the output is low. The outcome is that the buzzer attached to eye blink sensors frame make sound if the driver falls asleep and also for paralysis patient.

SUMMARY

7. SUMMARY

Globally vehicle accidents have seemed one of the major community health problems. So the eye blink sensor is one of the step to prevent these problems. The eye blink sensor illuminates the eye with infrared light and monitors the changes in the reflected light. The infrared light reflected from the eye is used to determine the results. The sensor output is active high for eye close and can be given directly to microcontroller for interfacing application.

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3) <https://docs.arduino.cc/hardware/nano>