INTERNET OF THINGS (IOT) HARDWARE

PROJECT PRESENTATION

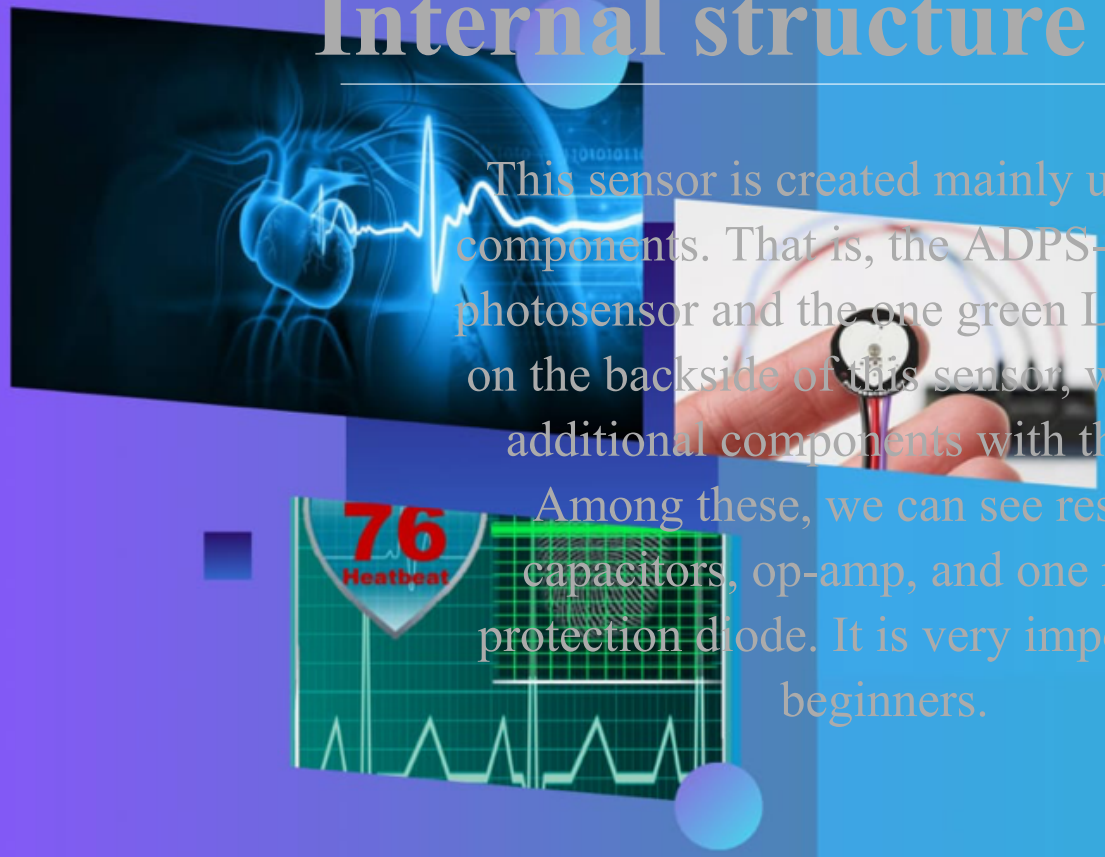
PROJECT

HEART RATE SENSOR

INTRODUCTION

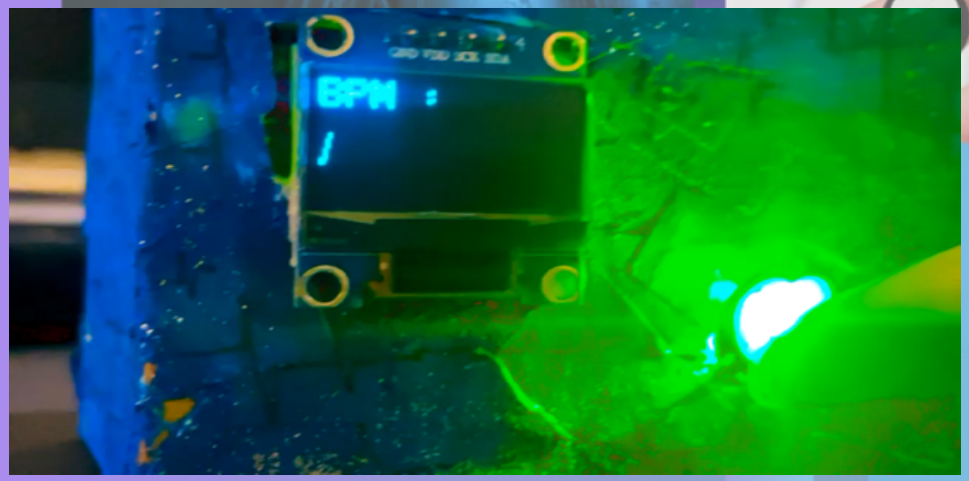
An optical heart rate sensor measures pulse waves, which are changes in the volume of a blood vessel that occur when the heart pumps blood. Pulse waves are detected by measuring the change in volume using an optical sensor and green LED. Adopting an optical filter optimized for pulse wave detection in the sensor block minimizes the effects of ambient light such as red and infrared rays. This enables high quality pulse signals to be acquired, even outdoors. In addition, leveraging optical sensor technology cultivated over many years allowed ROHM to significantly increase the sensitivity of the sensor block. Support for low brightness low VF LEDs makes it possible to achieve a low power optical heart rate monitoring system without the need for external circuitry (i.e. boost circuit). This contributes to longer operating times in wearables with limited battery capacity.

Internal structure of sensor



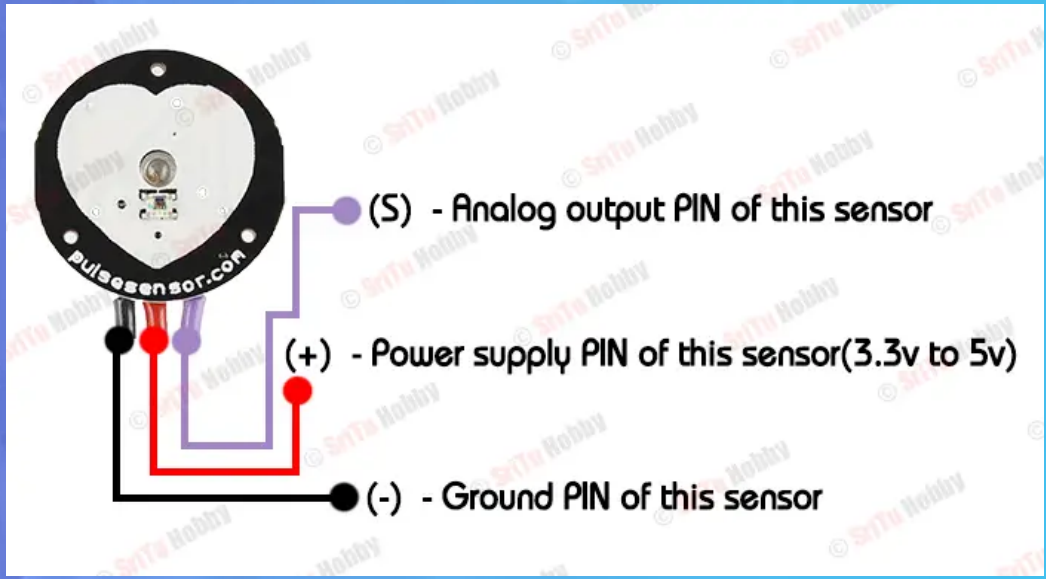
This sensor is created mainly using two components. That is, the ADPS-9008 light photosensor and the one green LED. Next, on the backside of this sensor, we can see additional components with the LED. Among these, we can see resistors, capacitors, op-amp, and one reverse protection diode. It is very important for beginners.

How heart rate sensor works?



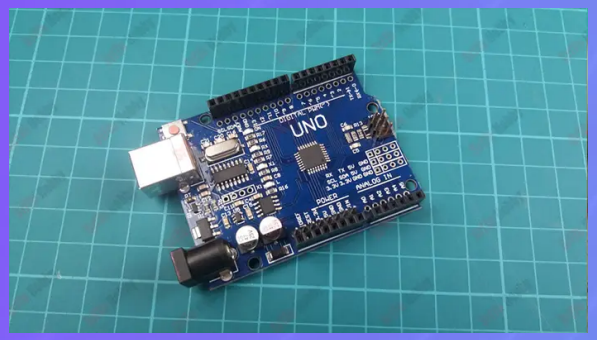
When your finger is close to the sensor, the green light on the sensor falls on your fingertip, and the light is reflected also towards the sensor. Then, this green light is absorbed into the hemoglobin of the blood. Also, as the amount of blood in our body is constantly pumping, the amount of hemoglobin in the blood also increases or decreases. Therefore, the amount of reflected light also increases or decreases. This difference is captured by the photosensor. (This is known as optical heart rate sensory theory) Finally, we can get this signal as an analog value.

The PIN diagram of this sensor

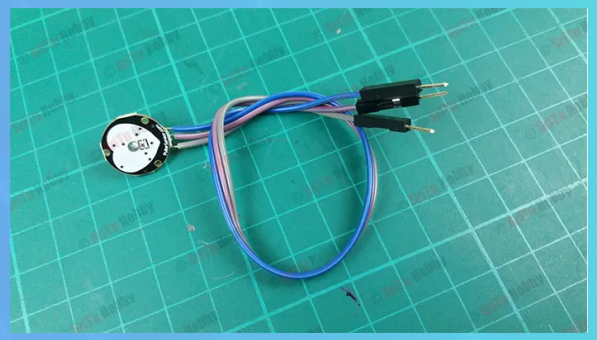


Components used

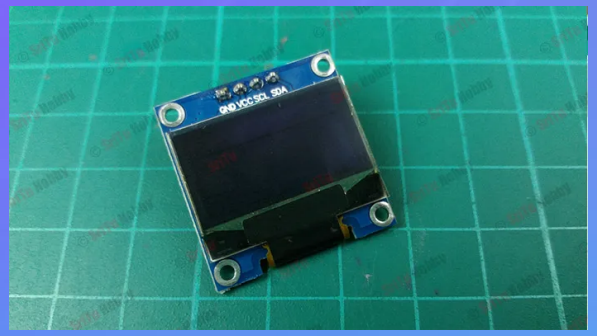
Arduino uno



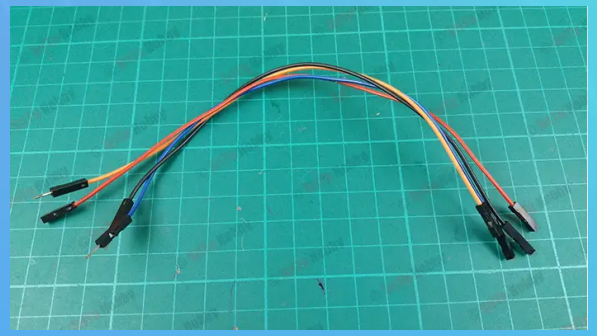
Heart rate senor



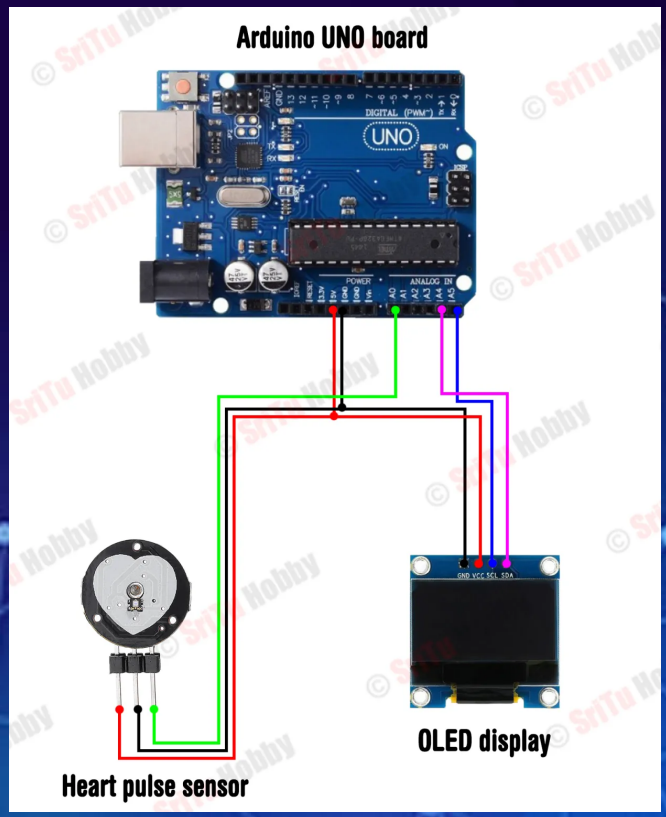
OLED



Jumper wires



Circuit diagram



Code explanation

Library files are included

```
#include <SPI.h>
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>
```

Create an object for oled

```
Adafruit_SSD1306 srituhobby = Adafruit_SSD1306(128, 64, &Wire);
```

The sensor pin and the high pulse values are defined. After variables are created to help the program.

```
#define sensor A0
#define Highpulse 540
int sX = 0;
int sY = 60;
int x = 0;
int Svalue;
int value;
long Stime = 0;
long Ltime = 0;
int count = 0;
int Bpm = 0;
```

In the setup function,

```
void setup()
{
//The serial monitor is begun
Serial.begin(9600);
//The OLED display is begun
srituhobby.begin(SSD1306_SWITCHCAPVCC,
0x3C);
// Address 0x3C for 128x32
delay(1000);
//All characters are cleared in the screen
srituhobby.clearDisplay();
}
```

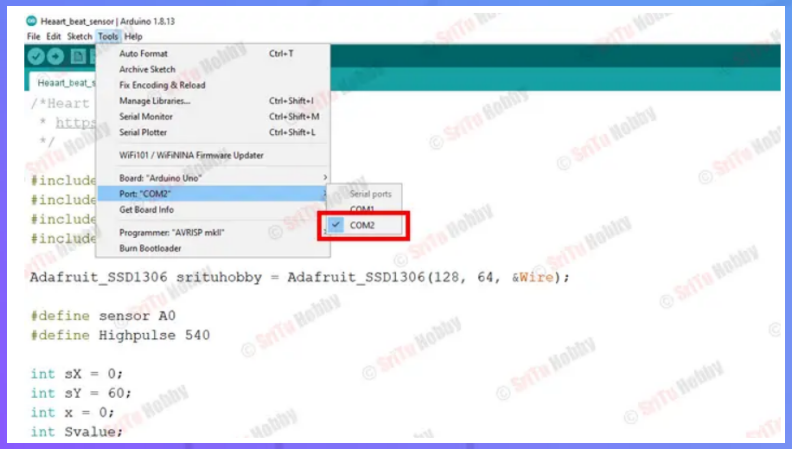
Heart rate calculate function,

```
void BPM()
{
if (Svalue > Highpulse)
{
Stime = millis() - Ltime; count++;
if (Stime / 1000 >= 10)
{
Ltime = millis();
Serial.println(count);
srituhobby.setCursor(60, 0);
srituhobby.setTextSize(2);
srituhobby.setTextColor(SSD1306_WHI
srituhobby.print(count);
srituhobby.print(" ");
srituhobby.display();
count = 0;
}
}
}
```

In the loop function,

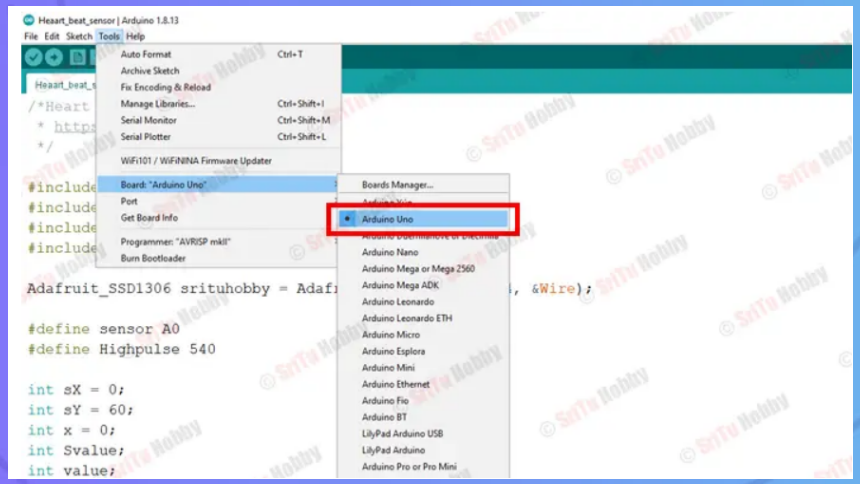
```
void loop()
{ //Gets sensor values
Svalue = analogRead(sensor);
Serial.println(Svalue);
//These values are changed from 0 to 45
value = map(Svalue, 0, 1024, 0, 45);
//These are the heartbeat design codes
int y = 60 - value;
if (x > 128)
{ x = 0; sX = 0; srituhobby.clearDisplay();
}
srituhobby.drawLine(sX, sY, x, y, WHITE);
sX = x;
sY = y;
x ++;
//This is BPM calculate function.
BPM();
//The heartbeat is printed on the screen
srituhobby.setCursor(0, 0);
srituhobby.setTextSize(2);
srituhobby.setTextColor(SSD1306_WHITE);
srituhobby.print("BPM :");
srituhobby.display();
}
```

Uploading of code into Arduino board



Step 1

Step 2



Step 3

CONCLUSION

The purpose of this sensor is to determine the effects of exercise on heart rate. We did this by doing a series of activities that affected heart rate, including sitting, standing, walking, jogging, and running. The data showed that the heart rate increased with increasing exercise, going from 66 bpm for walking up to 106 bpm for running, so the data did support the hypothesis. An explanation of the data is that as exercise increases, more oxygen is needed by the muscles for cellular respiration to produce more energy, so the heart must beat faster to supply the O2 to the muscles. Some errors may have occurred during the lab. Since heart rate was taken by counting for 15 seconds, and multiplying by 4, there is an error of +/- 4 bpm built in to the procedure. Miss-counting could also have been a factor, causing the heart rate to appear higher or lower by a few beats, but not affecting the overall results of the experiment. This sensor could have been improved by using heart rate monitors to get an exact count of beats, and by doing several trials of each activity to find an average heart rate for each activity.

THANK
YOU

Presented by

Team- Soul Celestia

Team members-Anish Thakur(6th sem)

Sejal Kaushik(6th sem)

Imbesat(4th sem)

Riya(4th sem)