Heart Pulse Rate Sensor
(Technical Note)

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What is a Heart Pulse Rate Sensor?

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. As the light shines through your skin, the sensor measures the amount of light that reflects back. The light reflections will vary as blood pulses under your skin past the light. The variations in the light reflections are interpreted as heartbeats. For example, a high heart rate means greater blood flow and thus decreased reflected light.

Scientific Fact and Applications

The sensor module has three pins namely ground, Vcc, and the analog pin from where it reads the data. The voltage signals read by the sensor can be further furnished to know the instantaneous heart rate, blood pressure, and other medical parameters. The sensing LED shines light into the fingertip or earlobe, or other capillary tissue, and sensor reads the light that bounces back from it.
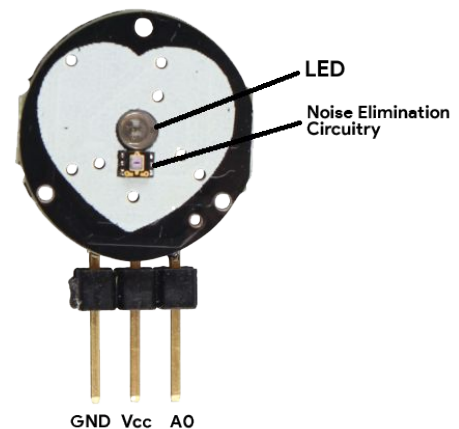
Applications:

Anxiety Tracking:
Pulse sensor can be used to track the anxiety level. During anxiety, pulse of the person increases. Pulse sensors can be monitored and appropriate measures can be taken.
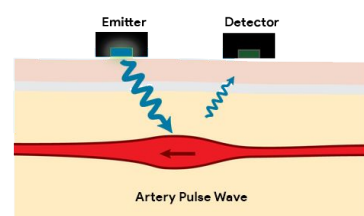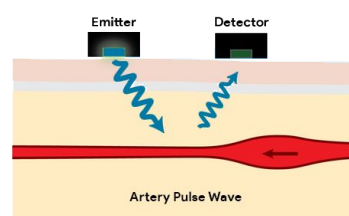
Health Bands:
Modern day smartwatches are equipped with pulse sensors to monitor the pulse rates and other body parameters. With smartwatches or health bands, pulse rates can be monitored for various different activities like walking, sitting, and running.

LED
Noise Elimination Circuitry

GND Vcc AO

Bright LED   **Light Dectector**

Emitter   Detector   Emitter   Detector

Artery Pulse Wave   Artery Pulse Wave

Project

To display user's live and changing BPM, Beats Per Minute, in Arduino's native Serial Monitor.

Components Required

Component	Part No.	Qty
Arduino UNO	EMX-00001-A	1
Pulse Sensor	EMS-00009-A	1
Jumper M-F	EDA-00001-A	1

Procedure

1. Connect + pin of the module to 5V of Arduino
2. Connect - of the module to GND of Arduino
3. Connect S pin of the module to pin A0 of Arduino
4. After uploading the code, start the "Serial Plotter" under "Tools" in Arduino.
5. Adjust the threshold so the led blinks according to your heartbeat.

Schematic
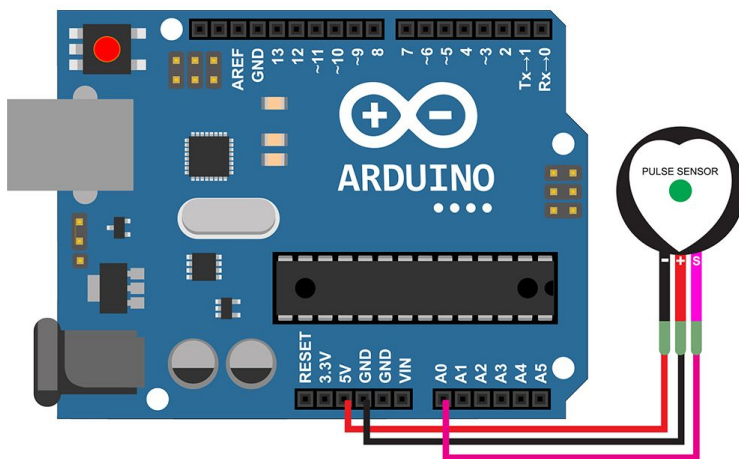
Challenge Yourself

1. Create a simple lie detector that checks if the beats per minute (BPM) has increased with the anxiety of telling a lie.

Code

```
/*Ref:
https://pulsesensor.com/pages/code-and-guide
 Pulse Sensor PURPLE WIRE connected to
ANALOG PIN 0
 The on-board Arduino LED Pin 13*/
int PulseSensorPurplePin = 0;
int LED13 = 13;

/* Create variable for signal and set
threshold to count as a Beat*/
int Signal;
int Threshold = 510;

void setup()
{
  pinMode(LED13,OUTPUT);
  Serial.begin(9600);
}

void loop()
{
  /*Read and Print the PulseSensor's value*/
  Signal = analogRead(PulseSensorPurplePin);
  Serial.println(Signal);

  if(Signal > Threshold)
  {
    /* If the signal is above the
threshold, turn-on Arduino's on-Board LED.*/
    digitalWrite(LED13,HIGH);
  }
  else
  {
    /* If the signal is below the threshold,
turn-off Arduino's on-Board LED.*/
    digitalWrite(LED13,LOW);
  }
delay(10);
}
```
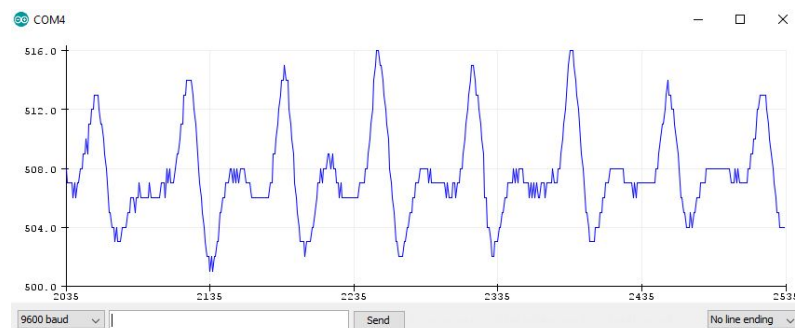

You should see your heart beat pattern using the Serial Plotter.