Measuring heart rate using the pulse sensor

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ABSTRACT

With plenty of new healthcare technology start-ups, Arduino alongside an Embedded System is rapidly revolutionizing the healthcare industry, during this project we'll find out how to design pulse measuring instruments using Pulse Sensor & Arduino. This paper describes how of measuring the heart rate through a fingertip and Arduino. The proposed approach consists of sensors that measure the heartbeat of an individual and display the readings in BPM on the serial monitor of Arduino IDE and visualizer.

*Keywords*: *Arduino, Pulse Sensor, Processing Visualizer*

1. INTRODUCTION

Technological innovationswithin the field of disease prevention and maintenance of patient health have enabled the evolution of fields like monitoring systems. Body health monitoring is extremely important to us to sure our health is in fitness. Over the past years, pulse has been becoming an important parameter which is linked withthe cardiovascular system of a person . There are several ways of measuring the heart beat rate. Our project is based on one such idea, we'll describe the design of low costHeartbeat/Pulse/BPM monitor using Arduino and Pulse Sensor.

2. HOW DOES PULSE SENSOR WORKS

Heart-rate sensors are very easy to know in theory. If you've ever shined a flash light through your finger tips and seen your heartbeat pulse, and if yougot an honest handle on the idea of optical heart- rate pulse sensors. A pulse sensor or any optical heart-rate sensor,works by shining a green light (~ 550nm) on the finger and measuring the quantity of reflected light employing a photosensor. This method of pulse detection through light is named Photoplethysmogram.

The oxygenated haemoglobin within the blood has the characteristic of absorbing green light. The redder the blood (the higher the haemoglobin), the more green light is absorbed. because the blood is pumped through the finger with each heartbeat, the quantity of reflected light changes, creating a

changing waveform atthe output of the photo sensor. As you still shine light and take photo sensor readings, you quickly start to urge a heart-beat pulse reading.
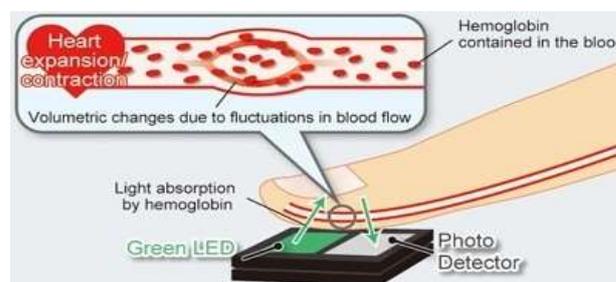
3. BLOCK DIAGRAM
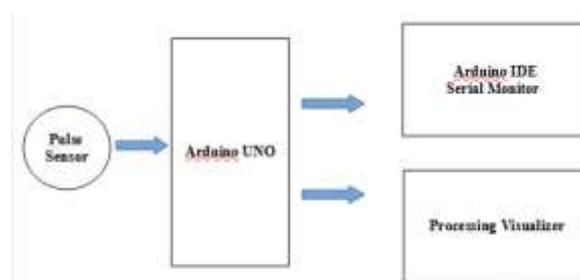
The Heart-Rate signals are collected from the sensor. This signals is counted by a microcontroller Arduino UNO and thereforethe results are going to be displayed on the serial monitor and visualizer. The Microcontroller is programmed with an algorithm to run the proposed pulse counting system.

4. HARDWARE USED
Arduino Uno
The Arduino Uno is a microcontroller board and it's developed by Arduino.cc. it's 14 digital I/O pins, 6 analog input pins, a USB connection. Each pin works at 5V and provide or receive a maximum of 40mA current. the method to use the microcontroller is pretty simple, simply connect it to a computer using the cable and use the Arduino application to code it.

Pulse Sensor
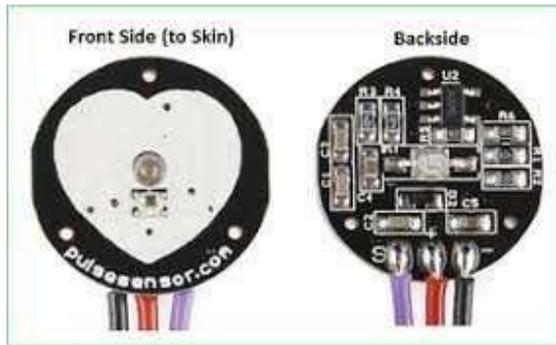
The Pulse Sensor is well-designed low-power plug- and play heart-rate sensor for the Arduino. This sensor plugs right into Arduino and simply clips onto a fingertip or earlobe.
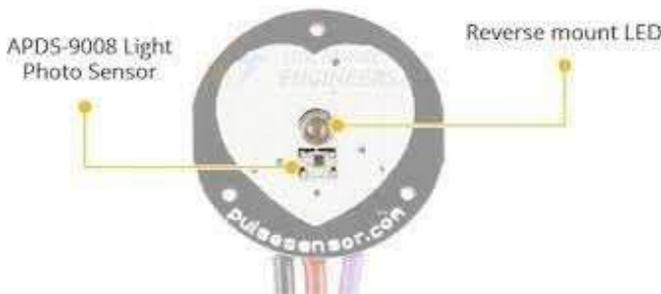
The front of sensor is where you place your finger. On the front side, you'll see a little round hole,from where the green LED shines. slightly below the LED may be a small ambient light photosensor APDS9008 which adjust the brightness in several light conditions.
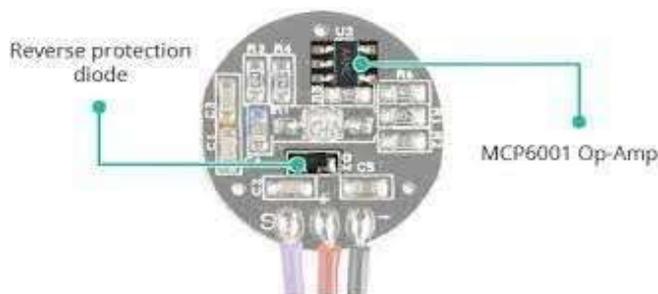

On the **rear** of the module you'll find MCP6001 op-Amp IC, a couple of resisitors, and capacitors. This makes up the R/C filter network. there's also a reverse protection diode to stop damage if you connect the facility leads reverse.

PinOut – Pulse Sensor
The pulse sensor has few pins:VCC,GND &Analog Pin.

5. CIRCUIT DIAGRAM
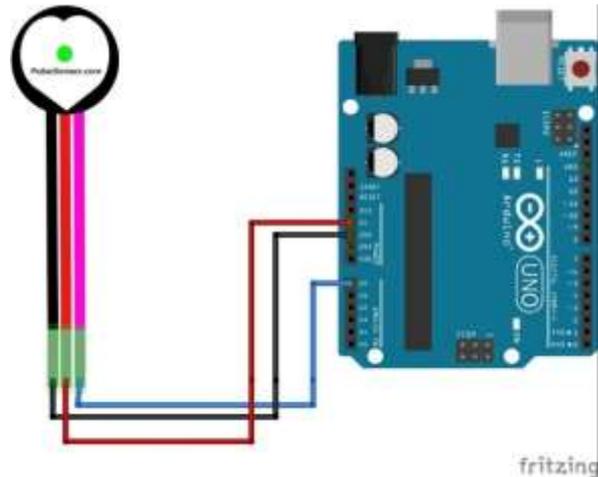
Connection of pulse sensor with Arduino
Hooking up the Pulse Sensor to an Arduino is straightforward . You simply got to connect three wires: two for power and one for reading the sensor value. Connect Pulse Sensor to Arduino UNO board:

| Pulse Sensor	Arduino Uno
+ (VCC)	+5V
- (GND)	GND
S (Signal)	A0

Software Used
Arduino IDE: The Arduino IDE is an open- source software, which is employed to write down and upload code to the Arduino boards. The IDE application is suitable for various operating systems like Windows, Mac OS X, and Linux. It supports the programming languages C and C++. The Arduino IDE is employed to write down the pc code and upload this code to the physical board.

Processing Visualizer:- The manufacturers of Pulse Sensor have put together a softwareto see the heart beat Sensor data on your computer. It's written in Processing. Thissoftware displays all of the infomation that the Arduino receives from Pulse Sensor. It graphs the user's pulse in real time. It also graphs the

BPM and IBI (Interbeat Interval)over time.
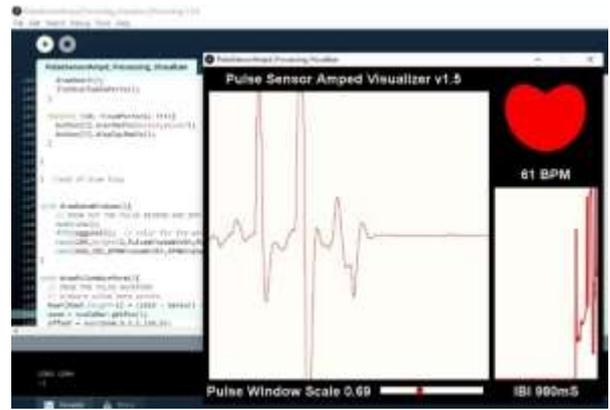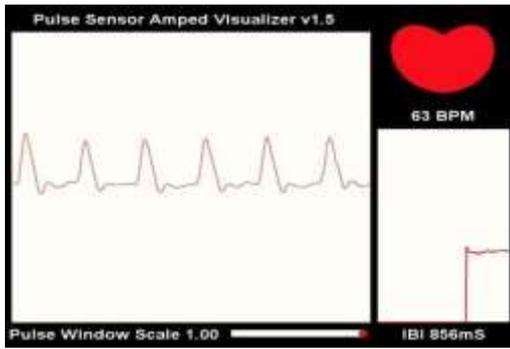
Working

First we'd like to attach the heart beat sensor and Visualizer to the Arduino board by following the above Connection table. then with USB cable Connect Arduino Board with laptop. As soon as You connect Arduino with laptop, the heart beat sensor Glows with a green light. In laptop open Arduino IDE and upload the code to the Arduino board. After Uploading the code, place your Fingeron the heart beat sensor. The Arduino calculates theheart rate and displays the heartbeat in BPM on Visualizer. you'll also notice the readings withinthe Serial monitor of Arduino IDE.
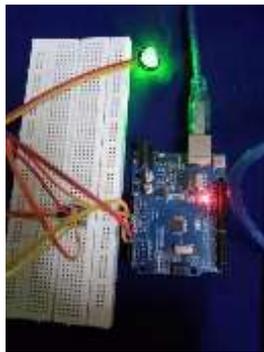
6. OUTPUT AND RESULTS

7. APPLICATIONS

- This device can be used as an inexpensive alternative to smart watches and other expensive Hart Rate Monitors.
- The device is portable, durable and not costly hence could be used by any individual in the proposed region.
- As a Heart rate monitoring in fitness center.
- In rural areas where medical facilities aren't available.

8. CONCLUSION

In this paper, the planning and development of low cost hear rate monitor device hasbeen presented. the heart rate monitor device is efficient and straightforward to use. Tests have shown accurate heartbeatresults. The device is able to measure the heart rate in a continuous interval length of time and display the heart beat rate per minute on visualizer and on a serial monitorof Arduino IDE.

9. REFERENCES

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