School of Electrical and Electronics Engineering

IOT Pulse Oximeter

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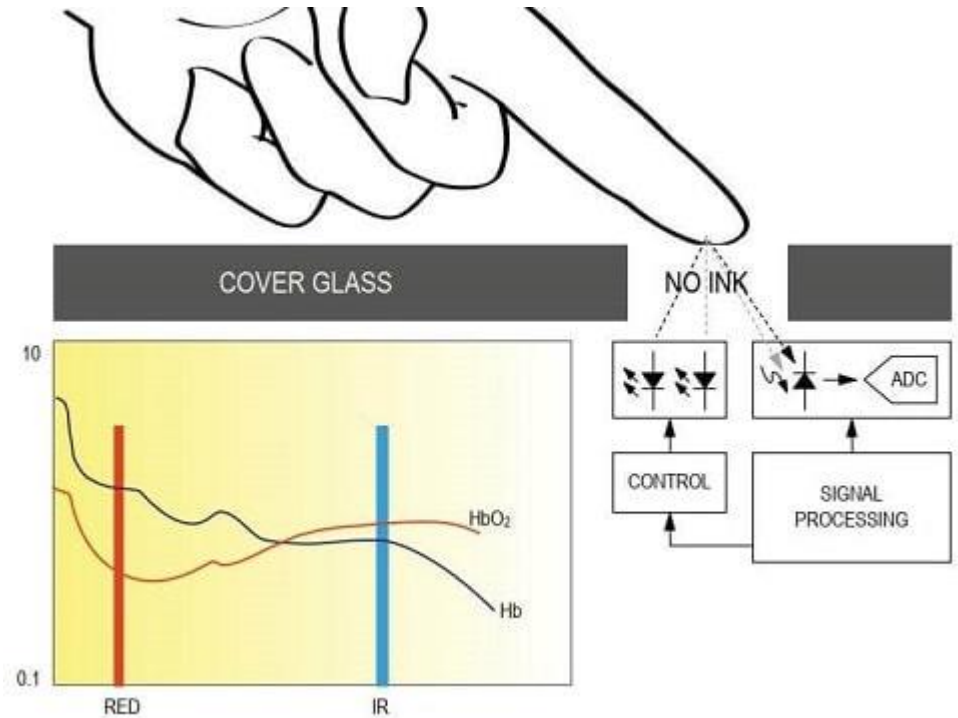
Introduction:

A pulse oximeter is a medical instrument that indirectly measures the saturation oxygen level of a patients' blood, i.e what proportion of the oxygen-carrying molecules in the blood (called hemoglobin) are actually carrying oxygen. This is known as oxygen saturation or SpO2.This saturation point oxygen level is very important to monitor while a patient is at risk for further process of medication.

Pulse oximeters have been used in medical settings for many years. In many cases, such as during an operation, in intensive care, the emergency room, even an unpressurized aircraft, a person's oxygen level may be unstable and needs monitoring. In addition, from these readings, the person's heart rate can also be determined. This project is an attempt to construct a working version of a pulse oximeter from a relatively cheap set of parts – including a microcontroller.


COVER GLASS
NO INK
ADC
CONTROL
SIGNAL
PROCESSING
10
0.1
HbO2
Hb
RED
IR

Objective

These days pulse oximeter is an important and life saving medical equipment. Due to COVID it is advisable to keep it at home as well. In this article we will build a IoT Pulse Oximeter Using NodeMCU82866 & Blynk app. Building this by our own will help us to know the how pulse oximeter works and what are the components required to build it. Here we will build it contact less with the help of IoT technology.

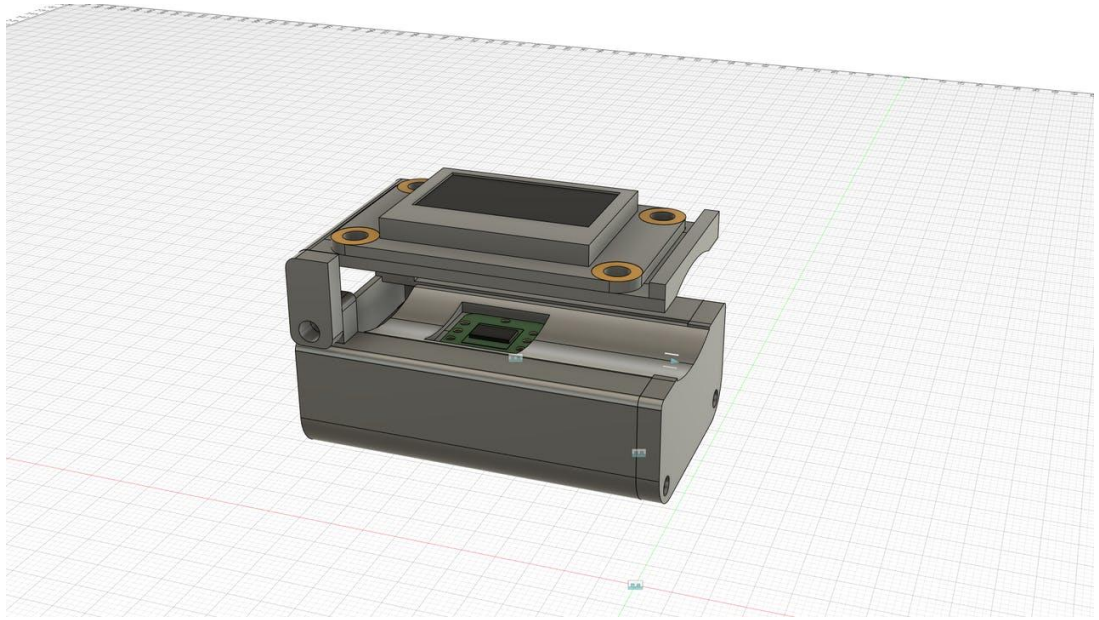
Work Plan:

	Particulars	Duration	Outcomes
1	Module 1(Give name such as literature survey with detail)	25 Sept-05 Oct 2021	planning & all basic about IOT pulse Oximeter.
2	Module2(planning and design)	05 Oct–25 Oct 2021	Design .
3	Module 3(Design)	25 Oct-25 Nov 2021	Implementation & Execution.
4	Module 4 (Implementation)	up to Dec	Hardware

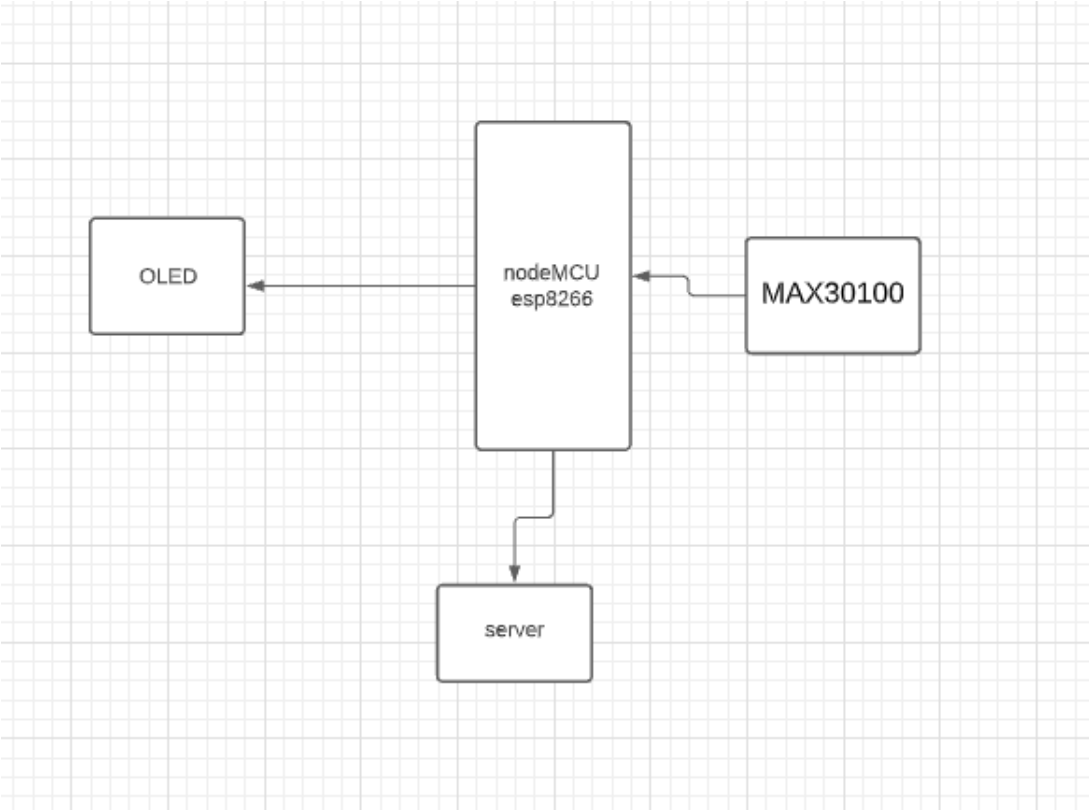
Proposed Methodology:

- The pulse oximeter is designed using infrared and visible (red) light detection from light that passes through a patient's finger from an emitter. The absorption will tell when blood is moving through the finger and how much of this is oxygen-rich. The output of this analog circuit will be fed into an Node microcontroller, which computes the pulse and oxygen level from these numbers.

Print Out and Clean Parts



Block Diagram:

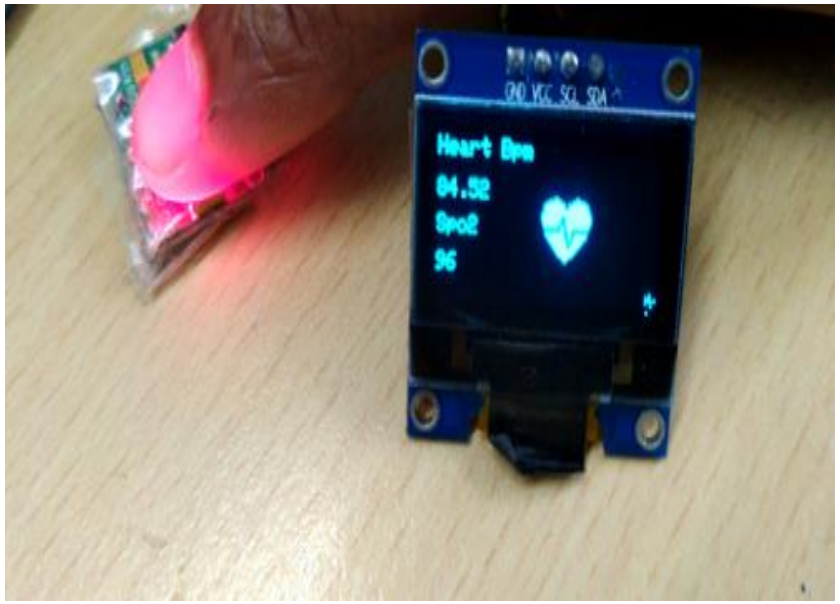


List of Components:

- **OLED**
- **NODEMCU ESP8266**
- **MAX30100 Pulse Oximeter**
- **Connecting Wires (Jumper Wires)**

OLED

OLED stands for ***Organic Light Emitting Diode***; TVs that use this technology have a thin carbon-based film built into the screen. When electricity hits the organic material, it lights up.



NODEMCU ESP8266

NodeMCU is an open source development board and firmware based in the widely used ESP8266 -12E WiFi module. It allows you to program the ESP8266 WiFi module with the simple and powerful LUA programming language or Arduino IDE.

MAX30100 Pulse Oximeter

The MAX30100 is an integrated pulse oximetry and heart- rate monitor sensor solution. It combines two LEDs, a photodetector, optimized optics, and low-noise analog signal processing to detect pulse oximetry and heart-rate signals.

Jumper Wires

A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end ,which is normally used to interconnect the components of a breadboard or other prototype or test

Software:

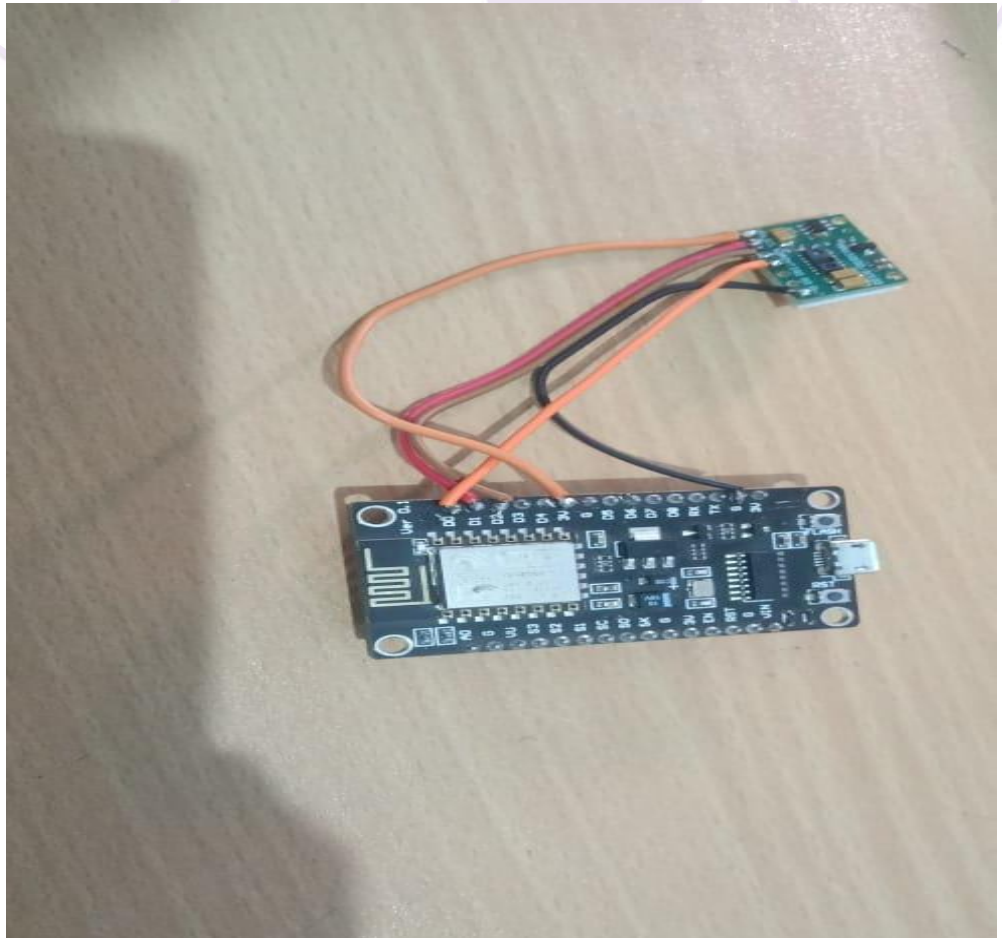
- Arduino IDE
- Blynk app

Code:

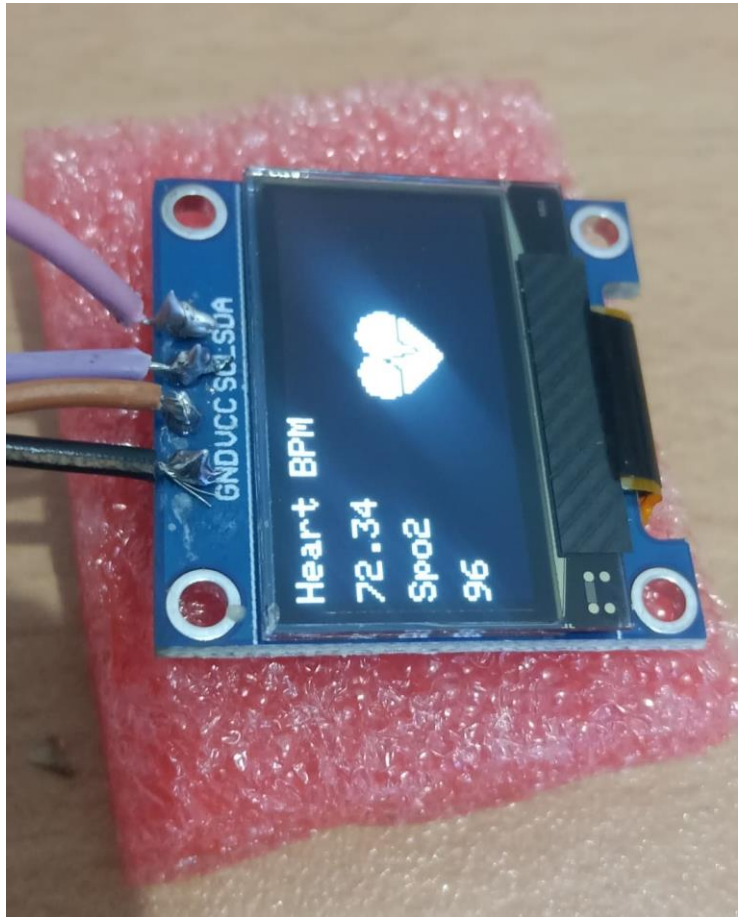
```
#include <Wire.h>
#include "MAX30100_PulseOximeter.h"
#define REPORTING_PERIOD_MS     1000
 PulseOximeter pox;
uint32_t tsLastReport = 0;
void onBeatDetected()
{
 Serial.println("Beat!");
}
void setup(){
Serial.begin(115200);
Serial.print("Initializing pulse oximeter..");
if (!pox.begin()) {
Serial.println("FAILED");
for(;;);
}
else {
Serial.println("SUCCESS");
 }
 pox.setIRLedCurrent(MAX30100_LED_CURR_7_6MA);
```

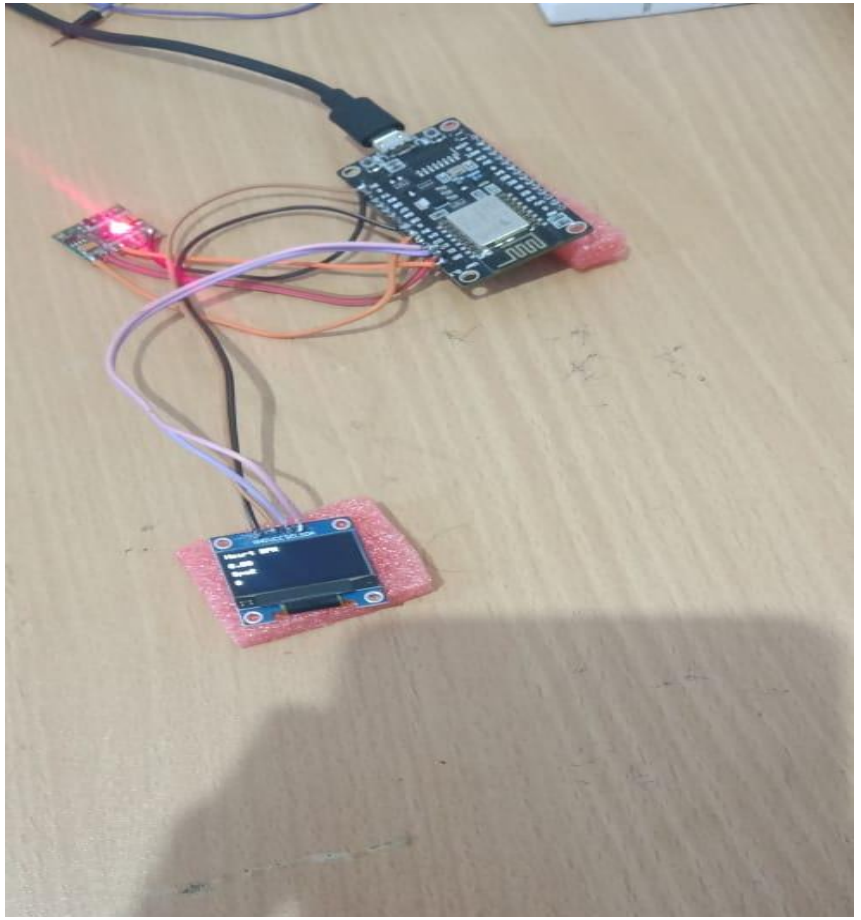
Cont.

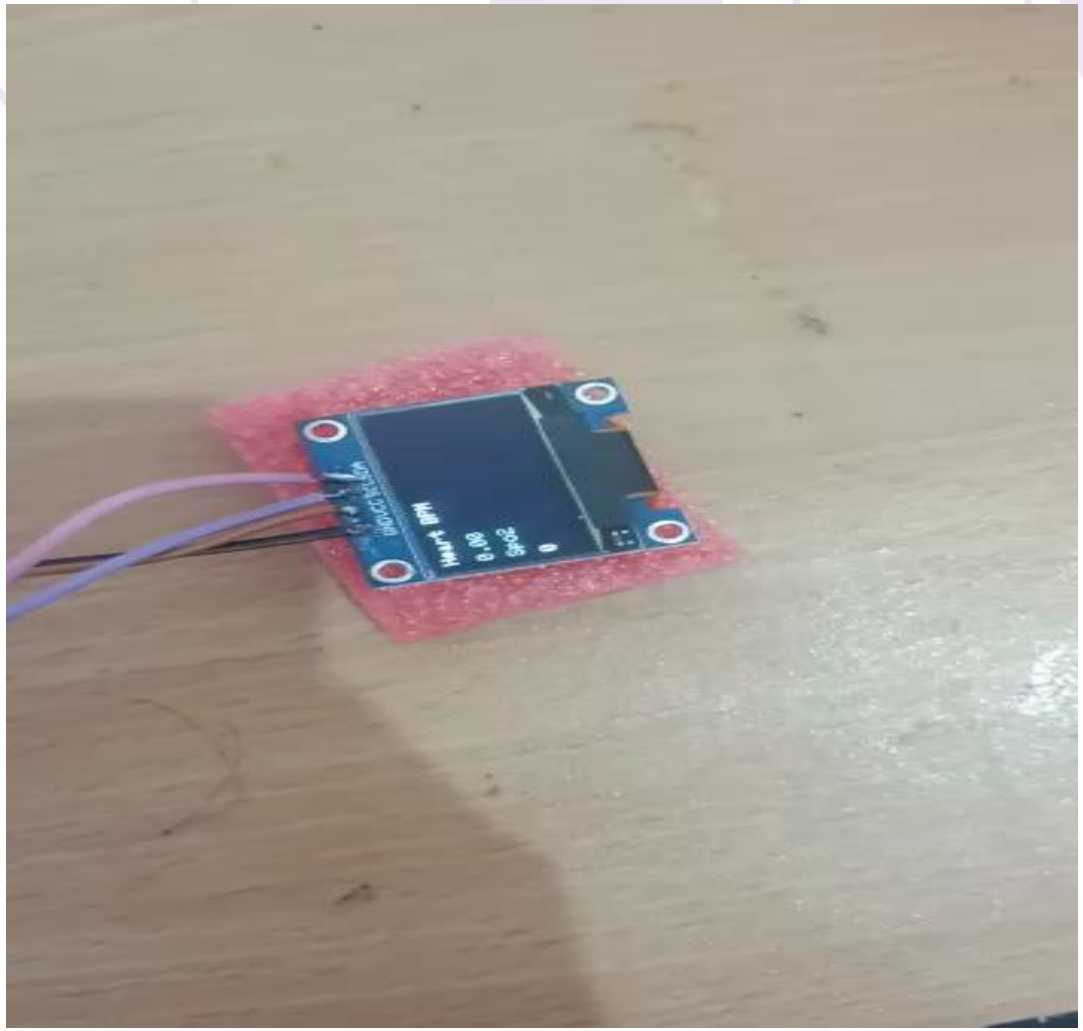
```
// Register a callback for the beat detection

  pox.setOnBeatDetectedCallback(onBeatDetected);
}
void loop()
{
// Make sure to call update as fast as possible
pox.update();
if (millis() - tsLastReport > REPORTING_PERIOD_MS)
 {
Serial.print("Heart rate:");
Serial.print(pox.getHeartRate());
Serial.print("bpm / SpO2:");
Serial.print(pox.getSpO2());
Serial.println("%");
tsLastReport = millis();
}
}
```

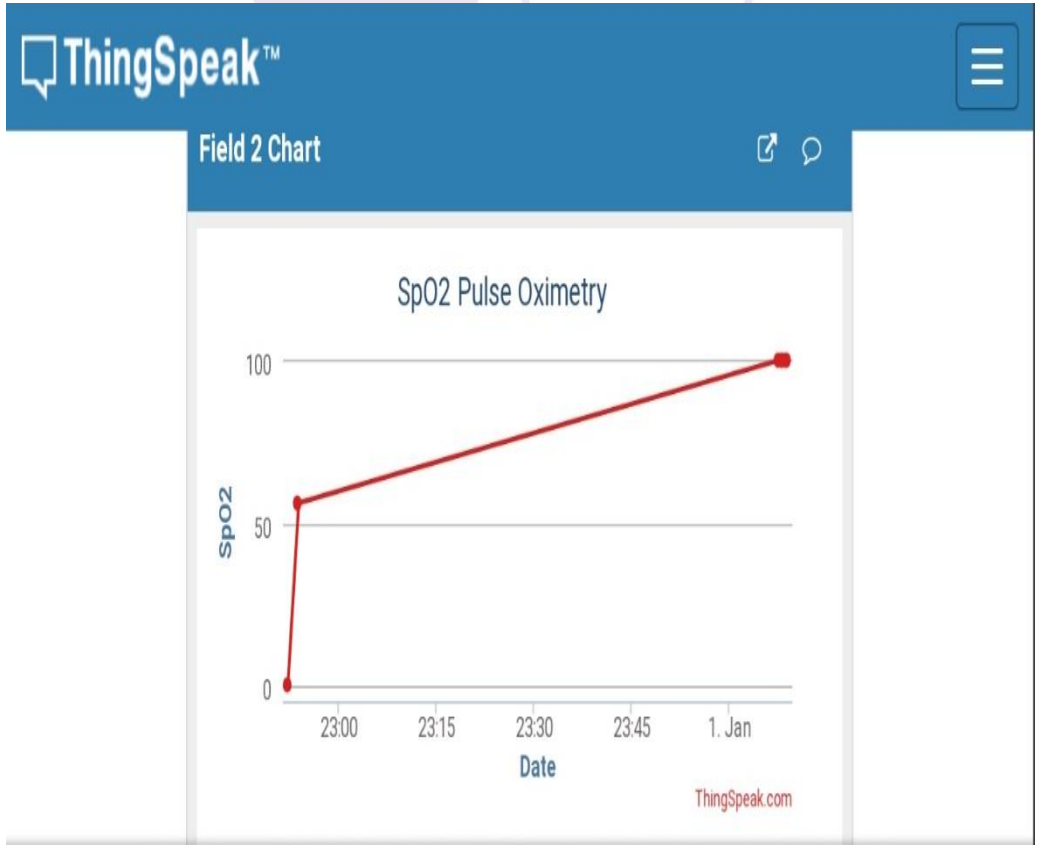


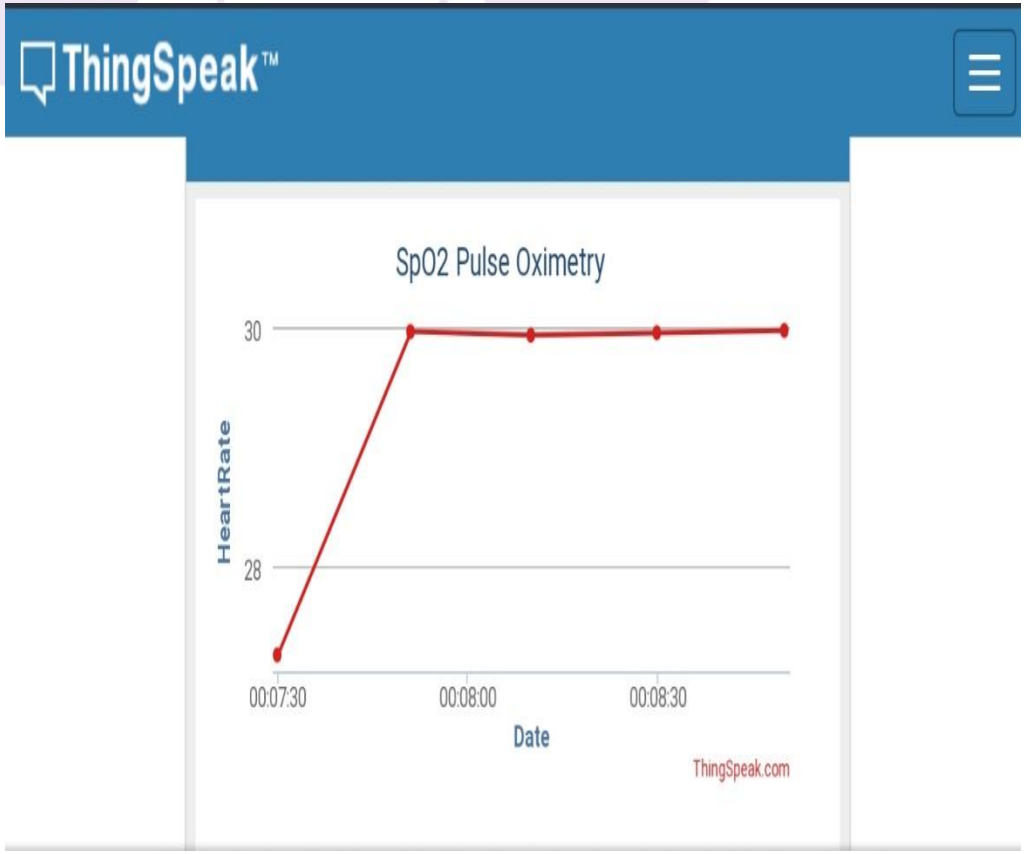
Hardware:






Heart BPM
0.00
SpO2
%


ThingSpeak™
Field 2 Chart
SpO2 Pulse Oximetry
100
50
0
SpO2
23:00
23:15
23:30
23:45
1. Jan
Date
ThingSpeak.com


ThingSpeak™
SpO2 Pulse Oximetry
30
28
HeartRate
00:07:30
00:08:00
00:08:30
Date
ThingSpeak.com

Conclusion:

- Light weight and Compactness.
- User-friendliness.
- Accuracy.
- Fast response time.
- Convenience.
- Give continuous measurement.

- During the ongoing coronavirus disease (COVID-19) pandemic, reports in social media and the lay press indicate that a subset of patients are presenting with severe hypoxemia in the absence of dyspnea, a problem unofficially referred to as "silent hypoxemia." To decrease the risk of complications in such patients, one proposed solution has been to have those diagnosed with COVID-19 but not sick enough to warrant admission monitor their arterial oxygenation by pulse oximetry at home and present for care when they show evidence of hypoxemia.

References:

- https://www.acadpubl.eu/hub/2018-119-16/1/183.pdf
- https://www.iotstarters.com/easy-nodemcu-programming-with-simple-steps/
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- https://www.iotstarters.com/iot-pulse-oximeter-using-nodemcu-max30100-blynk/#Things_Required
- https://how2electronics.com/pulse-sensor-with-oled-arduino/

Thank You…