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PROJECT REPORT ON

GUN OXIMETER

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

IN THE PARTIAL FULFILLMENT OF THIRD YEAR OF ENGINEERING

IN
ELECTRONICS AND TELECOMMUNICATION

BY

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UNDER THE GUIDANCE OF

Mrs. Mamta Wanjre

ACADEMIC YEAR: 2022-23

CERTIFICATE

This is to certify that Project Report entitled

“GUN OXIMETER”

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is the record of bonafide work carried out by them in partial fulfillment of the requirement for the award of the Degree of **Bachelor of Engineering (Electronics and Telecommunication)**, as prescribed by the Savitribai Phule Pune University in the Academic Year 2022-23.

This project report has not been earlier submitted to any other Institute or University for the award of any degree or diploma.

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Acknowledgement

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The motivation factor for this work was the inspiration given by our honorable principal **Dr. P.B. Mane**.

Lastly, I am thankful to those who have directly or indirectly supported for our work.

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ABSTRACT

Gun oximeter is a IOT based project which can be very useful in pandemic and post pandemic period. The COVID-19 virus has changed the lifestyle of people in every way. But coping with this virus we have to take precautions.

High temperature and Low oxygen which are the most primary signs need to be checked frequently at public places. For this Gun Oximeter which is a combination of Temperature Gun and Oximeter, will be very useful.

Gun Oximeter contains two main sensors, IR temperature sensor and SpO2 sensor which helps us detect two parameters using single device.

Moreover, we have integrated this hardware with a Web Application. Web Application totally changes the picture of traditional measuring systems. The sensor data which is collected at public places is displayed on a web page. Here one can store the data along with the person's information.

The sensor data + person's information is stored in an organized way so that this data can be further used for any type of analysis.

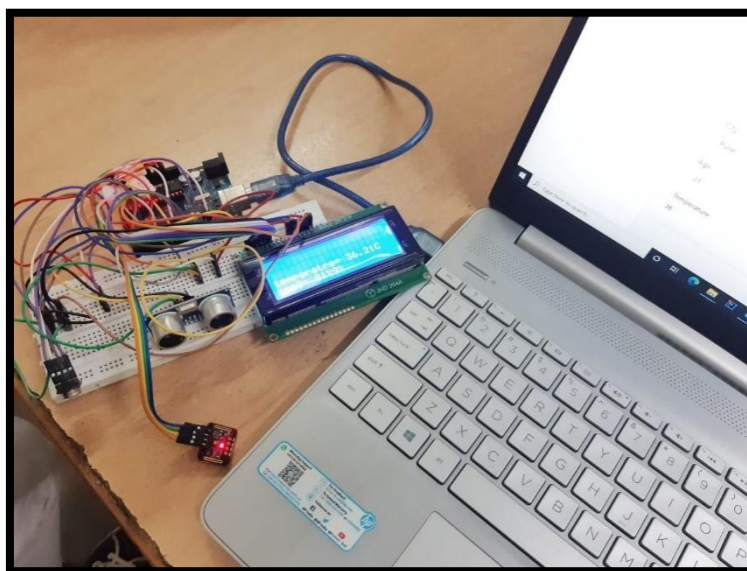


Fig.1 Gun Oximeter Circuit

INTRODUCTION

Deadly corona virus changed our lifestyle in every way. We are stuck in our houses. Once we step out for work we are in constant danger of getting infected. But we have to find a feasible way to live with this new lifestyle. While adjusting to the rush one must take into account that Corona Virus is not yet over.

And neither it will be totally eradicated. Government are making several attempts to make sure every person is aware of the basic things which can help us protect from getting affected.

High Temperature and Low Oxygen level are primary signs of infected person.

Often times people are not aware that they are infected unless their O₂ levels are checked.

At the public places only temperature is checked. Oxygen level is totally neglected. Oxygen level is more important as it tells the severity of the infection. There are the cases where due to normal temperature but very low oxygen level, people are getting into serious conditions.

There are several places where currently measuring oxygen saturation level is ignored. This is due to several problems

1. Problem of handling two instruments at same time.
2. Cost of the two devices is more.
3. There is also carelessness among the people.
4. Unawareness among the people.

However even though if the temperature is measured, no proper record is kept. A hard copy is used by the security guards, which is not a proper way of storing the data. There is actually no use of measuring the temperature as the data is neglected.

This data is very useful while making the data analysis of covid patients. One can use this data to check which area is in red zone, which age group is most affected etc.

Gun Oximeter is a device where one can measure both temperature and oxygen at public place. Not only this we can store this sensor data in organized way in a database along with the person's information which can be retrieved easily.

LITERATURE REVIEW

1. A Novel Patient Monitoring System Using Photoplethysmography and IOT in the Age of COVID-19

Due to covid outbreak . Thus, there has been a constant demand for a technology that is reliable, inexpensive, simple, and at the same time portable for the clinical settings for community and primary care. The wide availability of small and low-cost semiconductor components, with an advancement in the computer-based pulse wave analysis techniques provide a great platform to achieve this. The performance of this type of device and the criteria for screening are worth studying.

2. Contactless Temperature Detection of Multiple People and Detection of Possible Corona Virus Affected Persons Using AI Enabled IR Sensor Camera

The detection of temperature can be made possible by the use of the computer leveraging vision techniques which is equipped with the Raspberry-pi camera module. The process is based on the thermal imaging of the person which can detect the elevated temperature of the person and prevents them from entering into the institution or offices thereby the spread due to the possibly affected persons can be avoided thereby the spread can be controlled. The system not only identifies the person with high temperature but also checks whether the person is wearing a mask or not. The real time analysis of the system is the major advantage of the proposed system.

3. Current COVID-19 Analysis and Future Pandemics Prediction using Internet of Everything (IoE)

The oximetric measurement of oxygen concentration in blood has been a valuable tool since it became commercially available in the United States in the early 1970's. Generally, an oximeter is a photoelectric instrument that continually measures the oxygen content of blood or oxygen saturation in a person by measuring the intensity of a light beam transmitted through body tissue. Oxygen saturation is numerically displayed as a percentage, and is typically accompanied by an audible alarm if the current value is outside present limits of acceptable saturation. Motion artifact continues to be a significant source of error and false alarms

4. Pulse Rate and Blood Oxygen Monitor to Help Detect Covid-19: Implementation and Performance

Developed and tested the performance of an Atmel ATmega 328P MCU and MAX30100 sensor kit-based pulse rate and blood oxygen monitor. We applied the device on 12 subjects and compared the data with a commercially available, Rossmax SB150 pulse oximeter. A minimal deviation of 0.8175% for pulse rate and 0.425% for blood oxygen was obtained that endorses the accuracy of our algorithm and implementation.

5. COVID-19 Self-Detection Magic Mirror With IoTbased Heart Rate and Temperature Sensors

Proposed a solution to let the user do a COVID-19 self-detection by using Magic Mirror with IoT-based technology. This Magic Mirror uses two sensors (heart rate and temperature sensor) to measure user's heart rate and body temperature. If the user is suspected of having COVID-19, an alert will be displayed on the Magic Mirror or smartphone to let the user take further necessary action

1. US6129673A - Infrared thermometer - Google Patents

To overcome the limitations of the prior art, the invention provides a method and system for performing non-contact temperature measurement of an object accurately and efficiently.

In addition to the ambient T_a , the first thermistor 19 is positioned within the chamber to be exposed to the waveguide 15 and, consequently, to IR radiation entering the probe 4 through the window 17.

2. DE19526556A1 - Infrared temperature sensor - Google Patents

Infrared temperature sensors advantageously do not require any Surface contact, but instead use an infrared detector, the infrared light gets from the place where a temperature measurement should be done. Appropriate electronics with the infrared sensor is connected, determines the temperature at the desired location.

3. US4883353A - Pulse oximeter - Google Patents

BACKGROUND OF THE INVENTION This invention relates to displaying the process used by a pulse oximeter for identifying the maximum and minimum values of pulsatile waveforms in order to determine the amplitudes used for calculating oxygen saturation.

Under most operating conditions, the upper envelope and lower envelope will correctly track the peaks and valleys of the pulsatile waveform, indicating an accurate processing of saturation of oxygen percentile.

A pulse oximeter in accordance with claim 2 wherein said displayable process waveform comprises: an upper envelope for tracking the process of determining said maximum value of the pulsatile waveform; and a lower envelope for tracking the process of determining said minimum value of the pulsatile waveform.

4. EP2750604B1 - Wearable pulse oximetry device - Google Patents

TECHNICAL FIELD The present invention relates to systems and methods for pulse oximetry measurements at the wrist, particularly, the present invention relates to a pulse oximetry device that can be worn on a wrist. An increased optical path length, as provided by the configuration of the oximeter 30, brings about an increase of interaction between the propagating light and surrounding tissue for ultimately providing a robust signal from which pulse oximetry data can be obtained.

In other embodiments of the present technique, the wrist-band type oximeter utilizes a system for detecting and/or mitigating signal artifacts arising out user motion, for example, hand motion, thereby achieving a reliable pulse oximetry measurement.

AIM AND OBJECTIVE

Problem Statement: To design a single device which can measure the temperature and oxygen of people in public places. Storing this data in organized way on database for further analysis.

Aim

The motive of Gun Oximeter is to make the process of measuring temperature and oxygen of people at public places much easier , faster and safer. Along with this storing the data collected from public places in such organized way so that it can be used for data analysis in future.

Objectives:-

1. To design two in one device for accurate measurement of temperature and oxygen .
2. To interface the various sensors for detection with the microcontroller.
3. To collect the sensor data (temperature, oxygen saturation readings.) in proper format.
4. To build a Web Application where the sensor data will be stored along with person's information.
5. To migrating this data in Database where it can be stored properly.
6. To interface hardware with software webapp, collecting the sensor readings and storing it for further analysis.

METHODOLOGY

1. The project is divided into two parts. Hardware and Software.
2. Gun Oximeter works on two main sensors. IR Temperature detection sensor (MLX90614) and SPO2 Oxygen saturation sensor (MAX30102).
3. Both the sensors are interfaced with the Arduino Board . Measurements of the person ; temperature and oxygen readings are taken on the Arduino IDE.
4. The temperature and Spo2 reading are collected from the sensors and are then sent to the Python terminal.
5. Here the interfacing of Arduino with Python is done. The readings taken from sensors are displayed on the python terminal.
6. In this project Web Application is built using Django Framework. Here the readings are sent to a form.
7. This form contains several other fields related to person's information such as name, age, area , vaccination status etc.
8. Once the form is filled completely the data of the person along with the readings are saved in a database.
9. This allows us to use the information for further analysis.

SPECIFICATION OF THE SYSTEM: -

1. Temperature sensor (MLX90614):

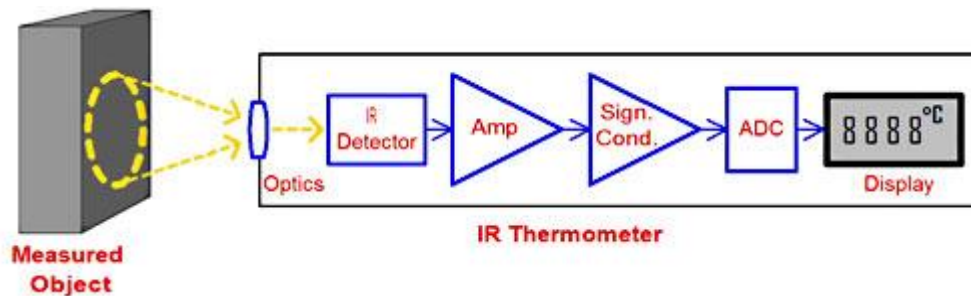


Fig 2 Temperature sensor principle

We have used MLX90614 Infrared thermometer. It has a lens to focus the infrared light. This light is emitting from the object onto a detector called thermopile. Thermopile is a thermocouple , when radiation falls on its surface it gets absorbed and converts into heat. Equivalent voltage output is produced.

2. Spo2 sensor (MAX30102):

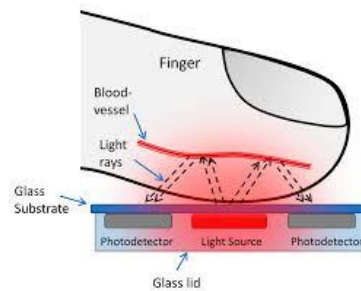


Fig 3 Oximeter Principle

Pulse oximetry is a simple mechanism. It has two different light sources and a photodiode. Based on the measurement site, there are two types of modes. One is transmissive and the other is reflective mode. In the transmissive mode, the light sources and photodiode are opposite to each other. The measurement site is between them. Light is passed through the site. The reflective mode has a different principle. The light sources and photodiode are on the same side, and light is reflected to the photodiode across the measurement site.

Detailed Specifications:

1. Operating Voltage= 5V
2. Operating temperature = Room temperature.
3. Spo2 sensor **MAX30102** =
 - a. Power supply 3.3V to 5.5V
 - b. Current draw ~600 μ A (during measurements)
~0.7 μ A (during standby mode)
 - c. IR LED Wavelength 880nm
 - d. Red LED Wavelength 660nm
4. Temperature sensor **MLX90614** =
 - a. Operating Voltage: 3.6V to 5V (available in 3V and 5V version)
 - b. Supply Current: 1.5mA
 - c. Object Temperature Range: -70° C to 382.2°C
 - d. Ambient Temperature Range: -40° C to 125°C
5. Efficiency = 40% to 60% more than static solar panel.
6. Communication Interface= USB or any external power source
7. Tracking Accuracy= -5% to +5% error can be induced.

Gun Oximeter

BLOCK DIAGRAM

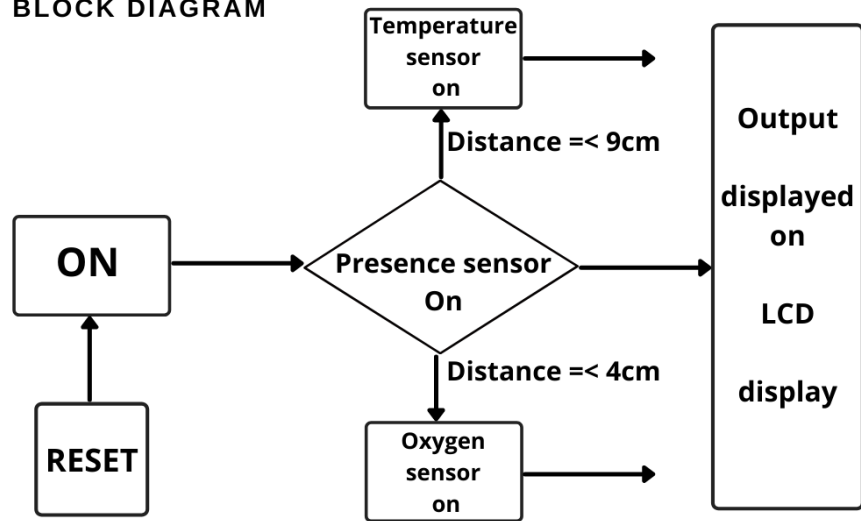


Fig 4 BLOCK DIAGRAM OF THE SYSTEM

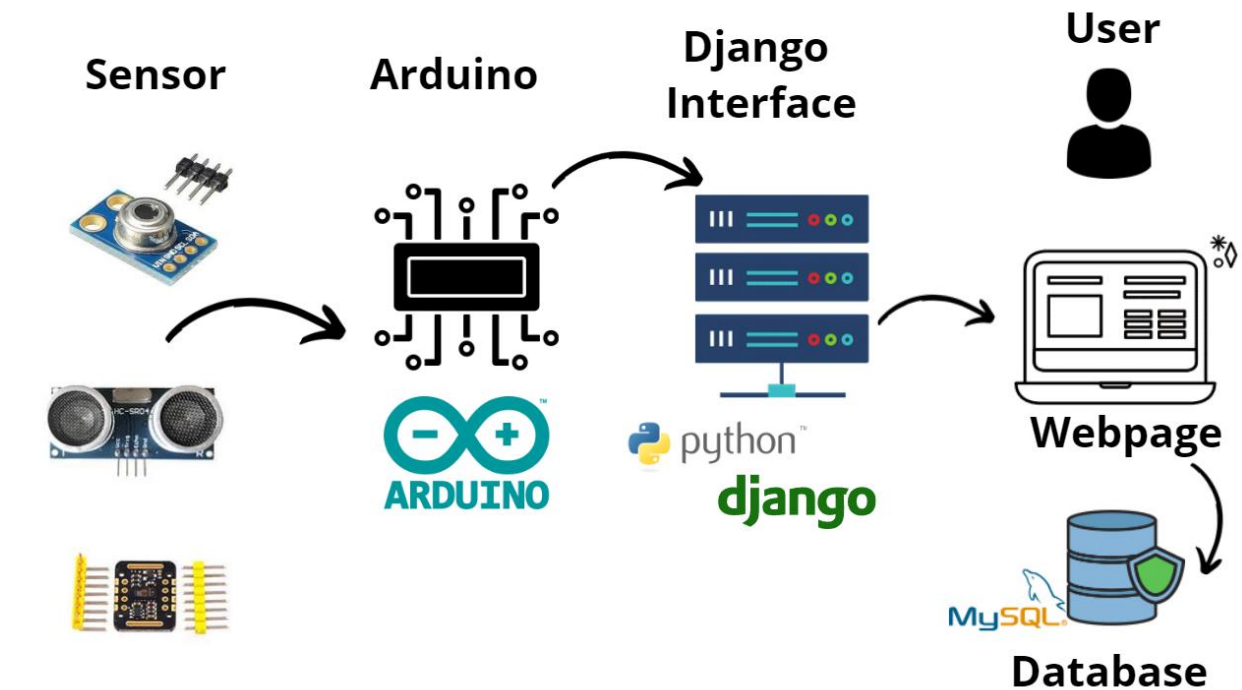


Fig 5 Data Flow Diagram

Hardware Design

In this project we have used following hardware components:

1. Arduino UNO R3 board.
2. Temperature Sensor (MLX90614)
3. SPO2 Sensor (Max30102)
4. 20x4 LCD Display
5. Breadboard
6. Jumper Wires.

1.Arduino Uno R3:-

Arduino UNO R3 microcontroller board is used in this project. ATmega328 AVR microcontroller is used in Arduino UNO .

- Arduino has total 20 input output pins.
- It has two serial pins RX and TX.
- Programs can be loaded on to it from the easy-to-use Arduino computer program



Fig 6 Arduino UNO R3

The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno.

- **Serial Pins 1 (Tx) and 0 (Rx):** Tx and Rx pins are used to receive and transmit TTL serial data.
- **Reset Pin:** Making this pin LOW, resets the microcontroller.

2.Temperature Sensor (MLX90614):-

The MLX90614 - **Contactless Infrared (IR) Digital Temperature Sensor** . This can be used to measure the temperature without actual contact of the person. The sensor uses Infrared radiations to measure the temperature of the object. It communicates with I2C protocol.

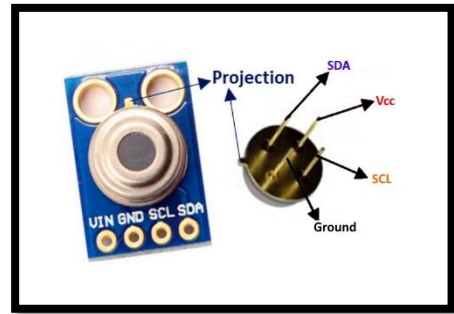


Fig 7 MLX90614 Sensor

MLX90614 Pinout Configuration

Pin No.	Pin Name	Description
1	Vdd (Power supply)	Vdd can be used to power the sensor, typically using 5V
2	Ground	The metal can also act as ground
3	SDA – Serial Data	Serial data pin used for I2C Communication
4	SCL – Serial Clock	Serial Clock Pin used for I2C Communication

MLX90614 Temperature Sensor Specifications

- Operating Voltage: 3.6V to 5V (available in 3V and 5V version)
- Supply Current: 1.5mA
- Object Temperature Range: -70° C to 382.2°C
- Ambient Temperature Range: -40° C to 125°C
- Accuracy: 0.02°C
- Field of View: 80°
- Distance between object and sensor: 2cm-5cm (approx.)

3.Oxygen Saturation Detection Sensor (MAX30102):-

The MAX30102 is pulse oximetry and heart-rate monitor module. It has internal LEDs, photodetectors, optical elements, and low-noise electronics with ambient light rejection.

It has two LEDs, a photodetector, optimized optics, and low-noise analog signal processing to detect pulse oximetry (SpO₂) and heart rate (HR) signals.

Inside the sensor on one side, the MAX30102 has two LEDs – a RED and an IR LED. Other side is a very sensitive photodetector.

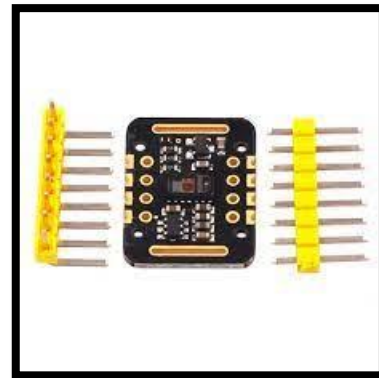


Fig 8 MAX30102 Oxygen Sensor

Technical Specifications

Power supply	3.3V to 5.5V
Current draw	~600 μ A (during measurements)
	~0.7 μ A (during standby mode)
Red LED Wavelength	660nm
IR LED Wavelength	880nm
Temperature Range	-40°C to +85°C
Temperature Accuracy	$\pm 1^\circ$ C

4.Liquid Crystal Display (20x4):-

A 20x4 LCD display is a very basic module that is commonly used in many devices and circuits. It is preferable to use these modules instead of seven segment and other multi-segment LEDs. This is because LCDs are economical, easily programmable, are capable of displaying custom characters (unlike seven segments), animations, and so on.

A 20x4 LCD can display 20 characters per line and there are 4 such lines. The LCD displays each character as a 5x7 pixel matrix. There are two registers on this LCD, namely Command and Data

The LCD on this controller is standard HD44780.

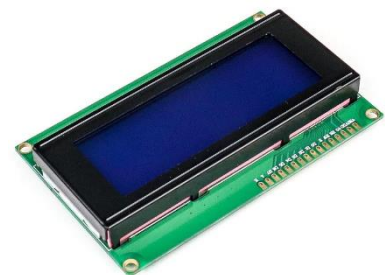


Fig 9 20x4 LCD

1. 20 Characters x 4 Lines
2. Built-in HD44780 Equivalent LCD Controller
3. Works directly with ATMEGA, ARDUINO, PIC and many other microcontroller /kits.
4. 4 or 8 bit data I/O interface
5. Low power consumption

Pin Configuration

Pin No:	Pin Name:	Parameters
Pin#1	It denoted as Vss	It is ground pinout potential at this pinout is zero.
Pin#2	It denoted as Vdd	At this pinout, five volts are provided.
Pin#3	This pinout denoted as Vo	This pinout is used to set the contrast of the screen.
Pin#4	This pin denoted as RS	It used to H/L register select signal.
Pin#5	It denoted as R/W	It used for H/L read/write signal.
Pin#6	This pinout denoted as E	It used for H/L enable signal.
Pin#7-14	The pinouts from seven to fourteen denoted as DB0 – DB7.	It used for H/L data bus for 4 bit or 8-bit mode.
Pin#15	It identified as A (LED+)	It used to set backlight anode.
Pin#16	It recognized as K (LED-).	It used to set backlight cathode.

WORKING OF GUN OXIMETER.

- In the Gun oximeter, Ultrasonic sensor detects the Human Presence. Once a Object is detected at certain distance Gun Oximeter is switched on.
- After switching on , when object is at particular distance, temperature sensor gets activated and temperature is displayed on LCD display.
- Then after temperature , person is asked to get more closer to the gun oximeter for SPo2 detection. After standing at particular distance , SPO2 sensor gets activated and spo2 level is displayed.
- The distances for which the sensors should switched on and off can be decided by user. after the data is being captured it is then sent to the python server.
- The Python server will then send the data to the Django Web page .
- Once the temperature and spo2 readings are displayed on the webpage the user can then enter the person's information.
- After the form is filled it is submitted . This data is saved in the MySQL database.
- This data can be used for future uses.

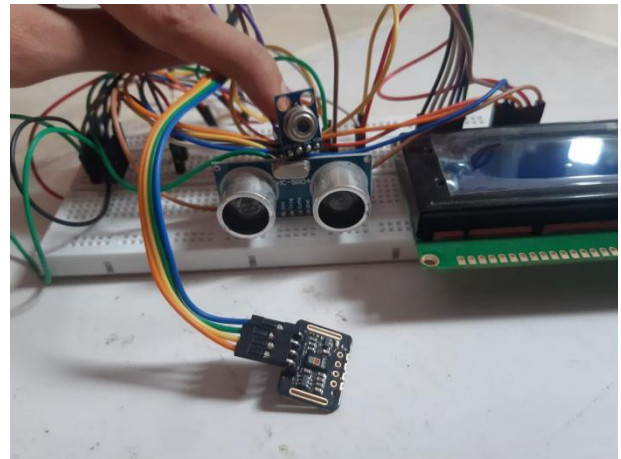
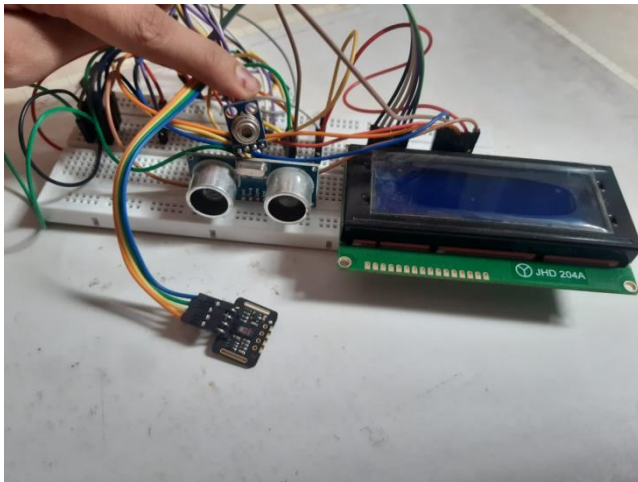


Fig 10 Hardware Circuit

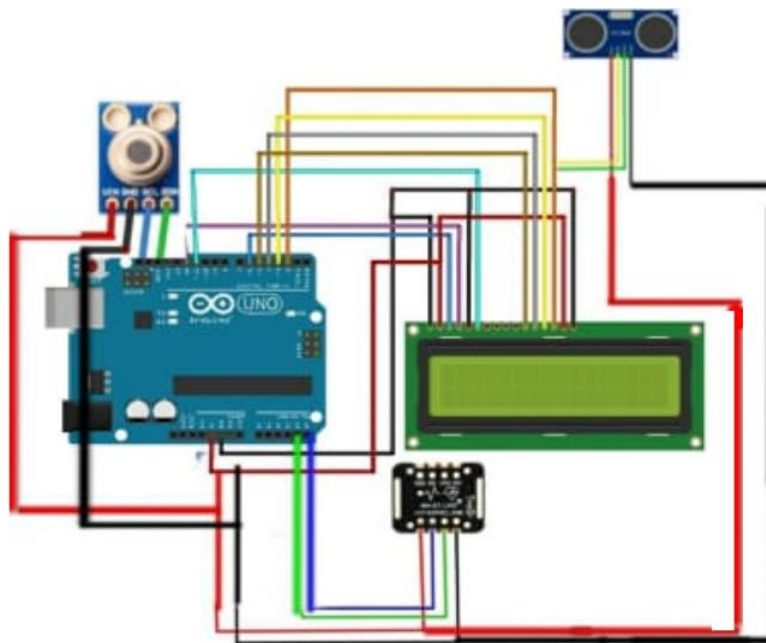


Fig 11 Circuit Diagram

Software design

We created the web site using **Django Framework** also we can display and store the data

What is the Django Framework?

Django is open-source python web framework used for rapid development, maintainable, clean design, and secure websites. A framework is a toolkit of all components needed for application development. We can use this component directly

The goal of the **Django** framework is to allow developers to focus on the main components of the application . Django is fully featured than many other frameworks on the market. It takes care of all other backend components and enables users to focus on developing components needed for their application.

Top 5 Uses of Django

1. Easy to Use
2. It's fast and simple
3. Excellent Documentation for real-world application
4. It's secure
5. It suits any web application project

Django MTV architecture components:

- **Model:** it defines the logical data structure.. All the classes representing the logical structure of the database are stored in a script named **models.py**.
- **View:** it defines the business logic, in the sense that it communicates with the model and translates it into a format readable by the Template. **A view is a Python function, which takes a request as input and returns a Web response as output.**
- **Template:** it defines the structure or the layout of a file, such as a HTML file. **It is a text document or a Python string encoded through the Django template language.**

The following figure illustrates the Django MTV architecture and how the Model, Template and View components interact each other:

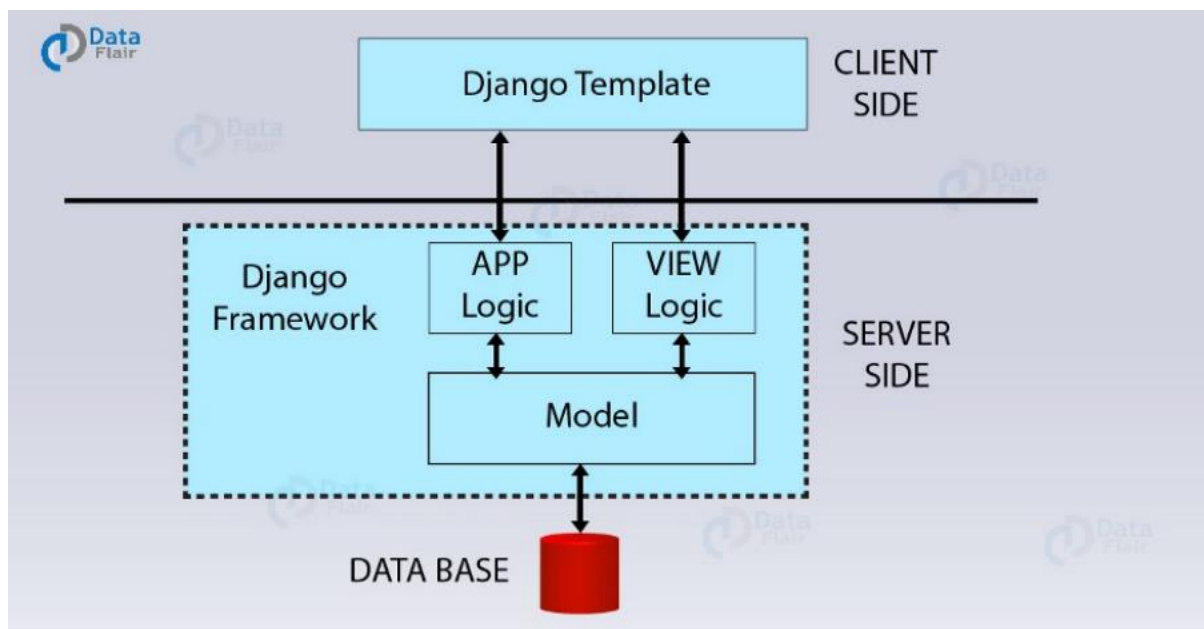
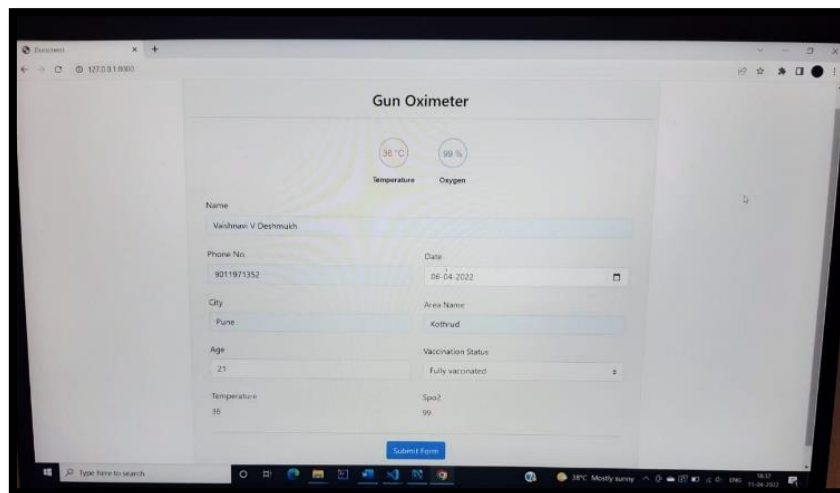


Fig 12 Django Work Flow

This is our website which we have created . In this web site we have created different fields for persons information and also we have interface hardware readings with software so we displayed the readings on our website for temperature and oxygen . For person information we have created fields like name , age, address etc.



Gun Oximeter

36 °C 98 %
Temperature Oxygen

Name
Vaishnavi V Deshmukh

Phone No
9011971352

Date
06-04-2022

City
Pune

Area Name
Kothrud

Age
21

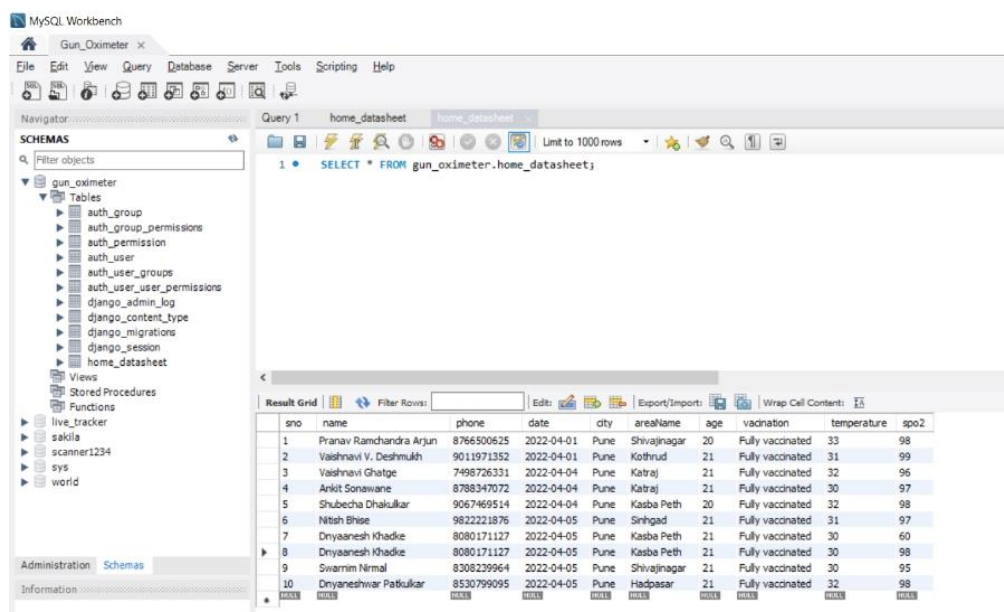
Vaccination Status
Fully vaccinated

Temperature
36

SpO2
99

Submit Form

We have also connected data base to our web site . We have used my SQL database for storing the data . When we submit the form then all the data of person with readings of temperature and oxygen will be stored in the database . Thus in this structured manner we can easily store the data .We can use this data for further analysis .



MySQL Workbench

Gun_Oximeter

Query 1 home_datasheet home_datasheet

1 • SELECT * FROM gun_oximeter.home_datasheet;

sno	name	phone	date	city	areaName	age	vaccination	temperature	spo2
1	Pranav Ramchandra Arjun	8766500625	2022-04-01	Pune	Shivajinagar	20	Fully vaccinated	33	98
2	Vaishnavi V. Deshmukh	9011971352	2022-04-01	Pune	Kothrud	21	Fully vaccinated	31	99
3	Vaishnavi Ghatge	7498726331	2022-04-04	Pune	Katraj	21	Fully vaccinated	32	96
4	Ankit Sonawane	8788347072	2022-04-04	Pune	Katraj	21	Fully vaccinated	30	97
5	Shubecha Dhakulkar	9067469514	2022-04-04	Pune	Kasba Peth	20	Fully vaccinated	32	98
6	Nitish Bhise	9822221876	2022-04-05	Pune	Sinhgad	21	Fully vaccinated	31	97
7	Dnyaanesh Khadke	8080171127	2022-04-05	Pune	Kasba Peth	21	Fully vaccinated	30	60
8	Dnyaanesh Khadke	8080171127	2022-04-05	Pune	Kasba Peth	21	Fully vaccinated	30	98
9	Swarnim Nirmal	8308239964	2022-04-05	Pune	Shivajinagar	21	Fully vaccinated	30	95
10	Dnyaaneshwar Patulkar	8530799095	2022-04-05	Pune	Hadapsar	21	Fully vaccinated	32	98

Code

1. Arduino Code :

```
//GUN OXIMETER.
// Adding libraries
#include <Wire.h>
#include "MAX30105.h"
#include "spo2_algorithm.h"
#include <Adafruit_MLX90614.h>
#include <LiquidCrystal.h>
int Contrast=145;
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
int temp;
#include<NewPing.h>
const int trigPin = 9;
const int echoPin = 10;
float duration, distance;
Adafruit_MLX90614 mlx = Adafruit_MLX90614();
MAX30105 particleSensor;
#define MAX_BRIGHTNESS 255
#if defined(__AVR_ATmega328P__) || defined(__AVR_ATmega168__)
//Arduino Uno doesn't have enough SRAM to store 100 samples of IR led data and red led data
in 32-bit format
//To solve this problem, 16-bit MSB of the sampled data will be truncated. Samples become
16-bit data.
uint16_t irBuffer[50]; //infrared LED sensor data
uint16_t redBuffer[50]; //red LED sensor data
#else
uint32_t irBuffer[50]; //infrared LED sensor data
uint32_t redBuffer[50]; //red LED sensor data

#endif
int32_t bufferLength; //data length
int32_t spo2; //SPO2 value
int8_t validSPO2; //indicator to show if the SPO2 calculation is valid
int32_t heartRate; //heart rate value
int8_t validHeartRate; //indicator to show if the heart rate calculation is valid

byte pulseLED = 11; //Must be on PWM pin
byte readLED = 13; //Blinks with each data read

void setup() {
  //LCD Set UP
  analogWrite(6,Contrast);
  lcd.begin(20, 4);

  //Presence Sensor Setup
  pinMode(trigPin, OUTPUT);
```

```

pinMode(echoPin, INPUT);
Serial.begin(9600);

// //HR and SPO2 Sensor Setup
Serial.begin(9600); // initialize serial communication at 115200 bits per second:
pinMode(pulseLED, OUTPUT);
pinMode(readLED, OUTPUT);

if (!particleSensor.begin(Wire, I2C_SPEED_FAST)) //Use default I2C port, 400kHz speed
{
  Serial.println(F("MAX30105 was not found. Please check wiring/power."));
  while (1);
}
Serial.read();

byte ledBrightness = 60; //Options: 0=Off to 255=50mA
byte sampleAverage = 4; //Options: 1, 2, 4, 8, 16, 32
byte ledMode = 2; //Options: 1 = Red only, 2 = Red + IR, 3 = Red + IR + Green
byte sampleRate = 100; //Options: 50, 100, 200, 400, 800, 1000, 1600, 3200
int pulseWidth = 411; //Options: 69, 118, 215, 411
int adcRange = 4096; //Options: 2048, 4096, 8192, 16384

particleSensor.setup(ledBrightness, sampleAverage, ledMode, sampleRate, pulseWidth,
adcRange);
//Configure sensor with these settings
mlx.begin();
}

void loop() {
  digitalWrite(trigPin, LOW);
  delayMicroseconds(1000);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(1000);
  digitalWrite(trigPin, LOW);

  duration = pulseIn(echoPin, HIGH);
  distance = (duration*.0343)/2;

  lcd.clear();
  lcd.setCursor(0, 0);

  lcd.print(distance);
  lcd.print(",");

  // Temperature

  temp= mlx.readObjectTempC();

  //LCD

```



```

delay(500);
lcd.clear();
lcd.setCursor(0, 2);
lcd.print("temperatre= ");
lcd.print(mlx.readObjectTempC());
lcd.print("C");
delay(1000);

//SPO2

long irValue = particleSensor.getIR();
bufferLength = 50; //buffer length of 100 stores 4 seconds of samples running at 25sps

//read the first 50 samples, and determine the signal range
for (byte i = 0 ; i < bufferLength ; i++)
{
    while (particleSensor.available() == false) //do we have new data?
        particleSensor.check(); //Check the sensor for new data

    redBuffer[i] = particleSensor.getRed();
    irBuffer[i] = particleSensor.getIR();
    particleSensor.nextSample();
}
    maxim_heart_rate_and_oxygen_saturation(irBuffer,  bufferLength,  redBuffer,  &spo2,
    &validSPO2, &heartRate, &validHeartRate);

//Continuously taking samples from MAX30102. Heart rate and SpO2 are calculated every
1 second
while (1)
{
    //dumping the first 25 sets of samples in the memory and shift the last 75 sets of samples to
the top
    for (byte i = 15; i < 50; i++)
    {
        redBuffer[i - 15] = redBuffer[i];
        irBuffer[i - 15] = irBuffer[i];
    }

    //take 25 sets of samples before calculating the heart rate.
    for (byte i = 25; i < 50; i++)
    {
        while (particleSensor.available() == false) //do we have new data?
            particleSensor.check(); //Check the sensor for new data
        digitalWrite(readLED, !digitalRead(readLED)); //Blink onboard LED with every data read

        redBuffer[i] = particleSensor.getRed();
        irBuffer[i] = particleSensor.getIR();
        particleSensor.nextSample();

        if (validSPO2){

```

```
Serial.print(distance);
Serial.print(",");
Serial.print(temp);
Serial.print(",");
Serial.print(spo2, DEC);
Serial.println(",");

}
delay(1000);
//LCD
lcd.setCursor(0, 3);
lcd.print("spo2= ");
lcd.print(spo2);
lcd.print("%");
}
maxim_heart_rate_and_oxygen_saturation(irBuffer,  bufferLength,  redBuffer,  &spo2,
&validSPO2, &heartRate, &validHeartRate);
}
}
}
```

Python Code

```
import serial
import time
import schedule
from django.http import JsonResponse
import numpy as np

def Arduino(request):
    arduino = serial.Serial('com3', 9600)
    print('Established serial connection to Arduino')
    data = arduino.readline()
    data = str(data, 'utf')
    data = data.strip('\r\n')
    data = data.split(",")

    # Decalring the varibales
    dist = (data[0])
    temp = (data[1])
    spo2 = (data[2])

    arduino.close()
    return JsonResponse({'temp': temp, 'spo2': spo2})
```

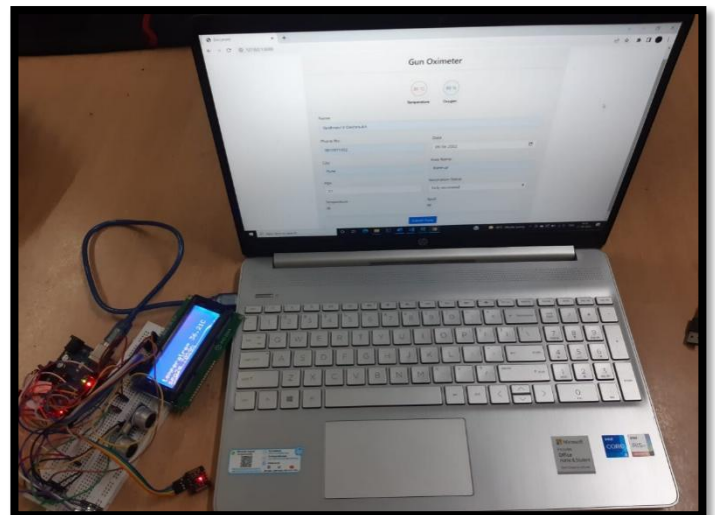
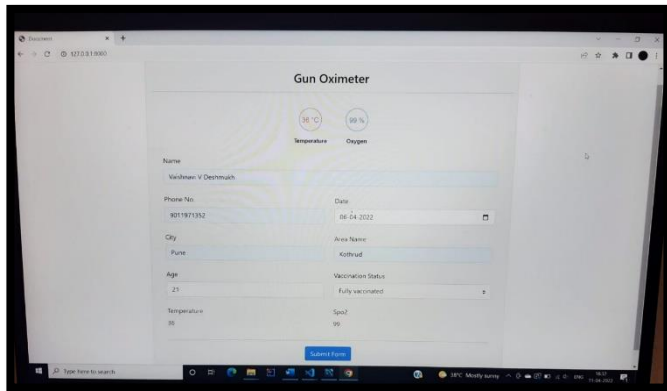


Fig 13 Web Page and Interfacing hardware with software.

Feasibility Study:

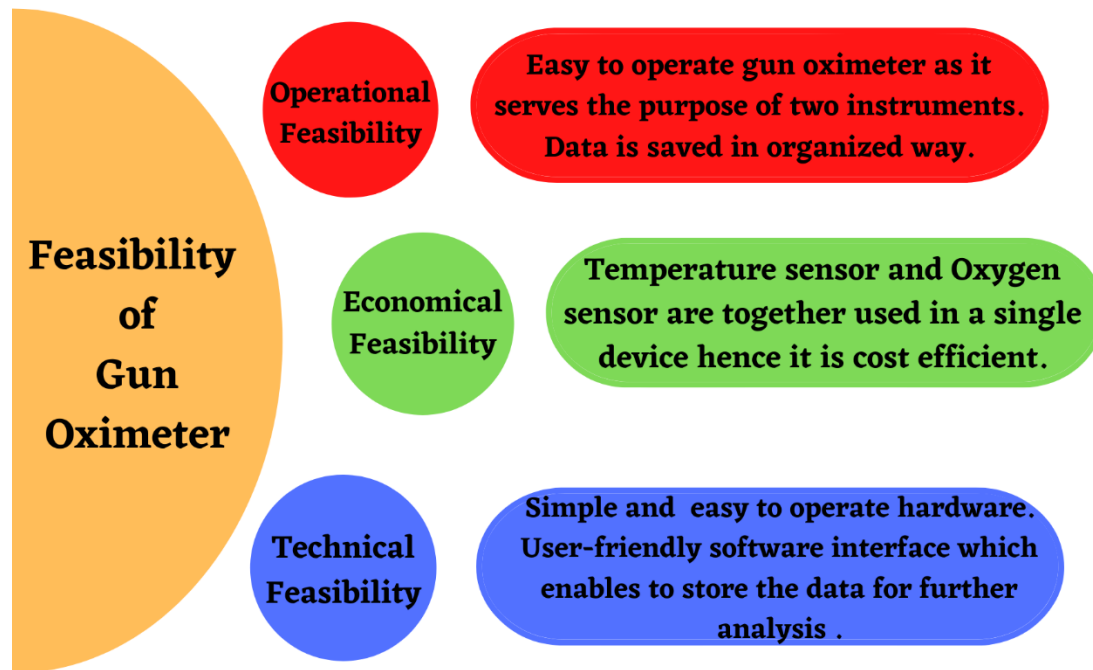


Fig 14 Feasibility Study

Test Results and Analysis

We have taken 10 readings using Gun Oximeter. About 90% of the temperature readings were accurate . The accuracy of temperature sensor of our device is quite good . The readings of the Spo2 sensor fluctuated at times. Invalid readings were captured.

Accuracy of temperature sensor is better than Spo2 sensor.

For the software part we used Django as Web framework and My SQL as Database.

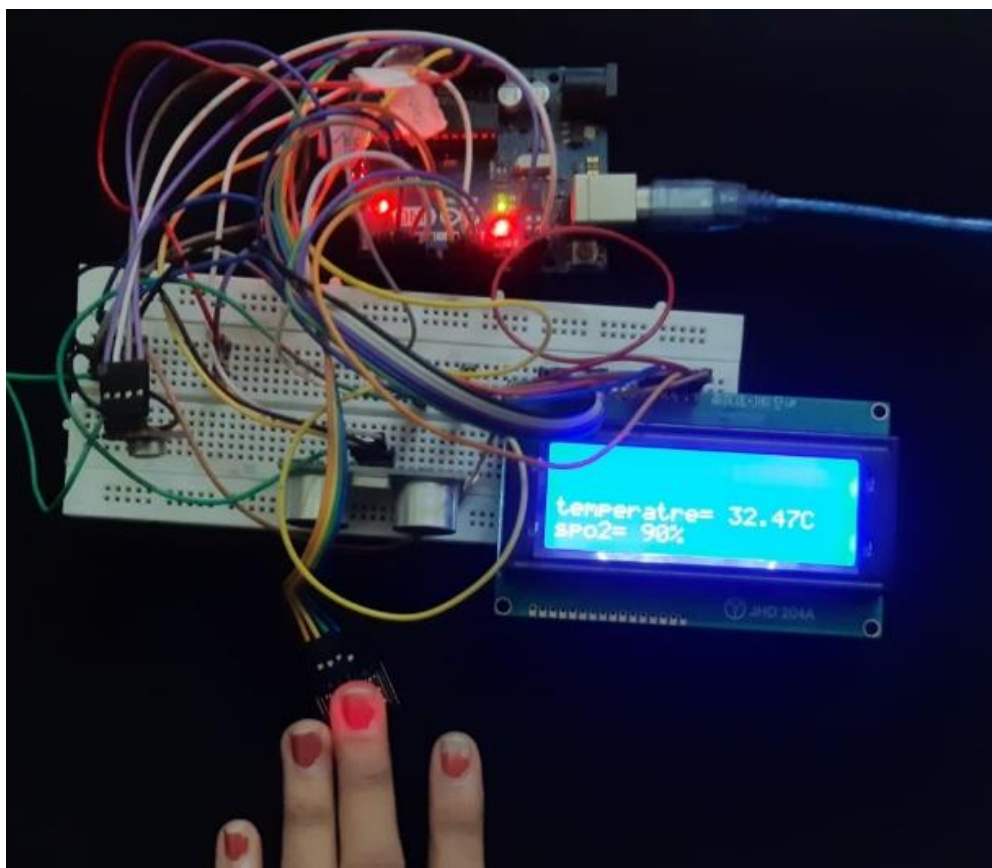


Fig 15 Readings using hardware

Sr.No.	Name	Temperature (Gun oximeter)	Actual Temperature	Oxygen (Gun oximeter)	Actual Oxygen
1	Pranav Ramchandra Arjun	33	31	98	99
2	Vaishnavi V. Deshmukh	31	31	85	98
3	Vaishnavi Ghatge	32	33	89	96
4	Ankit Sonawane	30	30	90	97
5	Shubecha Dhakulkar	32	32	95	98
6	Nitish Bhise	31	31	97	97
7	Dnyaanesh Khadke	30	29	60	99
8	Dnyaanesh Khadke	30	28	98	98
9	Swarnim Nirmal	30	30	87	99
10	Dnyaneshwar Patkulkar	32	31	91	98

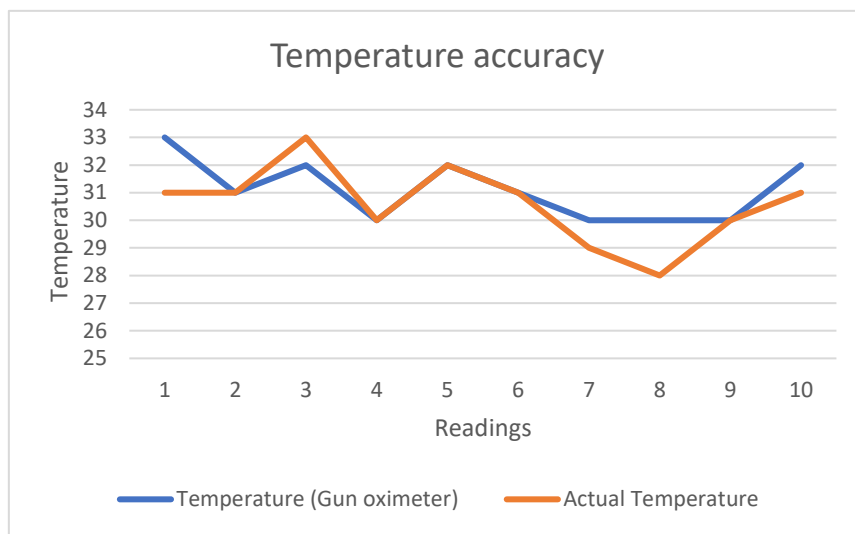


Fig 16 Temperature accuracy graph

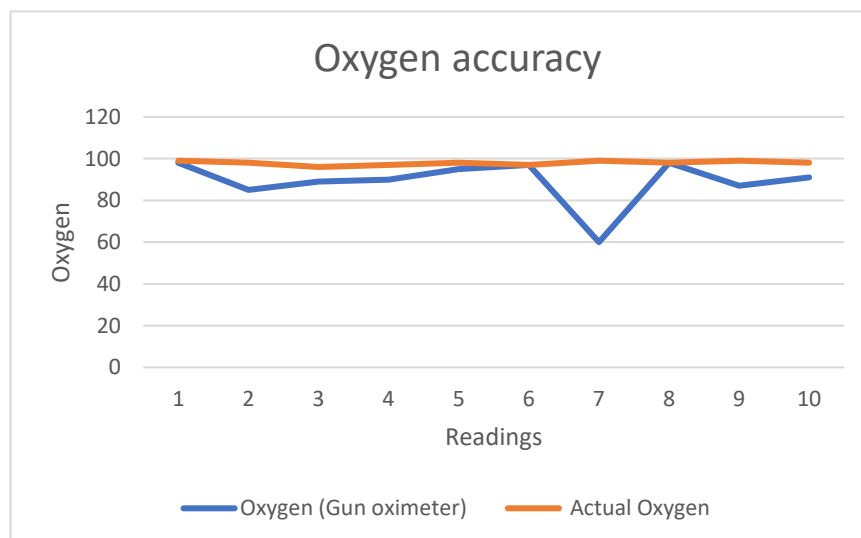


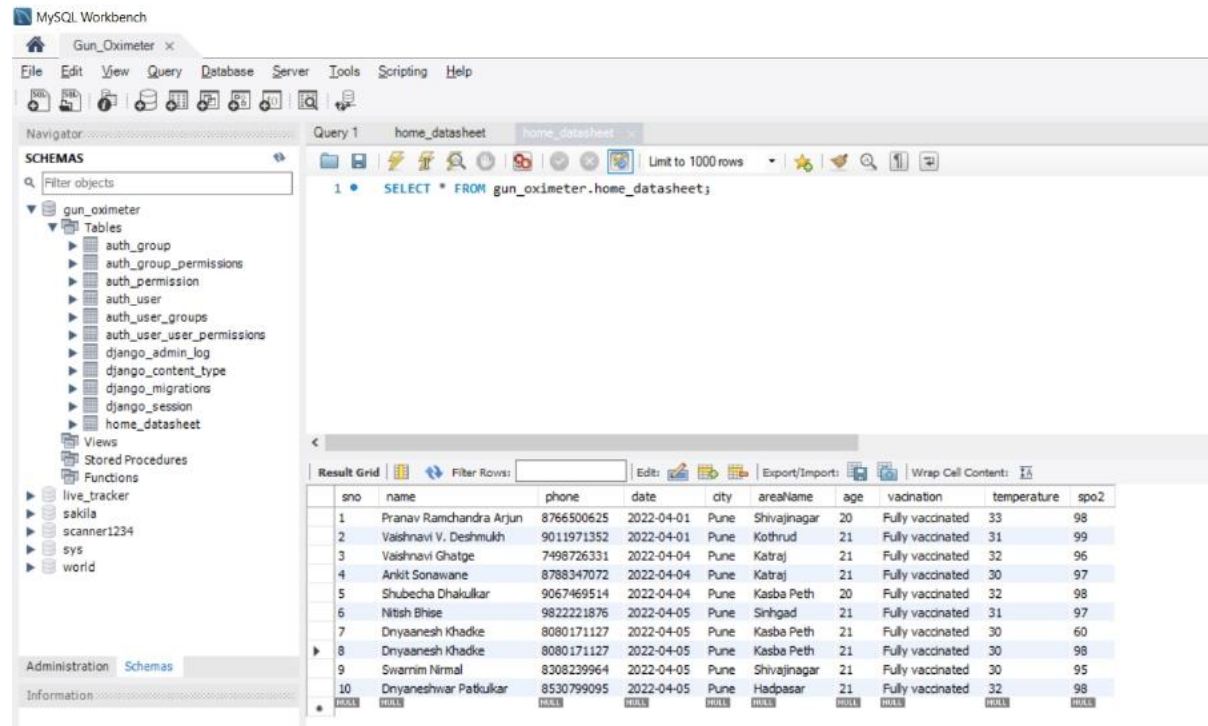
Fig. 17 Oxygen accuracy graph

The 10 readings were saved in the Database as shown below.

In these 10 readings accuracy of temperature sensor is very high as compare to spo2 sensor.

Spo2 sensor readings are fluctuating as you can see reading no 7.

Temperature sensor readings were accurate.



The screenshot shows the MySQL Workbench interface. The left sidebar displays the 'SCHEMAS' tree with the 'gun_oximeter' database selected. The main window shows a query result for the 'home_datasheet' table. The query is 'SELECT * FROM gun_oximeter.home_datasheet;'. The result grid displays 10 rows of data with columns: sno, name, phone, date, city, areaName, age, vaction, temperature, and spo2.

sno	name	phone	date	city	areaName	age	vaction	temperature	spo2
1	Pranav Ramchandra Arjun	8766500625	2022-04-01	Pune	Shivajinagar	20	Fully vaccinated	33	98
2	Vaishnavi V. Deshmukh	9011971352	2022-04-01	Pune	Kothrud	21	Fully vaccinated	31	99
3	Vaishnavi Ghatge	7498726331	2022-04-04	Pune	Katraj	21	Fully vaccinated	32	96
4	Ankit Sonawane	8788347072	2022-04-04	Pune	Katraj	21	Fully vaccinated	30	97
5	Shubecha Dhakulkar	9067469514	2022-04-04	Pune	Kasba Peth	20	Fully vaccinated	32	98
6	Nitish Bhise	9822221876	2022-04-05	Pune	Sinhgad	21	Fully vaccinated	31	97
7	Dnyaanesh Khadke	8080171127	2022-04-05	Pune	Kasba Peth	21	Fully vaccinated	30	60
8	Dnyaanesh Khadke	8080171127	2022-04-05	Pune	Kasba Peth	21	Fully vaccinated	30	98
9	Swarnim Nirmal	8308239964	2022-04-05	Pune	Shivajinagar	21	Fully vaccinated	30	95
10	Dnyaaneshwar Patilkar	8530799095	2022-04-05	Pune	Hadapsar	21	Fully vaccinated	32	98

Fig 18 My SQL Database Workbench

Challenges and Problems faced

1. The sensors not showing accurate readings at times due to fluctuations.
2. Delay in outputs. (eg MAX30102 takes 50 samples)
3. Looping the functioning of the three sensors simultaneously.
4. Power and memory management of prototype and Arduino board.

CONCLUSION

We have built an IOT based project . This project is divided into two main parts . Hardware and Software. We have built a device which can measure temperature and oxygen . Moreover this data will be store on MySql database. We have Arduino as our microcontroller to interface with the sensors.

For the storing part we have developed a webpage which can store the person's readings along with the information. This data will be further analyzed for future uses.

References

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3. Current COVID-19 Analysis and Future Pandemics Prediction using Internet of Everything (IoE) Shivangi Sharma Ajay Kumar Singh M.Tech (CSE) Dept. Of CSE Computer Science and Engineering Computer Science and Engineering
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5. COVID-19 Self-Detection Magic Mirror With IoTbased Heart Rate and Temperature Sensors Maria Seraphina Astriani Computer Science Department, Faculty of Computing and Media Bina Nusantara University Jakarta, Indonesia 11480 seraphina@binus.ac.id Andreas Kurniawan Computer Science Department, Faculty of Computing and Media Bina Nusantara University Jakarta, Indonesia 11480

APPENDIX

A1 Bill of Material:

1. Arduino Board-459/-
2. MLX90614 temperature sensor – 1500/-
3. LCD – 200/-
4. MAX30102 SPO2 sensor – 500/-
5. Distance Sensor- 300/-
6. Bread Board – 100/-
7. Jumper wires-100/-

A2 Datasheets:

1. MAX30102 Datasheet

[<https://datasheets.maximintegrated.com/en/ds/MAX30102.pdf>]

2. MLX90614

[https://www.sparkfun.com/datasheets/Sensors/Temperature/MLX90614_rev001.pdf]

3. Arduino UNO R3

[<https://www.farnell.com/datasheets/1682209.pdf>]