GURU NANAK KHALSA COLLEGE

AUTONOMOUS

(UNIVERSITY OF MUMBAI)

MUMBAI - 400 019.

DEPARTMENT OF INFORMATION TECHNOLOGY

CERTIFICATE

Exam.
Seat No. ____________

Date ____________

CERTIFIED that the practicals, assignments duly signed, were performed by Mr./ Ms. Shaikh Mohammad Zahid Faiyaz Ahsan Roll No. 453 of F.Y. / S.Y. / T.Y.B. Sc. class in the Information Technology Laboratory of G. N. Khalsa College, Mumbai during the academic year 20 23 20 24 He/She has completed the course of Laboratory assignments in Information Technology as contained in the course prescribed by University of Mumbai.

Zahida

Sign. of the Student

Date ____________

Head of Dept.
Information Technology

Date ____________

Professor-in-charge

1) ____________

Date ____________

2) ____________

Date ____________

Sign. of Examiner's

1) ____________

Date ____________

2) ____________

Date ____________

ACKNOWLEDGEMENT

I would like to extend our sincere and heartfelt thanks towards all those who have helped me in making this project. Without their active guidance, help, cooperation and encouragement, I would not have been able to present the project on time.

I extend my sincere gratitude to **my Prof Dr. Jasbir Kaur** and to our HOD of Information Technology Department **Dr. Jasbir Kaur** for their moral support and guidance during the tenure of my project.

I also acknowledge with deep sense of reverence, my gratitude towards my parents, my friends and other faculty members of the college for their valuable suggestions given to me in completing the project.

DECLARATION

I hereby declare that the project entitled, "**PATIENT HEALTH MONITORING**" done at **G. N. KHALSA COLLEGE OF ARTS, SCIENCE & COMMERCE**, has not been in any case duplicated to submit to any other universities for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other university.

The project is done in partial fulfilment of the requirements for the award of degree of **BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)** to be submitted as Internet of things (IOT) semester project as part of our curriculum.

Shaikh Mohammad Zahid Faiyaz Ahsan [453]

Shifa Md Ali Shaikh [455]

TABLE OF CONTENTS

PATIENT HEALTH MONITORING

1.INTRODUCTION

In today's fast-paced world, time is an invaluable resource, and the need for efficient and accurate healthcare solutions is paramount. Our IoT Patient Health Monitoring is a response to this demand. We have harnessed the power of the Internet of Things (IoT) to create a groundbreaking system for monitoring heart pulse rates, delivering timely and precise health insights to individuals.

Our project addresses the critical need for real-time patient health monitoring. In an era where health-consciousness is on the rise, and early detection of heart-related issues is crucial, our IoT-based system offers a solution that combines cutting-edge technology and medical expertise.

This project leverages a combination of components, including the MAX30100 pulse oximeter sensor, Arduino, and IoT connectivity, to create a sophisticated yet user-friendly platform. It allows individuals to monitor their heart pulse rates remotely and instantly share this data with healthcare professionals or loved ones.

As with any advanced technology, the emphasis on precision, safety, and ethical use is of utmost importance. Our project aligns with these principles to ensure that the heart pulse data collected is not only accurate but also secure and accessible only to authorized parties.

In this documentation, we will delve into the intricacies of our IoT ‘s Project, covering the hardware setup, sensor interfacing, data acquisition, wireless communication, and data visualization. This project has the potential to improve the quality of life for individuals, enhance healthcare practices, and contribute to a healthier society as a whole.

• PURPOSE

The purpose of the Patient health Monitoring is to provide a reliable and user-friendly solution for continuous and accurate monitoring of an individual's heart rate. This system is designed with the primary goal of promoting proactive health management and early detection of heart-related issues. By offering real-time heart rate data, historical trend analysis, and customizable alert mechanisms, the system empowers user to monitor their cardiovascular health effectively. Whether for personal use or healthcare professionals, the system's purpose is to assist in making informed decisions, initiating timely medical interventions, and ultimately contributing to the overall well-being and quality of life of its users. Additionally, the system aims to align with ethical principles, ensuring data security, privacy, and regulatory compliance, thereby enhancing trust and confidence in its use for healthcare applications.

• SCOPE

The scope of the Patient Health Monitoring is broad, encompassing various healthcare applications and extending into the realm of personal health management and medical diagnostics. This innovative system holds significant potential for a wide range of uses, including but not limited to:

1. **Personal Health Monitoring**: The system enables individuals to monitor their heart rate continuously and conveniently, offering insights into their overall cardiovascular health. This feature is particularly valuable for those with existing heart conditions or individuals striving for a healthier lifestyle.

2. **Early Detection of Cardiac Abnormalities**: By providing real-time heart rate data, the system can play a vital role in the early detection of cardiac irregularities such as arrhythmias, tachycardia, or bradycardia. This early warning can lead to timely medical intervention and potentially life-saving measures.

3. Fitness and Exercise Tracking: The system can be integrated into fitness wearables, aiding fitness enthusiasts in tracking their heart rate during workouts, ensuring that they stay within their target heart rate zones for effective exercise.

4. Telemedicine and Remote Monitoring: Healthcare providers can leverage the system for remote patient monitoring, allowing them to assess patients' heart rates and overall cardiovascular health from a distance.

5. Stress Management: The system's continuous heart rate monitoring can assist individuals in managing stress by providing real-time feedback on heart rate changes, helping them identify stress triggers and adopt relaxation techniques.

• APPLICABILITY

The applicability of the Patient health Monitoring extends to a wide range of healthcare and wellness scenarios, making it a valuable tool for individuals, healthcare professionals, and medical institutions.

In the realm of personal health monitoring, the system offers individuals the ability to track their heart rates in real-time. This is especially useful for those managing chronic health conditions, such as heart disease or hypertension, as it enables early detection of irregular heart rhythms and the timely adjustment of treatment plans. Furthermore, athletes and fitness enthusiasts can utilize the system to optimize their training regimens and ensure they are exercising within safe heart rate zones.

In healthcare facilities, the Heart Pulse Detection System plays a critical role in patient care. Medical professionals can use the system for continuous heart rate monitoring in hospital settings, especially in intensive care units and during surgical procedures. It aids in the early identification of cardiac issues and provides data for making informed clinical decisions.

The system also finds applications in telemedicine and remote patient monitoring. Patients in remote or home-based care can benefit from regular heart rate monitoring, and the data can be transmitted to healthcare providers for timely interventions. This not only enhances patient comfort but also reduces the need for frequent hospital visits. Beyond individual health and clinical settings, the system's applicability extends to research and data collection. Medical researchers can employ the system to gather heart rate data for studies related to cardiovascular health, stress, and sleep patterns, contributing to a deeper understanding of these areas.

2.COMPONENTS AND MATERIALS

• ARDUINO UNO

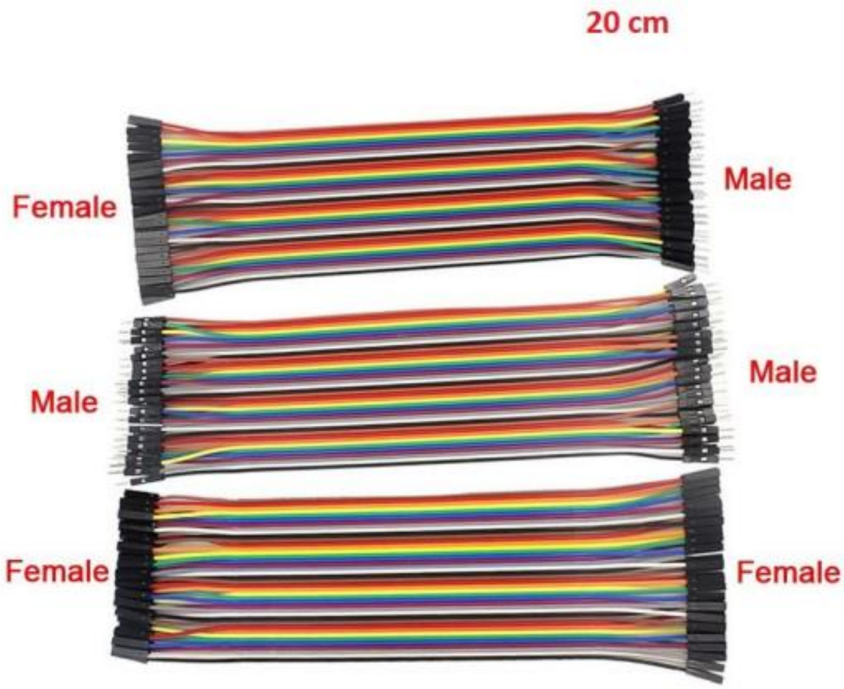
The Arduino is a versatile microcontroller platform that serves as the brain of the Human Health monitoring. It is responsible for controlling and coordinating the various components of the system, processing data from the MAX30100 sensor, and displaying information on the LCD screen. Arduino boards are known for their user-friendly programming environment and wide range of applications in electronics and automation.

• I2C BASED 16X2 LCD DISPLAY

The I2C-based 16x2 LCD (Liquid Crystal Display) is a visual interface that provides a user-friendly output for the Heart Pulse Detection System. It offers a clear and easily readable two-line, sixteen-character display. The I2C interface simplifies connectivity, reducing the number of wires required for communication with the Arduino. The LCD display is an essential component for visualizing heart rate data and system status.

• JUMPER WIRES

Jumper wires are fundamental for establishing electrical connections between various components in the system. They come in different lengths and can be easily plugged into components, breadboards, and connectors to facilitate signal and power transfer. Jumper wires simplify the wiring process, making it more organized and efficient.

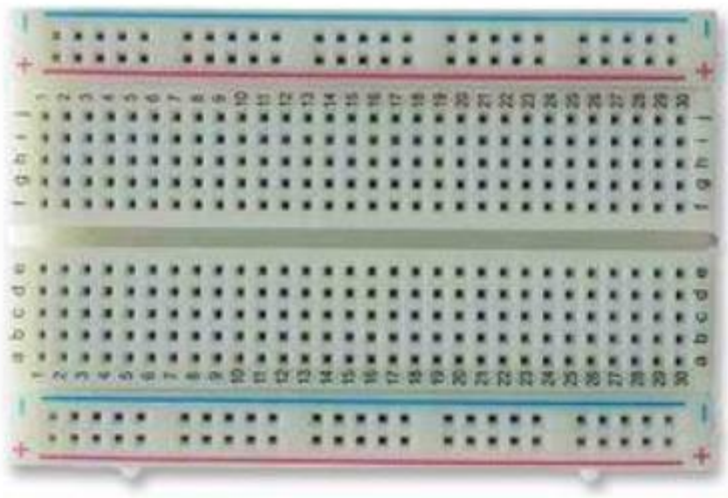


• MAX30100 PULSE OXIMETER SENSOR

The MAX30100 Pulse Oximeter Sensor is a crucial component for heart rate monitoring in the system. It combines red and infrared LEDs with a photodetector to measure the amount of oxygen in the blood, providing an accurate heart rate reading. This sensor plays a pivotal role in the real-time data acquisition and forms the core of the system's health monitoring capability.

• **BREADBOARD**

The mini breadboard is a prototyping tool that enables the temporary assembly of electronic circuits during the system's development. It consists of a grid of interconnected holes that accommodate components, facilitating experimentation and testing. The breadboard allows for quick and easy circuit design without the need for soldering.



• HW BATTERY

The hardware battery provides a portable power source for the Human Health Monitoring, ensuring its functionality in various settings. Depending on the specific battery type and capacity chosen, it can power the system for extended periods, making it suitable for mobile and remote health monitoring applications.

• DC JACK

The DC jack is an interface for connecting an external power supply to the system. It allows the system to operate when not powered by the battery. The DC jack provides a convenient and reliable means of supplying power to the system and is especially useful in situations where continuous operation is required.

3.HARDWARE SETUP-CONECTION

Step 1: Prepare the Hardware:

• Ensure that all the required components are in working condition and free from defects.

• Make sure you have the necessary cables and connectors ready.

Step 2: Connect the I2C-Based LCD Display:

• Connect the I2C-based LCD display to the Arduino using jumper wires. The LCD should have SDA (Serial Data) and SCL (Serial Clock) pins for I2C communication.

• Connect the SDA pin from the LCD to the A4 pin on the Arduino.

• Connect the SCL pin from the LCD to the A5 pin on the Arduino.

• Connect the VCC and GND pins from the LCD to the 5V and GND pins on the Arduino, respectively.

Step 3: Connect the MAX30100 Sensor to Breadboard:

Step 4: Connect the MAX30100 Sensor:

• Connect the MAX30100 Pulse Oximeter Sensor to the Arduino using jumper wires.

• Connect the VIN pin from the MAX30100 to the 5V pin on the Arduino.

• Connect the GND pin from the MAX30100 to the GND pin on the Arduino.

• Connect the SCL and SDA pins from the MAX30100 to the corresponding A5 and A4 pins on the Arduino for I2C communication.

Step 5: Load and Upload Arduino Code:

• Write or obtain the Arduino code for reading and displaying heart rate data from the MAX30100 sensor on the I2C-based LCD display.

• Upload the code to the Arduino using the Arduino IDE and a USB cable.

Step 5: Power Supply:

• If you are using a hardware (HW) battery, connect its positive and negative terminals to the VIN and GND pins on the Arduino, respectively.

• Alternatively, if you have a DC jack for external power, connect it to the Arduino to power the system.

Step 6: Verify and Monitor:

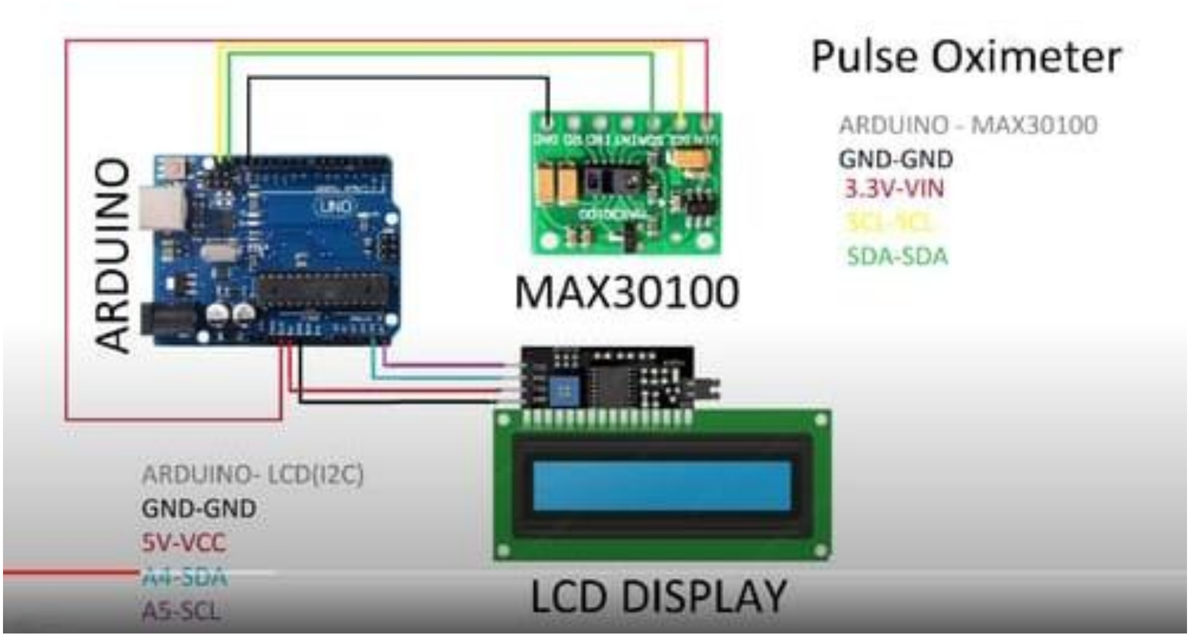
• Once the code is uploaded and the connections are in place, the Human Health Monitoring should start displaying real-time heart rate data on the LCD display.

Step 7: Fine-Tuning and Testing:

• Adjust the system's settings, thresholds, or features as needed to meet the specific requirements of your application.

• Test the system's functionality, accuracy, and reliability, making any necessary adjustments.

4. CIRCUIT DIAGRAM



5.SOFTWARE REQUIREMENT

For Coding and Uploading the Sketch, the Arduino Software (Arduino-IDLE) is Used

6.ARDUINO CODE

In this code, I used a two library MAX30100_PulseOximeter & LiquidCrystal_I2C. Which we needed to install on Arduino idle

CODE:

```
#include <Wire.h>
#include "MAX30100_PulseOximeter.h"
#include <LiquidCrystal_I2C.h>
#define REPORTING_PERIOD_MS 1000

LiquidCrystal_I2C lcd(0x27,16,2);

PulseOximeter pox;
uint32_t tsLastReport = 0;
int sp = 0;
int hr = 0;
byte Heart[] = {
B00000,
B01010,
B11111,
B11111,
B01110,
B00100,
B00000,
B00000};
```

```
void onBeatDetected() {
        Serial.println("Beat!");
}
void setup() {
        Serial.begin(9600);

Serial.print("Initializing pulse oximeter..");
lcd.init();
lcd.backlight();
lcd.createChar(0, Heart);

lcd.setCursor(0,0);
lcd.print(" PATIENT HEALTH ");
lcd.setCursor(0,1);
lcd.print(" MONITORING ");
delay(2000);
lcd.clear();

lcd.setCursor(0,0);
lcd.print(" SYSTEM USING ");
lcd.setCursor(0,1);
lcd.print(" ARDUINO ");
delay(2000);
lcd.clear();
```

```
if (!pox.begin()) {
        Serial.println("FAILED");
for(;;);
} else {
        Serial.println("SUCCESS");
}

pox.setIRLedCurrent(MAX30100_LED_CURR_7_6MA);
pox.setOnBeatDetectedCallback(onBeatDetected);
}
void loop() {
        pox.update();
                if (millis() - tsLastReport > REPORTING_PERIOD_MS) {
                        hr = pox.getHeartRate();

sp = pox.getSpO2();
lcd.setCursor(0,0);
lcd.print("HEART RATE:");
lcd.print(hr);
lcd.write(0);
lcd.print(" ");
Serial.print("HEART RATE:");
Serial.print(hr);
```

```
lcd.setCursor(0,1);
lcd.print("SpO2 LEVELS:");
lcd.print(sp);
lcd.print("% ");
Serial.print("bpm / SpO2:");
Serial.print(sp);
Serial.println("%");
tsLastReport = millis();
}
}
```

7.REFERENCES AND RESOURCES

1.Introduction

https://www.healthline.com/health/normal-blood-oxygen-leve

https://www.lung.org/lung-health-diseases/lung-procedures-and-tests/pulse-oximetry

2.Hardware and component

https://docs.arduino.cc/software/ide-v1/tutorials/arduino-ide-v1-basics

https://www.dfrobot.com/product-135.html#:~:text=This%20I2C%2016x2%20Arduino%20LCD,All%20connectors%20are%20standard%20XH2.

https://blog.sparkfuneducation.com/what-is-jumper-wir

https://www.analog.com/media/en/technical-documentation/data-sheets/max30100.pdf

https://learn.sparkfun.com/tutorials/how-to-use-a-breadboard/all

3.Software Requirement

https://www.arduino.cc/en/software