

# Monitoring Body Temperature and Oxygen Level (SpO2) Using IoT

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**Abstract** - Health is characterized by a perfect state of physical, mental, and social well-being, not a complete lack of illness. There are basic factors that people need for health. Life, Unfortunately, the global health problem is due to certain reasons, such as poor health care, long distances between rural and urban areas, and the absence of doctors and nurses. IoT in the recent decade any object is being connected internally and it will be considered the next technological revolution. Smart Health Monitoring System Smart Parking, Smart Home, Smart City, Smart Climate, Industrial Sites, and Agriculture are some of the applications of IoT. The most powerful use of IoT is in healthcare management which provides health and environmental status tracking facilities. IoT is nothing more than connecting computers to the Internet using sensors and networks. These connected components can be used on devices for health care. This paper describes the design and operation of an effective remote patient monitoring system that measures a patient's oxygen level and body temperature. Monitoring body temperature and SPO2 (oxygen level) using IoT.

body temperature outside. Remote patient monitoring saves time for both the patient and the doctor, thus increasing the efficiency and reliability of health services. Oxygen levels and body temperature are the main signs that are measured by a doctor after regular visits.

IoT technology makes certain physical events can have an [9] impact on other things remotely. Using this technology can execute controlling or monitoring something somewhere in the world [10]. Additionally, this technology provides a communication channel between human-to-human, human-to-smart devices, and smart devices-to-smart devices without human interaction. IoT applications have been increasing over time such as smart wearable devices, smart cities, home automation, remote control, and monitor systems. Also, IoT technology has a modern evolution in healthcare systems and fitness applications. This can be an essential step to change the conventional healthcare systems which require patients' existence inside hospitals or clinic centers to check their health parameters. On the other hand, there are some challenges of this technology such as data management, security, privacy, human-cloud interface [10].

**Key Words:** Internet of Things, Healthcare, Sensors, Temperature, Oxygen Level (SpO2).

## 1.INTRODUCTION

There is a growing problem in human health Unfortunately, people have always found it too late to get serious medical care when things are inseparable. But since it is well-known everywhere (or across the continent) it is very dangerous and can be fatal if not tested and treated beforehand. If action is taken as soon as possible, many patients can recover and help stop the spread. Heart rate and body temperature are among the most important indicators of human health. It would be helpful if there was a way to monitor the heart rate and temperature of these people [9].

So, we have a problem. This project focuses on how we can overcome this problem and solve it. Medical professionals use heart rate to track a patient's physical condition. Body temperature is a measure of the body's ability to release heat. It is the main indicator of functioning and health. Keeping the STS temperature in a narrow and safe range is the nature of the human body, despite the large changes in

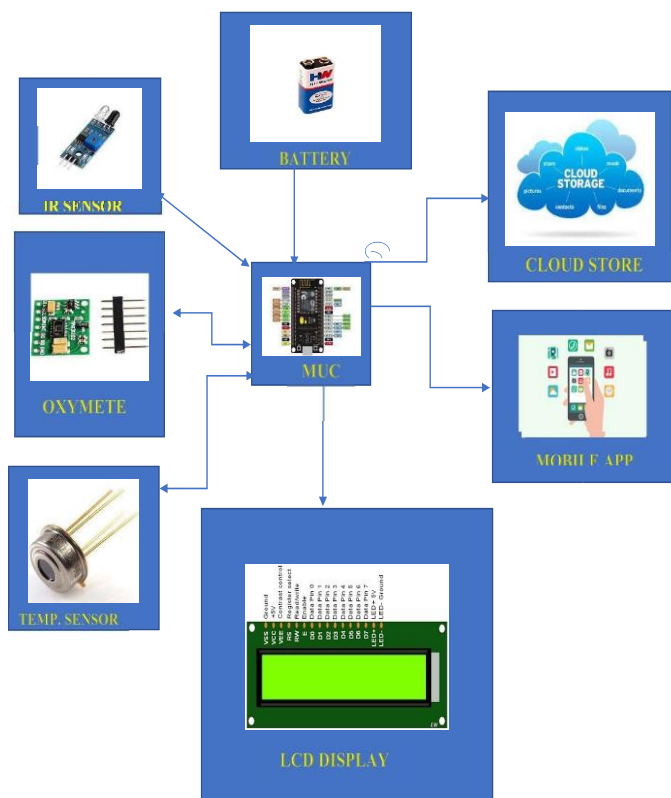


Fig - 1: Block Diagram of the System

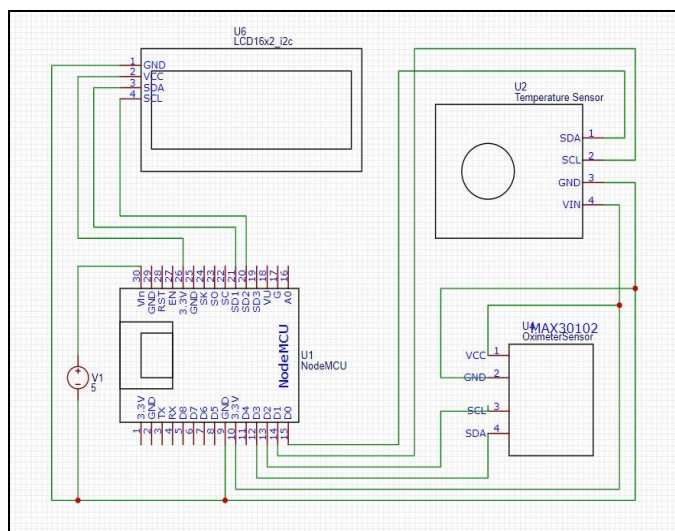


Fig - 2: Circuit Diagram of the System

## 2. WORKING OF THE SYSTEM

The Brain of the system we have built is a microcontroller where every sensor is connected. When it comes to run the system, we need to provide input to MCU which is nothing but the battery supply depending on the availability of resources. Once we provide the power supply MCU gets to start and the IR sensor emits the radiation within the range and monitors the same with temperature sensor.

The detailed working of the system is mentioned below:

This is a prototype model for IoT-based pulse rate monitor, developed a health monitoring system that can monitor basic symptoms of a patient like heart rate, body temperature. Whenever we discover or innovate a system, what we all need is the workflow and how easily we can implement it. The system is implemented using a combination of hardware components. All the hardware components are assembled in the implementation phase as mentioned in the block diagram and the circuit diagram of the developed system is demonstrated in fig. In our system, there are various component includes a temperature sensor, oximeter, and display unit. All the listed components are connected to Node MCU8266 which is an open-source Lua-based firmware and development board specially targeted for IoT-based Applications. The system is located at the entrance of any room it may include an auditorium, classroom, marriage hall, etc.

When An object or a person comes in the distance covered by Infrared Radiation situated at the entrance body temperature will get monitored by The MLX90614 is a Contactless Infrared (IR) Digital Temperature Sensor used to measure the temperature of a particular object ranging from -70° C to 382.2°C [4]. The sensor uses IR rays to measure the temperature of the object without any physical contact and communicates to the microcontroller using the I2C protocol and it will display [4] on 16x2 LCD Display having an Operating Voltage is 4.7V to 5.3V simultaneously person will get notification on mobile via Application for the same [8].

Once temperature displayed on 16x2 LCD Display if it is greater than normal temperature alarm/buzzer will notify and also will get a notification to the person on mobile that you need to check oxygen level by using MAX30102 is an integrated pulse oximeter and heart-rate monitor module for that person has to touch the oximeter sensor once and SpO2 will be measured by the MAX30102 and the same will display on LCD [8]. The MAX30102 operates on a single 1.8V power supply and a separate 5.0V power supply for the internal LEDs [8]. MAX30102 has an Operating Temperature Range of -40°C to +85°C.

### 3. ACTUAL PICTURES/READINGS

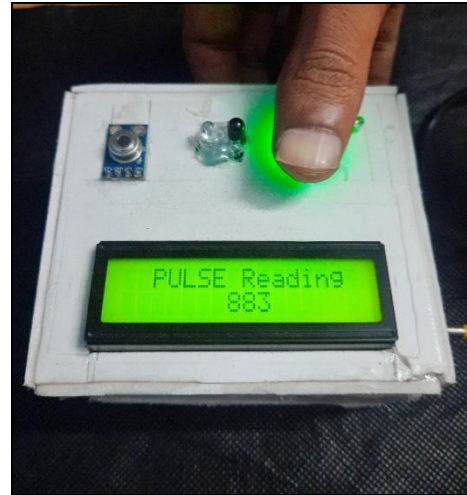


**Fig - 3 (a):** System Image



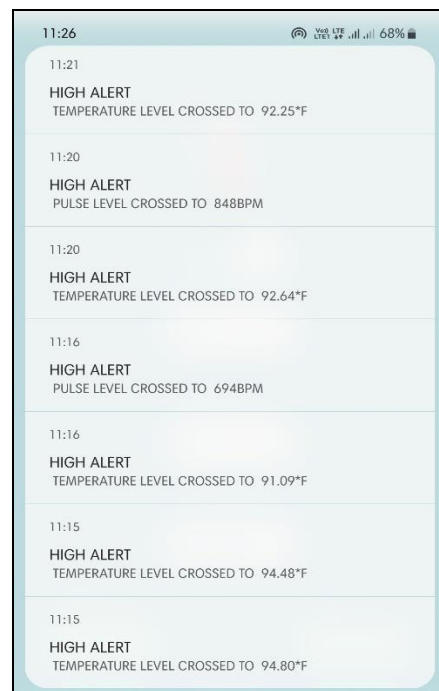
**Fig - 3 (b):** Thermal Temperature Reading

The system measures the thermal temperature in Fahrenheit as shown in Fig - 3 (b).



**Fig - 3 (c):** Pulse Reading

The system measures the pulse reading in the range 700BPM to 900BPM as shown in Fig - 3 (c). The range of this reading is set as per the program of the component which we used for measuring. This is the normal range as per the program.



**Fig - 3 (d):** Notification

The figure shows how the system notifies alerts after measuring the reading of the thermal temperature and the pulse.

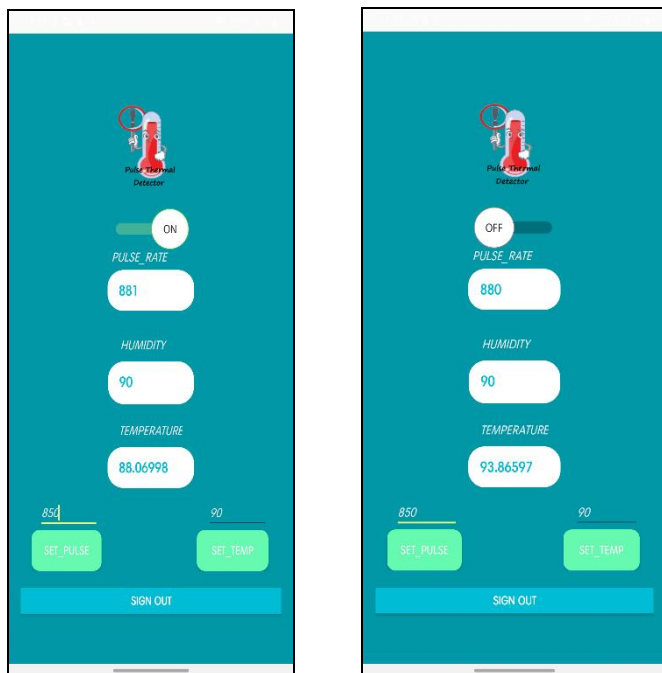


Fig - 3 (e): Application UI

The figure shows the application user interface.

#### 4. ADVANTAGES

- **Advanced healthcare management: -**
  - IoT gadgets help track the administration of drugs and the acknowledgment to the medication and lessen medical failure. By Using IoT projects, healthcare committees can get worthy information about facilities and use it to recommend some new modifications.
- **Reporting and Monitoring: -**
  - This is an asset that IoT projects utilize, through these connected tools, it becomes apparent for doctors to monitor patients' health. Additionally, this actual-time monitoring can conserve lives in medical distress like diabetic attacks, heart failure, asthma attacks, and so forth.
  - Further smart medical device connected to the smartphone app, accumulating medical and other required health data will not be formidable. These IoT devices obtain and transfer health statistics like blood pressure, oxygen levels, and blood sugar, weight, ECGs, and much more.
- **Prohibition: -**
  - For alleviating the diseases and certain medication issues the smart sensors examine health conditions, lifestyle choices, and the context and promote precautionary actions are restriction.

- **Medical data convenience: -**
  - Availability of computerized medical records enable patients to achieve quality care and help healthcare person obtain the appropriate medical decisions and prevent complexities.

#### 5. CHALLENGES/CONFRONTATIONS

- **Data security and privacy: -**
  - With the data cached within IoT enabled devices to prone to information-stealing and it makes the information progressively vulnerable to cyber-criminals that can hack into the core to imperil personal data.
- **Data overload and efficiency: -**
  - The non-consistency of data and correspondence etiquette, it is tough to accumulate data for essential bits of knowledge and investigation. IoT gathers data in magnitude and for relevant data evaluation, the data should be quarantined in pieces without over-burdening with absolute exactness for more suitable conclusions. Over-loading of data may affect the dynamic method in the kindness department in the more drawn-out run.

- **Synthesis: various devices and protocols: -**

- The encompassment of different kinds of devices causes a hindrance in the usage of IoT in the civil security part. The goal of this roadblock is that device inventors haven't agreed on correspondence conventions and benchmarks. This results in a circumstance where each producer presents its different background of IoT devices that don't operate with the devices and implementation of competing inventors.

#### 6. FUTURE SCOPE

- **Peace of Mind: -**
  - A subject at residence solely becomes a risky affair. The circumstance shifts worst when a patient is experiencing dementia. Fortunately, the situation was disastrous earlier that has been concluded with the presence of IoT health monitoring. In addition, wearable tech makes it even more potent. These wearable gadgets detect the patient's health along with transmitting data to the caregiver too. The data can either be transmitted through several ways of message conveying involves text or e-mail while signaling the doctors too.
- **Medicines on Appropriate time: -**
  - How often did you overlook taking medications on time? If your counterclaim is habitual, y'all are somehow like me! This issue has been hit by an IoT



monitoring gadget that keeps track of a patient's prescribed medicine habit.

- **Independent Health Monitoring:** -

- In every medical emergency, folks of any age require prompt help from relevant sources. The necessity for monitoring and conveying the alert to the involved person along with the doctor, IoT domestic health monitoring gadgets are progressing levels of independent health monitoring. From an individual's viewpoint, IoT offers excellent career possibilities which necessitate being harnessed.

- **Healing at Home:** -

- A few years following, observing the patients were confined to the care of family or home attendants in case the patient is recovering at household. Contrary, if a patient is required to be admitted to the hospital, then periodic monitoring is an obvious task. But with time and the initiation of IoT health monitoring tools, the choice of remedial at home turns easy. Inclusion of real-time monitoring and other definite modules, patients do not significantly need to be in the hospital. The technology thus holds a strengthening future mobile health monitoring while reducing the tension to visit doctors and organizations.

## 7. CONCLUSIONS

The primary concern of IoT in the healthcare industry is to ensure more profitable patients, engaged curative aids suppliers, and cost-putting slightly aside for both. With the most outstanding services, you can compile a savvy IoT sensor arrange.

There exist sure essentials to cost-effectiveness, which perhaps applied in IoT application progression for civil insurance too, for instance, composed overspending, the considerably characterized job of sensors and its capacities, and send and get data when requisite. For doing all this, you have to make a viable IoT application advancement methodology and application engineering in a collaboration with your innovation accomplice.

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This is word of acknowledgement really to express our deep sense of gratitude and express our sincere thanks to all those illumination because of whom, this work has become successful.

Our guide Dr. N. N. Khalsa inspires us at every stage and also helps in making available all the facilities to complete our project successfully.

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## BIOGRAPHIES



"A motivated and enthusiastic team player, reliable for teammates, with good communication and ability to work under high pressure with mutual skills."

**Sumedh S. Mule<sup>1</sup>**



"I am an enthusiastic, determinant and accountable person with good management skills. I can work efficiently both as individual contributor and along with the team."

**Yogesh S. Raut<sup>2</sup>**



"I am Ethical and Reliable. A Cheerful person who's Versatile as well. I am better at individual level and best with team."

**Pranay D. Chopkar<sup>3</sup>**



"I am realistic person. I am a good team player. I like simple things but I can make work simply better and advance."

**Sharvari S. Hastak<sup>4</sup>**