

# COVID-19 PATIENT MONITORING SYSTEM USING IOT

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**Abstract-** From last year, the world has a witness of rapidly spread of the Coronavirus (COVID-19), which leads to millions of deaths, and most of all it is spreading among the elderly and people who suffered from older disease. To stop the spread of the virus and maintain health of the patients we design mobile and web-based application to monitor health of individuals at home. The proposed design consists of different sensors likewise ECG sensor, temperature sensor and oximeter. In this paper, we used Internet of Things (IoT) to monitor patient's health status. IoT is an interconnection of Internet, physical devices, apps, sensors and network connections that used to gather and exchange data. The COVID-19 patients monitoring system can help to minimizing the Coronavirus infection risk.

**Keywords** - Internet of Things (IoT), Healthcare, Patient monitoring, COVID-19

## 1.INTRODUCTION

The IoT offers a rising technology to attain the next level of health services. It assures for the adorable, low cost, reliable and handy devices to be carried or embedded with the patients, so that to enable seamless networking between the patients, medical devices and physician. An IoT system, combined with Artificial Intelligence (AI), may offer the following contributions when considering a pandemic: -1) Improving public security using surveillance and image recognition system, 2) Utilizing drones for supply, delivery or disinfection, 3) Contact tracing and limiting people access to public places through apps and platforms impowered with AI. These progressive technologies will have a transformative impact in every human's life and health monitoring; it will reduce the healthcare expenses and a step ahead in the prediction of disease.

## PROBLEM STATEMENT AND PROPOSED METHODOLOGY

### 2.1 Statement of the problem

In times of COVID we have special COVID-19 Quarantine centres setup in order to treat COVID-19 patients. Since COVID-19 is highly infectious it is very important to quarantine COVID-19 patients but at the same time doctors need to monitor the health of COVID-19 patients too. With the increasing number of cases, it is becoming difficult to keep a track on the health conditions of so many quarantined patients.

The problems here are:

- Doctors need to regularly monitor patient health.

- There are an increasing number of patients for the doctors to monitor.
- The doctors are at risk of infection just for monitoring purposes.

### 2.2 Methodology

To Solve this issue, we here design a IOT based health monitor system that allows for monitoring of multiple COVID-19 patients over the internet. The system monitors patient heartbeat, temperature and oxygen using a heartbeat sensor, temperature sensor and oxygen sensor respectively.

The system then transmits this data over the internet using Wi-Fi transmission by connecting to Wi-Fi internet connection. The data is transmitted and received over IOT-by-IOT platform to display data of patients remotely. The entire system is run by a microcontroller-based circuitry. If any inconsistency is detected in patient health or if the patient presses the emergency help button on an IOT device, an alert is sent over IOT.

### 2.3 Design and Development

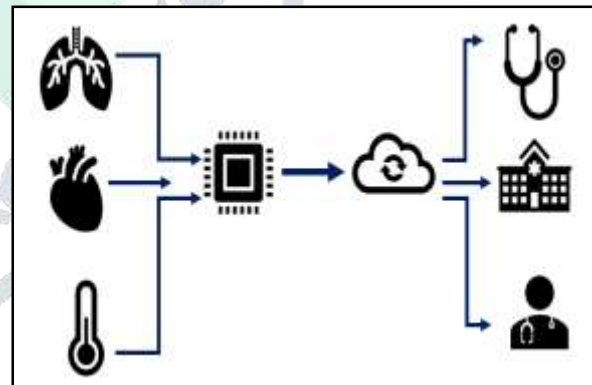


Fig.2.3 Concept Diagram

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This System allows:

- Doctors to monitor patients without risk of infection
- A single doctor has over 500 patients at a time.
- Doctors get an instant alert in case of health fluctuations or emergencies.

The system is mounted at the patient bedside and constantly transmits patient health data over the internet so that doctors

can monitor multiple patients remotely and attend the desired patient urgently when needed.

### 3.WORKING

#### 2.4 Hardware Implementation

We are using ESP32 microcontroller for this implementation of project. In this system proposed, Real-Time value and parameter acquisition, ECG sensor, Temperature sensor, Oximeter are employed for screening the values of COVID-19 patient. Data of the transformer are then sent to a IOT server for easy access from anyplace in the globe. All these sensor values are processed in Programmable Microcontroller. The values acquired are then sent directly under TCP IP Protocol via a Wi-Fi Module to a committed server address that displays the data in real time in any android or iOS mobile phone or lap top with internet for display. Then microcontroller will send notification to monitoring system via Wi-Fi and values are revised or updated in the server.

Various components used in Hardware Implementation are as follows:

##### 1)AD8232 ECG SENSOR

Electrical activity that is happening in our heart that is the heart contracts and the hot relax and the signal is generated known as ECG signal or electrocardiogram so on the basis of electrocardiogram you can understand what your heart is how the heart is functioning and what other disease that you are facing

##### 2)LM35 Temperature Sensor

LM35 is an analog linear temperature sensor. Its output is proportional to the temperature (in degree Celsius). The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every 0C rise or fall in temperature. It can be operated from a 5V as well as 3.3 V supply and the standby current is less than 60uA.

##### 3)Pulse oximeter

Pulse oximeter monitors SpO2 of a patient based on two wavelengths, red(660nm) and IR(940nm). Absorption characteristics of HbO2 and Hb are obtained by switching the wavelength transmission alternatively through a body part such as a finger or external-pinna which is reflected and captured by a photodiode sensor. This photo-detector captures the transmitted light from LEDs. This is a weak bio-signal which is boosted using an inverting operational amplifier.

##### 4)Microcontroller

ESP32-WROOM-32 is a powerful, generic Wi-Fi+BT+BLE MCU module that targets a wide variety of applications, ranging from low-power sensor networks to the most demanding tasks, such as voice encoding, music streaming and MP3 decoding. At the core of this module is the ESP32-D0WDQ6 chip\*. The chip embedded is designed to be scalable and adaptive. There are two CPU cores that can be individually controlled, and the CPU clock frequency is adjustable from 80 MHz to 240 MHz

## 4.SYSTEM IMPLEMENTATION

### 4.1 Block Diagram and its working

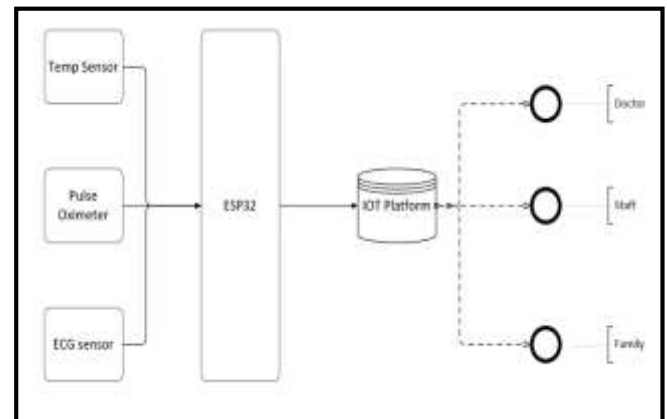


Fig. 4 Block Diagram of System Implemented

In this project we are implementing using ESP32 microcontroller. ECG sensor will be connected with analog pin of microcontroller. Temperature sensor we are using is LM35. This sensor interfaced with analog pin of microcontroller. We are measuring Oxygen level using Pulse oximeter and this sensor need two digital pins of microcontroller for this operation. All these sensors will read the health status from patient and will pass this value to microcontroller. After this data is processed by the microcontroller and data will update IOT cloud with help of Esp32 built-in WIFI and user will able to access this data on IOT Platform android or iOS phone from anywhere across the world location.

## 5.RESULTS

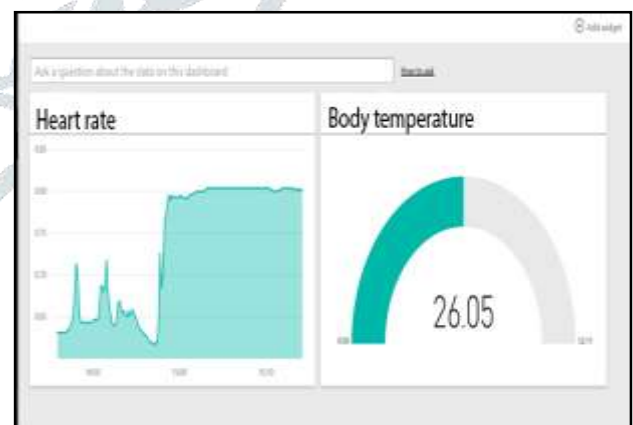


Fig. 5.1 Output on IOT Platform

The body temperature sensor, ECG sensor, pulse rate sensor values are check-up by using ESP32 microcontroller. After that the sensor values are then sent to the cloud. On the basis of values received, the diseases of the patient is diagnosed by relative doctors. By using this system, the patient will able to get proper medical treatment at home without any issues of distancing.

## 6.CONCLUSIONS AND FUTURE SCOPE

### 6.1 CONCLUSION

The system introduced smart healthcare to monitor the basic important signs of patients Like heart rate, body temperature and blood oxygen level, pulse rate and some measures of hospital room's condition such as room humidity. The monitoring system can also benefit nurses and doctors in situations of epidemics or crises as raw medical data can be analysed in a short time. The system is very useful in the case of infectious disease like a novel coronavirus (COVID-19) treatment. In each phase, we evaluate the role of IOT linked technologies including wearables, drones, robots, IOT buttons and Smartphone applications in combating COVID - 19.

### 6.2 FUTURE SCOPE

COVID-19 is considered as both a global health crisis and an international economic threat. As future work, changes will be made to this system to make it more appropriate to the quarantine operations of coronavirus (COVID-19) patients, as we will develop the patient's mobile application to enable them to measure vital signs by themselves. The restrictions put in place in response to the COVID-19 pandemic have had devastating effects on many businesses, market places, economics, and society lives. IOT technology has shown promising results in early detection, quarantine time, and after recovery from COVID-19, however we learn more about the virus and its behaviour. As a part of smart living in the smart city, Smart home IOT-based technologies can also reduce the infection rate of COVID-19.

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