ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 8, Issue 10, October 2021

Covid Support System for Home Isolation Patients

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Abstract: Today due to covid outbreak many people were affected and there isn't enough place to treat patients. So, the patients with mild symptoms need to be home isolated, in order to know the patient's condition always the patient cannot approach a doctor. To support this fight, A Covid Support System (CSS) is proposed for monitoring a patient's health status and to provide the prescription remotely. Besides the doctor can also analyze and diagnose from the data collected from the user using IoT. A web-based application is implemented for efficient patient-doctor communication. With the proposed system patients can be remotely monitored from their homes. Medical devices connected to the internet can be used for physiological measurements such as heart rates, blood oxygen saturation, and body temperature and send the measurement result to a server.

Keywords: Covid-19, IOT, Monitoring, SPO2.

I. INTRODUCTION

Technology has changed the lifestyle of the human beings and their way of life. Internet of things has changed everything and connected the devices remotely and these electronic devices are connected using the cloud interface. Using IOT many fields have been automated like smart farming, smart buildings, and smart industries.

Covid-19 had made a large impact on human beings all around the world, because of which social distance and masks has been made mandatory around the globe[1]. According to the data given by the ministry of health, India. The medical infrastructure isn't enough to treat all the patients. So, the patients with mild symptoms should opt for home-isolation[2].

IOT based solutions are proving very helpful in many dimensions of the healthcare landscape and these intelligent solutions can be fruitful in developing a Covid Support System to monitor the health status of the patient infected with covid-19[3]. The Pulse, Temperature and SPO2 are the key factors to be monitored.

II. SYSTEM OVERVIEW

A. Proposed Architecture

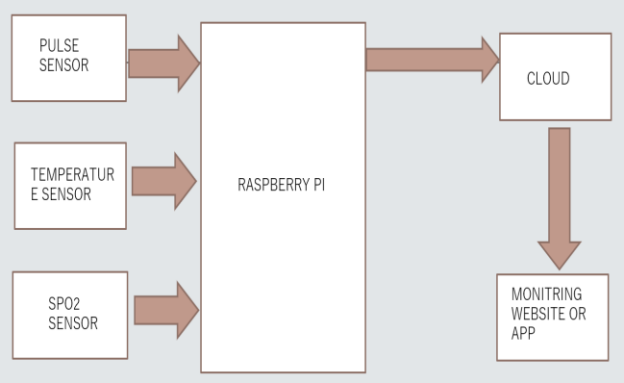

Fig. 1. Architecture of proposed system.

The proposed architecture of covid support system consists of raspberry pi connected to physiological parameter devices like Spo2 sensor, pulse sensor and contactless temperature sensor[4]. The data that is collected using these sensors are feed through the cloud where doctor can analyze the vital parameters of the patient.

IoT system integrated with the smart devices can be used for monitoring the parameters of the patients and the data generated can be used to analyze the condition of the patient[5]. The Cloud platform connected to the sensors can be used for analysis and visualization of the collected data.

ISSN (Online) 2394-6849

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Vol 8, Issue 10, October 2021

B. Sensor Network Topology

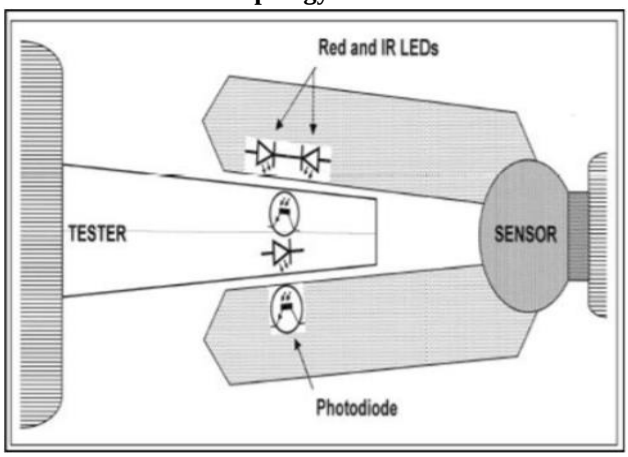

Fig. 2.1. Working of Spo2 Sensor

Fig: 2.2. Pulse Sensor

The network system consists of three main components firstly Spo2 Sensor, it measures the blood saturation level in the human body and displays the oxygen level. SPO2 is measured using a sensor, usually attached to the patient's finger. There are two methods of SpO2 technology: transmissive and reflective. The transmissive method is the more commonly used of the two[6]. As shown in fig 2.1, transmissive technology transmits red and infrared light through the finger to a photo detector. In which the data is transferred to the cloud and where analysis and visualize of the data can be done and doctor can be diagnosis the condition of the patients and monitors, patient health condition

The pulse sensor is used to measure the BPM i.e., beat per minute. The sensor makes the use green light, as the color of the blood is red it reflect red light and absorb green light[7]. the sensor is designed to compensate for low signal levels by increasing both LED brightness and sampling rate. That's why the heart rate sensor on the flashes its LED lights hundreds of times per second, helping the device calculates heart rates precisely.

The MLX90614 sensor can measure the temperature of an object without any physical contact with it. This is made possible with a law called Stefan-Boltzmann Law, which states that all objects and living beings emit IR Energy and the intensity of this emitted IR energy will be directly proportional to the temperature of that object or living being. So, the MLX90614 sensor calculates the temperature of an object by measuring.

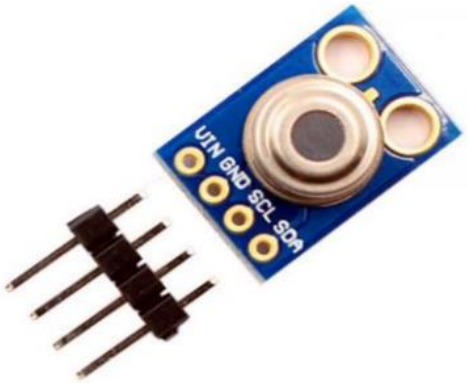

Fig. 2.3. Contactless Temperature Sensor

C. IOT Cloud Gateway

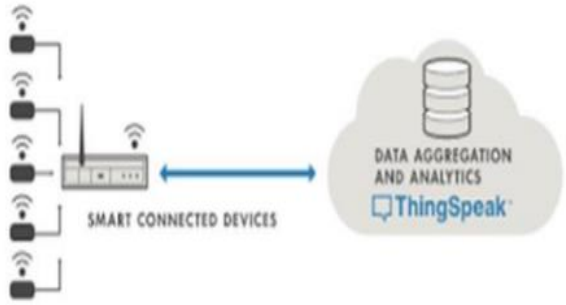

Fig. 2.4. Thingspeak Cloud Connected Using IoT.

The Data that is received from the sensor is collected using Thingspeak cloud Application. "Thingspeak is an opensource Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP and MQTT protocol over the Internet or via a Local Area Network[8]. Thing Speak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates".

As shown in the flowchart our first step is to get Physiological data from the various sensors connected to the body[9]. After getting the data a database of all Physiological data for the website will be created with

ISSN (Online) 2394-6849

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
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help of Thingspeak App and it will be updated at regular intervals. Then the doctor can view the health statics of the patient by accessing the website or App from anywhere. In condition of any inappropriate health statics an alert message email will be send to the doctor. 1. The history of patient's health will be created which can be used to take the appropriate action. 2. Doctors can monitor the patient's health from anywhere using the website. 3. In case of inappropriate health conditions the alert message will send to the doctors or other staff members. In Thingspeak Cloud we will create the channel using API key and this key will be connected to the raspberry programming coding in order to collect the data and we can create sub widgets and visualization charts so that we can observe the data collected using graphs and doctor can analysis the condition and monitoring the patient continuously and email is sent to the doctor in case of low vital parameters are obtained.

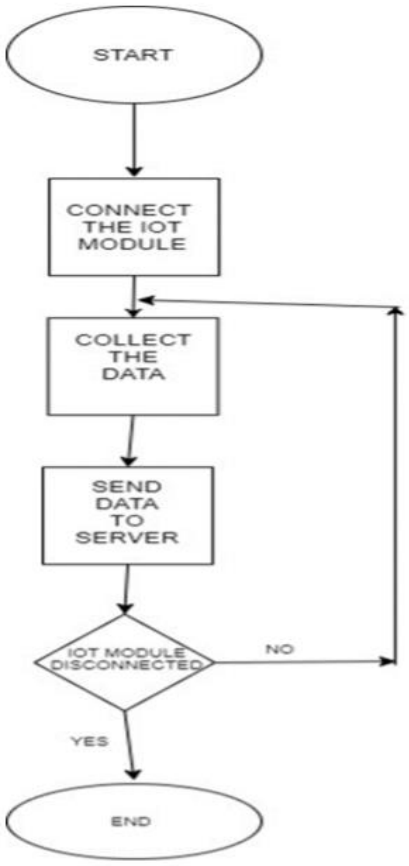

Fig. 2.5 Flow Chart of Covid Support System

III. METHODS

The temperature sensor will return the reading in degree Celsius and in order to make it easy for the doctor the reading is converted into degree Fahrenheit.

$$\mathbf{C} \times 9/5 + 32 = \mathbf{F}$$

C=temperature in degree Celsius
F=temperature in degree Fahrenheit

IV. PROTOTYPE

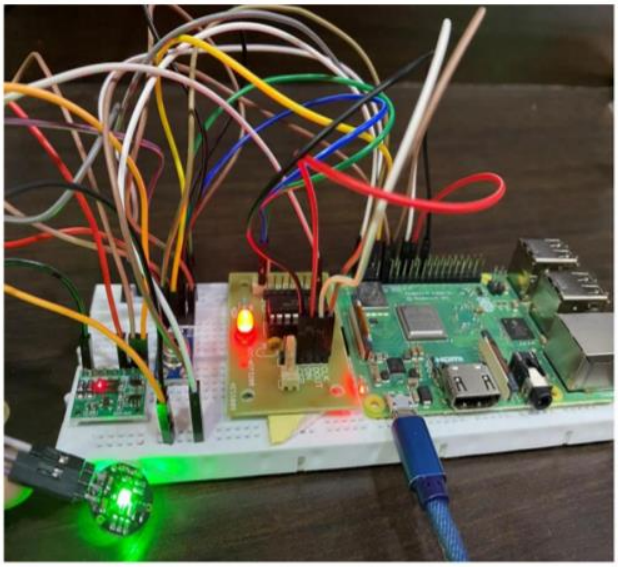

Fig. 3. Hardware Implementation of IoT Based CSS

V. ADDITIONAL FEATURES

The project is equipped with a additional feature to make the model more efficient and practical.

If the life vitals of the patient being monitored aren't stable, then an email alert will be triggered to both the patient and to the doctor.

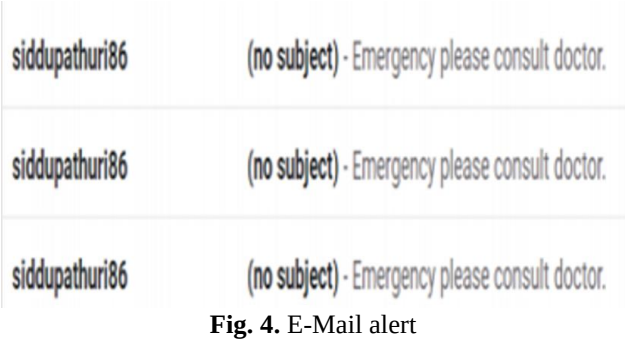

Fig. 4. E-Mail alert

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VI. RESULTS

The three physiological sensors data is taken i.e., pulse rate, spo2 and body temperature and is monitored remotely. Thingspeak Cloud IoT is open Software used in many IoT projects and the data sent to the Thingspeak platform can be visualized by either the Thingspeak web-application or its mobile application.

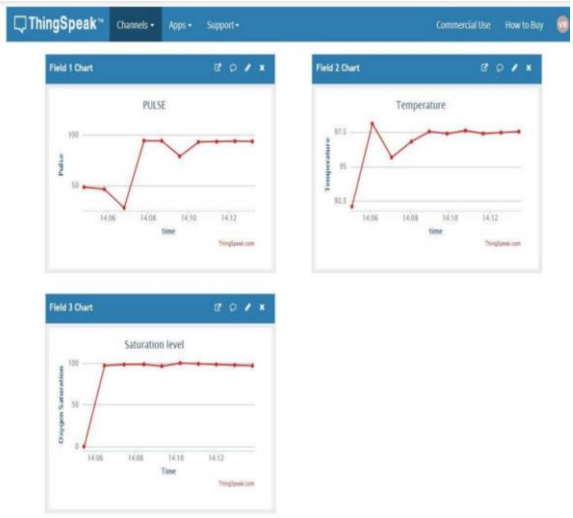

Fig: 4.1 Output of Different sensors of Covid Support System in Thingspeak Website.

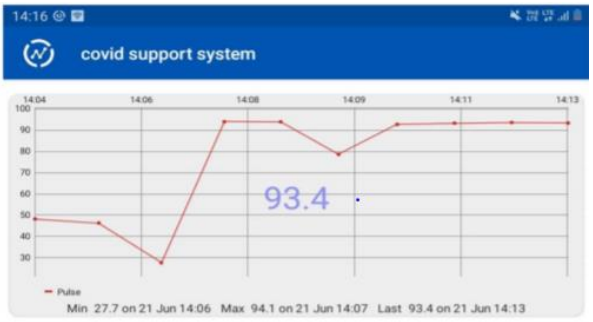

Fig: 4.2.1. Pulse sensor output of Covid Support System using Thingspeak APP

Fig: 4.2.2. Temperature sensor output of Covid Support System using Thingspeak APP.

Fig: 4.2.3 Spo2 sensor output of Covid Support System using Thingspeak APP.

VII. PERFORMANCE EVOLUTION

The system gives satisfactory result to monitor the health of a human being. The three physiological data i.e., pulse rate, SPO2 and body temperature are accessible remotely through the website or App. The parameter is accessed immediately without any delay. The pulse sensor gives the average accuracy reading of BPM which is sufficient for monitoring the normal BPM rate. The accuracy to measure body temperature was good. The message was sent to the doctor within 10 seconds to the doctor in case of abnormal health condition.

CONCLUSION

In This study an approach of healthcare system with Internet of Things is presented. That provides an easy way to monitoring the heath of a patient and provides the alert to doctor in case of inappropriate conditions. Raspberry pi is used for this application because of its multi-tasking capability and low power consumption. Also, this system can be installed easily in all the hospitals and huge data obtained can be stored in the database. Moreover, this data is much valuable. Raspberry Pi, with its broad variety of features can be used for several purposes and have much scope in future. Even the results can be made to be accessed from mobile through an application. Any intelligent system can be added and can be further improvised to facilitate the clinicians and the patients

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