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THE DEVELOPMENT OF SMART DEVICES FOR COVID USING IOT

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Abstract

The development of iot smart monitoring devices for covid is a device that is placed on a fingertip. This device uses to determine the blood's oxygen saturation and pulse rate. The amount of oxygen carried in the blood is determined by oxygen saturation. The traditional Oximeter can only be read briefly, and the data cannot be recorded automatically. Besides that, the traditional Oximeter device can only be seen by the person who uses it. The development of iot smart monitoring devices for covid is to design the tool that doctor can make online monitoring of the patient. Next, to develop the tool that can also make it easier for other family members to monitor. Lastly, to evaluate record patient data from home. The devices include a portable and cost-effective heart rate and SpO2/level sensor device based on the Internet of Things. The system has an integrated OLED display and simple internet connectivity. The development of the prototype is a succeed and produce relatively accurate results. The result in this project is hybrid method using pulse oximeter and IoT system combine to make one medical device. The project's findings on human blood pressure and oxygen have provided a direction for the project's development.

Keywords: Smart devices for covid using IoT, Covid, IoT.

1. Introduction

COVID-19 is caused by a novel coronavirus that enters the human body through the respiratory system, directly harming the lungs through pneumonia and inflammation, both of which can reduce the amount of oxygen that reaches the bloodstream. Pneumonia is caused by fluid buildup in the lung tissue. This hinders the exchange of oxygen between blood and air sacs. This oxygen deficiency can happen at any stage of COVID-19, not just in severely sick patients on ventilators. Small liquid particles of the virus can escape from the mouth or nose and spread when an infected person speaks, sneezes, coughs, or simply breathes. These particles come in a variety of sizes, ranging from huge respiratory droplets to microscopic aerosols. [2] The prototype oximeter allows for the quick assessment of the body's oxygen saturation level without the need for needles or blood samples. The red blood cells' oxygen saturation is represented by the measured amount that is displayed on the screen by using the sensor. The sensor transmits light through the fingertip, giving the impression that it is red, using a cold light source. The device can analyze the light from the light source that travels through the finger to determine the amount of oxygen in a red blood cell. [1]. Lastly, it connected to the Iot system which display the measurement of the oxygen saturation level.

2. Literature Review

2.1 Human body temperature

The normal range for the body temperature of an adult is 36.5–37 C, regardless of the climate or outside temperature. Although every person's physiology is unique, the ideal core temperature of the body when muscles are primed and ready to go generally falls within a set range; it is right about 37.5 degrees celsius. [3] The normal range for body temperature, on the other hand, is at least 36.1 to 37.2 degrees celsius. Based on activity level and time of day, body temperature changes. Older people typically have lower body temperatures than younger people do. The following thermometer reading indicates a fever. In the rectal, ear, or temporal arteries, temperatures of 38 C or higher. 37.8 degrees celsius or higher for the oral cavity a temperature in the armpits of at least 37.2 degrees Celsius.[4]

2.2 Human pulse and blood pressure

The effect of blood pumped by the heart causes the cyclic expansion and contraction of an artery. The pulse can be felt with the fingers at various pulse pressure sites throughout the body, and it can also be heard with a stethoscope. In this study, blood pressure and pulse rates will be measured using the radial and brachial pulses, which are located at the wrist and elbow, respectively.[5] The arterial blood pressure measures how much pressure blood applies to blood channel walls while the heart contracts and relaxes. The systolic blood pressure refers to the force with which the heart pumps (contracting). When the heart is relaxed, it exerts a force known as diastolic blood pressure.

2.3 Covid-19 detect using traditional pulse oximeter

COVID-19 patients may experience a wide range of symptoms, ranging from no symptoms to mild symptoms to severe sickness. Patients with COVID-19 frequently have critically low oxygen levels. However, not everyone who has a low oxygen level will have trouble breathing. A pulse oximeter is a gadget that you place on a patient's finger, toe, or earlobe to test their oxygen level. It's a quick and painless exam that takes less than two minutes to complete. The monitor with the display and the sensor (or probe) help compensate a pulse oximeter. The probe is on the finger, where it is observing the blood flow. On the monitor, this appears as a pulse wave. To prove that a pulse is being detected, a pulse wave must be present.

2.4 Technology based on Iot

The most common use of Iot devices in healthcare is remote patient monitoring. A medical facility can monitor the heart rate, blood pressure, temperature, and additional health data are automatically gathered by Iot devices of patients who are not there in person, making hospital visits unnecessary for patients. The Internet of Things (Iot) continues promising us a more intelligent future, The internet of things, which tracks your health and sends real-time data to your doctor's smartphone, is a network of connected computing devices, physical and digital items, and smart equipment. The Internet of things ecosystem, or Iot, is made up of web-enabled smart devices that use embedded systems, such as processors, sensors, and communication equipment, to gather, send, and act on the data they receive from their surroundings. The Iot devices connect to other IoT devices or gateways to share the sensor data they acquire. Then, either locally or via the cloud, this sensor data is evaluated.[8]

3. Methodology

3.1 Block diagram

Based on Figure 1, The USB cable provides 5V power. The ESP 8266 module is powered by 3.3V and coupled to the MAX 30100. The OLED display will receive the output and display the reading, as well as connect wirelessly to the mobile phone via Wi-Fi.

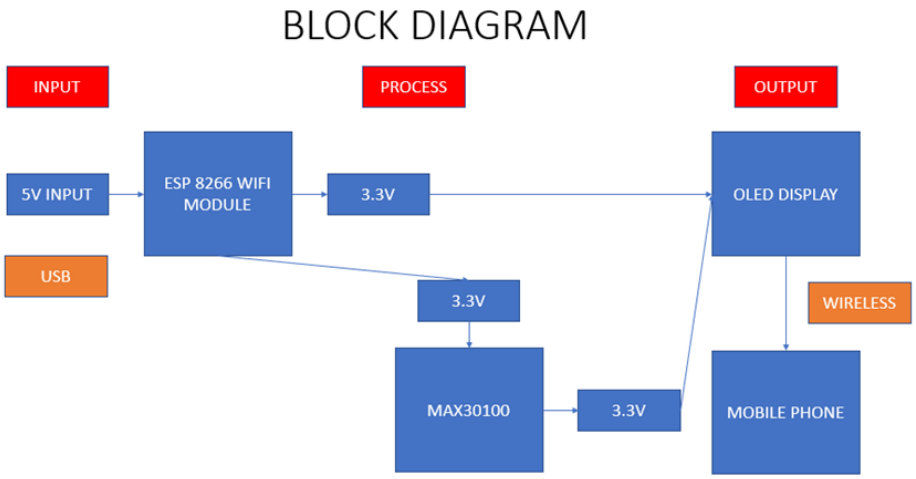

Figure 1: Block diagram of the development of smart devices for covid using Iot.

3.2 Hardware

ESP8266 is module allows microcontrollers to connect to 2.4 GHz Wi-Fi, using IEEE 802.11 ban. It can be used with ESP-AT firmware to give an external host MCU Wi-Fi connectivity, or it can be utilised as an independent MCU by utilising an RTOS-based SDK. A sensor solution including integrated pulse oximetry and heart rate monitoring is called MAX30100. It uses two LED or a photodetector to improve optics and low-noise analogue signal processing in order to detect pulse oximetry and heart rate signals. The oled display whenever these diodes are introduced by current These organic layers generate light that travels via a colour refiner and onto the screen as an image.

3.3 Software

This project was created with the Arduino Software (IDE), For creating electrical projects, there is an open-source platform called Arduino. It is also simpler to learn to programming because to the Arduino IDE's use of a simplified version of C++. Finally, by using the Arduino the project program can test and do on the software.

4. Result & Discussion

The results of prototype pulse oximeter have taken from different patient and the analysis showed in table 1.

Table 1: Comparison between prototype pulse oximeter and conventional pulse oximeter

	CONVENTIONAL PULSE OXIMETER		THE DEVELOPMENT OF SMART DEVICES FOR COVID USING IOT	
Age/gender	Bpm	SpO2	Bpm	SpO2
24/Male	99	90	98	89
23/Male	98	89	97	87
20/Male	99	97	96	89
58/Male	97	90	98	89
57/Female	98	89	97	100
10Months/Female	99	98	100	99

Table 1 shows the comparison between of prototype and normal pulse oximeter based on the patient the age and gender. MAX30100 sensor compared to industry-standard measuring devices for blood oxygen saturation and heart rate, Testing sensor performance grants a smartphone accessibility to measurement results information. and evaluates the MLX90614 sensor's accuracy in measuring body temperature in comparison to similar equipment used in industry (digital thermometers). The heart rate and oxygen saturation sensor measurements are analyzed, with each subjected to up to five trials on different patients. The accuracy of the measuring device is determined by comparing test results with those from the Finger Oximeter (FO), which is the industry standard.

5. Conclusions

The goal of this project, a pulse oximeter, is to assist patients with COVID in receiving heart rate and oxygen saturation readings connected to an Iot system. Because this device is less expensive for patients to purchase than the currently available, it can help the community become more independent. At the end of this project, with the development of smart devices for covid using Iot, it can be detecting the heart rate by a Max 30100 sensor that can receive input from the patient pulse and the output receive from the heart rate. Power supply is connected to the USB port so the device can be power up and activated the device. In addition, the device is consisting of a display panel to display the reading oxygen level of the patient. The ESP 8266 Wi-Fi module can be transmitting the data to the Iot cloud.

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