PATIENT MONITORING SYSTEM USING ESP 32 WEB SERVER

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ABSTRACT

IoT is swiftly transforming the healthcare sector thanks to the proliferation of innovative healthcare technology start-ups. Due to our hectic schedules and the demands of daily life, it might be challenging to monitor your patient's health status at home. Patients who are elderly should be checked on frequently. So, we provide a novel approach that easily automates this task. Our product offers a sophisticated patient health monitoring system that uses a web server to track the health of a person's indicators like the rate of the heartbeat, oxygen level in blood, and temperature of a person's body.

The heart rate/pulse (BPM) and blood oxygen level (SpO2) will be measured using the MAX30100/102 Pulse Oximeter Sensor. The body temperature will be determined using a DS18B20 Temperature Sensor. Like the Patient, a room must have a specific temperature and humidity level for the patient to feel comfortable. We also need to keep an eye on the humidity level in the space to accomplish that. DHT11 Humidity & Temperature Sensor will therefore be used. The position of the body will be checked using MEMS. Finally, to monitor the patient, we employed ultrasonic HC-SR04 to determine if the patient was alone or in a crowd.

Keywords:Healthcare, IOT, BPM, PULSE OXIMETER, MEMS, HC-SR0

INTRODUCTION

- A spate of new technology of healthcare start-ups are leveraging IoT to quickly disrupt the sector of health and its care.
- Maintaining tabs on your patient's health at home is a challenge due to our hectic schedules and busy lives. Therefore, we provide a unique method that may effectively automate this operation. Patients, especially those in their senior years, should be checked routinely.
- In our project, a web server is used to create a smart patient health tracking system that enables the monitoring of patient health data, including heart rate, blood saturation levels, and body temperature.
- Blood saturation level (SpO2) and heart rate (BPM) will both be tracked using the MAX30100 Pulse Oximeter Sensor.
- A DS18B20 temperature sensor will be used to determine the body's temperature and the patient must be kept in an environment that meets certain requirements for temperature and humidity to prevent discomfort
- To do this, we must additionally monitor the room's temperature and humidity. The DHT11 Humidity and Temperature Sensor will thus be employed.
- To determine whether the patient is alone, the HC-SR04 ultrasonic sensor will be employed.
- MEMS will be adopted to track the patient's movements and present condition.

LITERATURE SURVEY

- Tao and associates (2009) created a wearable sensor that tracks the patient's movements. To lower the error rate of the recorded data, the device was calibrated to a scaled level below 5%.
- Stefano and colleagues (2012) introduced a system to track the movements of patients and when a drop is detected a request is sent automatically for assistance to the caretakers.
- Using the symptoms of the patient, Gennaro and colleagues (2012) created a personal health tracking system. The risks of the ailment that the patient is suffering from are established by analyzing a huge amount of information that is gathered.

- Francesca and colleagues (2012) have emphasized how the development of continuous tracking features for patients, and the enhancement of workflows and efficiency of medical personnel are the innovations of next-generation systems. The numerous wireless technologies and the benefits of adopting such technologies for faster communication have been highlighted. When it comes to the administration of IoT devices, security is a major problem.
- The 4 safety needs that have been put into practice are (i) safe access to information by authorized individuals,
  (ii) safety of IoT information,
  (iii) safe bootstrapping of objects and transmission of information, and
  (iv) safe authentication and authorization.
- According to Mohammed (2015), the distribution of keys is necessary to ensure the security of e-health applications in general. A strict protocol for the management of keys has been suggested, which allows the collected information to be sent over a secure channel. It is necessary to increase security while deploying IoT in healthcare since patient data is more sensitive and cannot be exploited by negative societal elements.
- Rohan Tabish and colleagues (2014) developed an application that saves information from sensors in a file by a remote server utilizing a Cloud service, such as Ubuntu can be downloaded to improve efficiency.
- Debiao and Sherali (2016) explored the security needs and authentication approaches for RFID based on elliptic Curve Cryptography, which they found to be quite effective (ECC)
- Jieranet and colleagues (2012) created RFID technology and smart systems that detect disinfected products and inform medical personnel to clean their hands after coming into touch with disinfection articles. The Internet of Things (IoT) can improve healthcare promotion. Doctors who are in an emergency could use health-related information to communicate with them. Even if a doctor is not present in the hospital or close to the patient, the doctor can still be aware of the patient's condition so that the doctor's suggestions can be offered in severe circumstances as necessary.
- Cristina et al. (2013) created a method for maintaining healthcare information for a patient acquired in many locations.

METHODOLOGY

- Our project utilizes a Web Server to provide a smart patient health tracking system that monitors patient health information like body temperature, blood saturation levels, and heart rate.
- The Pulse Oximeter Sensor MAX30100/102 will be used to monitor both the Heart Rate (BPM) and the Blood Saturation Level (SpO2).
- The temperature of the body will be measured using a DS18B20 Temperature Sensor.
- Similarly, the patient must be placed in a room with a specific humidity and temperature level to avoid discomfort.
- We must also keep track of the room's temperature and humidity to accomplish this. As a result, the DHT11 Humidity and Temperature Sensor will be used.
- All the sensors are capable of operating at 3.3V VCC.
- As a result, connect their VCC to the 3.3V Power Supply. GND should be connected to GND.
- Because the MAX30100 is an I2C sensor, connect its SDA and SCL pins to GPIO21 and GPIO22, respectively.
- Connect the INT pin to GPIO19 on the ESP32.
- The DHT11's output pin is wired to the ESP32's GPIO18 (General Purpose Interface).
- In a similar vein, the output pin of the DS18B20 is linked to GPIO5 on the ESP32 microcontroller.
- A 4.7K pull-up resistor is placed between the output pin of the DS18B20 and the VCC pin of the device.
- MEM Sensor is connected to ESP32 Microcontroller as well

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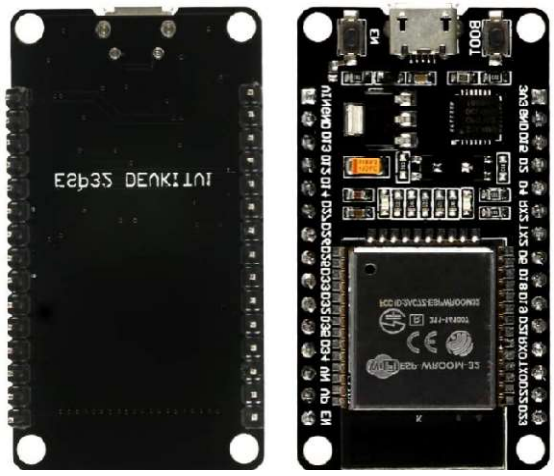
- HC-SR04 is linked to ESP32 microcontroller as well using jumping wires
- Installing a few libraries is required for program compilation for Patient Monitoring System using IoT, on the ESP32 Web Server.
- DHT11 Library, Dallas Temperature Library, One Wire Library, and Arduino MAX30100 Library are the libraries.
- All the libraries should be downloaded and installed in the Arduino IDE.
- Change the SSID and password for Wi-Fi.

IMPLEMENTATION

The materials needed for this project are listed below:



1.ESP32 Board: ESP32 ESP-32S Development Board (ESP-WROOM-32)

2.Pulse Oximeter Sensor: MAX30100/MAX30102 I2C Pulse Oximeter Sensor:

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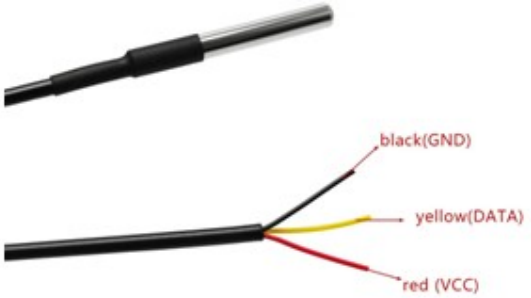
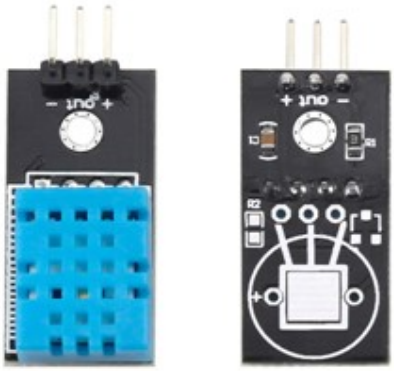
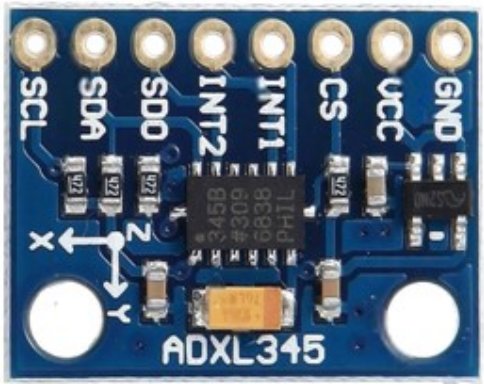


3. DS18B20 Sensor: DS18B20 One-Wire Waterproof Temperature Sensor:



4. DHT11 Sensor: DHT11 Digital Humidity Temperature Sensor



5. MEMS Sensor

6. Ultrasonic Sensor: HC-SR04

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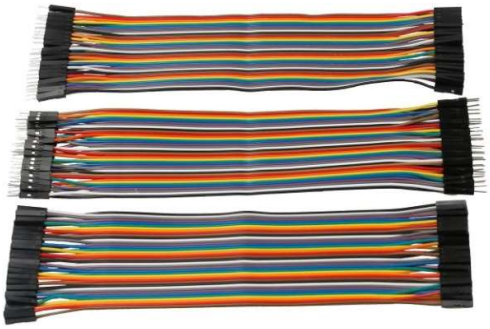
7. Resistor: 4.7K



8. Connecting Wires: Jumper Wires:

9. Breadboard

II. Software Implementation:

For source code compilation, you will need to install a few libraries on your computer. All the libraries should be downloaded and installed in the Arduino IDE.

1. Arduino MAX30100 Library
2. One Wire Library
3. Dallas Temperature's Library
4. DHT11 Library
5. Wi-Fi Library
6. ESP-32 Library

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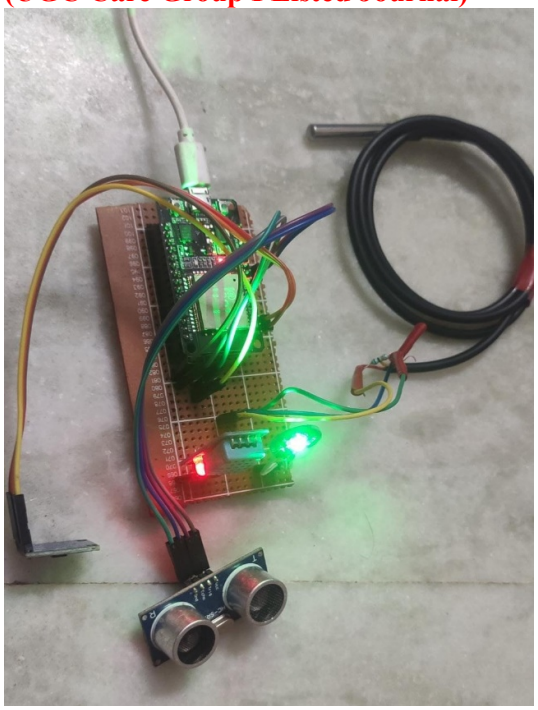

RESULT

Hardware of the project.

- After executing the code, you can see the results on the serial monitor.
- The ESP32 will attempt to establish a connection with a network.
- It will display the values once it has been successfully connected.
- You will be able to see the room's temperature, humidity, heart rate, blood oxygen level, body temperature, Position of the patient, and object or person near the patient.

FUTURE WORK

- The project's future work is critical to the advancement of the design system, and it must continue to progress.
- < UNK> Adding more sensors, which assess a variety of health metrics, would significantly improve the system as envisioned.
- To discover consistent patterns and systematic links in the disease, data mining can be used to examine the data, including the medical history of many patients' parameters and their corresponding outcomes.
- As an example, if a patient's health parameters are changing in the same way as the health parameters of a previous patient in a database, the repercussions can be predicted.
- If doctors and medical researchers can identify and study similar patterns again and over again, it will be easier for them to develop a treatment for the problem.

CONCLUSION

- The Internet of Things is now considered the most practical solution for remote monitoring, especially in the area of patient tracking.
- It makes it possible for any clinician to monitor the patient's health and detect the disease from a safe distance, which is beneficial.
- The patient monitoring system, which makes use of the Internet of Things, was created in this paper.

- Sensors in the system monitored the temperature and humidity of the room, as well as the body temperature, blood oxygen saturation, the position of a patient objects around a patient, or whether a person is alone and the results can be displayed on any smart device.
- The doctor then diagnoses the ailment and assesses the patient's overall health based on the values he or she has collected.

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