IOT BASED PATIENT HEALTH MONITORING SYSTEM ON ESP32 WEB SERVER

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

SUBMITTED BY

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UNDER THE GUIDANCE OF

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AFFILIATED TO

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY

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Certificate of Recommendation

We hereby recommend that the mini report entitled, **"**IOT BASED PATIENT HEALTH MONITORING SYSTEM ON ESP32 WEB SERVER**"** carried out under our supervision by the students listed below may be accepted for the evaluation of Mini Project (EC 681) of "Bachelor of Technology in ECE" of Asansol Engineering College under MAKAUT.

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Abstract

The IoT-based patient health monitoring system on ESP32 web server is a groundbreaking solution that integrates IoT technology with healthcare to enable real-time monitoring and tracking of patients' vital signs. By utilizing the ESP32 microcontroller and various sensors, the system collects and transmits crucial physiological data to a web server. Healthcare professionals can remotely access the server, which acts as a centralized hub for data management, displaying the information on a user-friendly web interface. With features such as real-time alerts, data logging, and historical analysis, this system enhances patient care, facilitates early detection of health issues, and empowers health-care providers to make informed decisions, ultimately revolutionizing healthcare practices.

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PREFACE

1.1. Introduction

The IoT-based patient health monitoring system on ESP32 web server is a cutting-edge solution that utilizes IoT technology to monitor and track patients' vital signs in real-time.By integrating the ESP32 microcontroller, equipped with Wi-Fi capabilities, and a web server, this system enables remote patient monitoring and enhances healthcare delivery. It allows healthcare providers to collect, transmit, and analyze patient data, facilitating proactive interventions and improving overall patient care. With the potential to revolutionize healthcare practices, this system offers convenience, early detection of health issues, and improved medical decision-making.

2. Motivation of the project

Health monitoring is the major problem in today's world. Due to lack of proper health monitoring, patient suffer from serious health issues. Also most humans live a busy life in which going to a doctor for weekly or even monthly checkup is an impossible task. Without monitoring your health it is not possible to whether you are a healthy or sick person. This problem leads to the design of a product which monitors your health every day without going to a doctor . There are lots of IoT devices now days to monitor the health of patient over internet. Health experts are also taking advantage of these smart devices to keep an eye on their patients. With tons of new healthcare technology start-ups, IoT is rapidly revolutionizing the healthcare industry.

3. Basic Description of the project

The IoT-based patient health monitoring system on ESP32 web server is a comprehensive solution designed to monitor and track the vital signs of patients in real-time. The system incorporates the ESP32 microcontroller, which acts as the central hub, connecting various sensors such as heart rate sensors, temperature sensors, and blood pressure sensors. These sensors continuously collect and transmit the patient's physiological data to a dedicated web server. The web server processes and stores the data, allowing healthcare professionals to remotely monitor multiple patients simultaneously through a user-friendly web interface. Real-time alerts and notifications can be set up to promptly inform healthcare providers of any critical changes or abnormalities in a patient's vital signs. The system also supports data logging and historical analysis, enabling healthcare professionals to track the progress and trends of a patient's health over time. With its remote monitoring capabilities and advanced data management features, the IoT-based patient health monitoring system on ESP32 web server offers an efficient and effective solution for enhancing patient care and promoting proactive healthcare interventions.

1.4. Objective of the project

●Enable remote monitoring: Develop a system that allows healthcare providers to monitor patients' vital signs and health parameters from a remote location, providing convenience and flexibility for both patients and healthcare professionals.

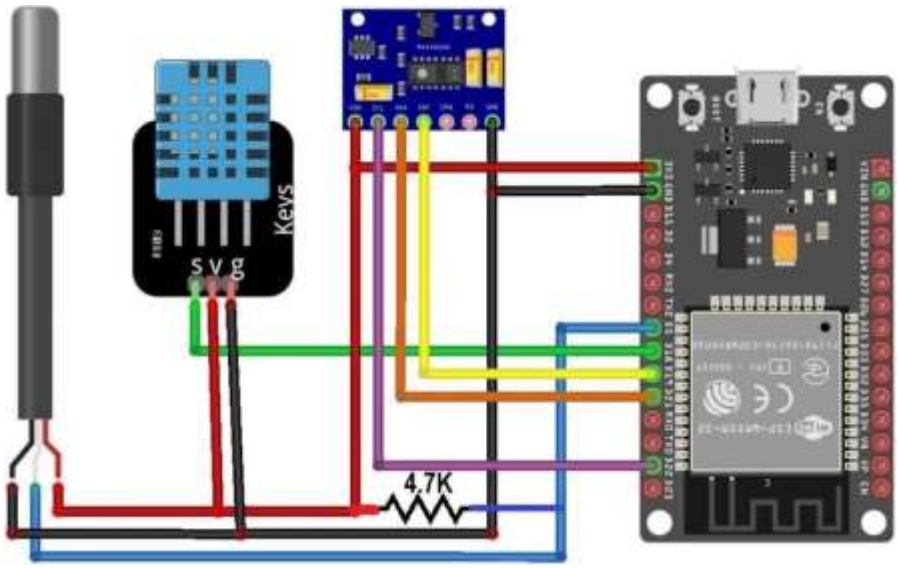
●Improve patient care and outcomes: Utilize the IoT-based patient health monitoring system to detect early signs of health issues and enable proactive interventions, leading to improved patient care and better overall health outcomes.

●Enhance medical decision-making: Provide healthcare professionals with real-time access to patient data, enabling them to make informed and timely decisions regarding treatment plans and interventions based on the collected data and trends.

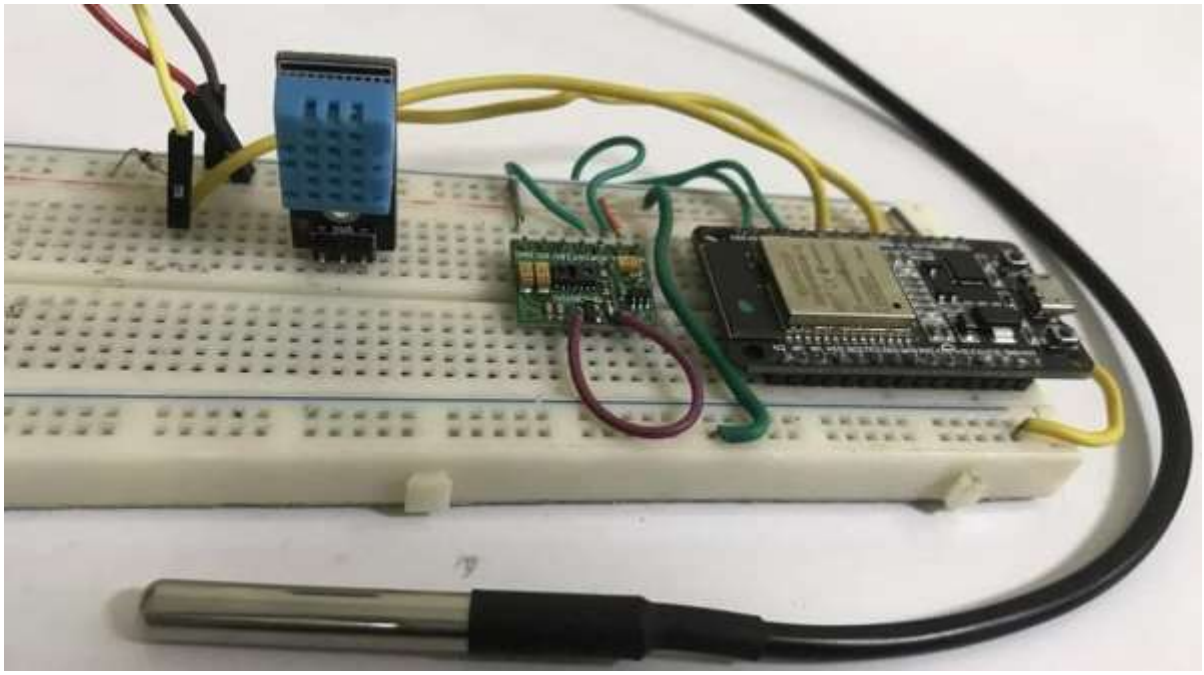
●Reduce healthcare costs: By monitoring patients remotely and detecting health issues early on, the IoT-based system has the potential to reduce hospital readmissions, emergency visits, and overall healthcare costs associated with managing chronic conditions.

●Promote preventive healthcare practices: With the ability to track and analyze patient data over time, the system can help identify patterns and trends that can be used to promote preventive healthcare practices, such as lifestyle modifications or early intervention strategies to mitigate health risks.

1.5. Circuit-Diagram



1.6 DIAGRAM OF THE PATIENT HEALTH MONITORING SYSTEM (WITH COMPONENTS):



SYSTEM REQUIREMENT STUDY

1. HARDWARE SPECIFICATION:

- ESP32 BOARD
- MAX30100 PULSE OXIMETER SENSOR
- DS18B20 SENSOR (TEMPERATURE SENSOR)
- DHT11 SENSOR (HUMIDITY & TEMPERATURE)
- RESISTOR 4.7K
- CONNECTING WIRES
- BREADBOARD

2.2 DETAILS OF THE COMPONENTS USED

- **ESP32 BOARD:** The ESP32 board is a versatile microcontroller development board known for its Wi-Fi and Bluetooth capabilities, dual-core processor, and extensive I/O options. It offers easy compatibility with the Arduino IDE and has ample memory resources. It is widely used in IoT projects for wireless communication and interfacing with various sensors and devices.

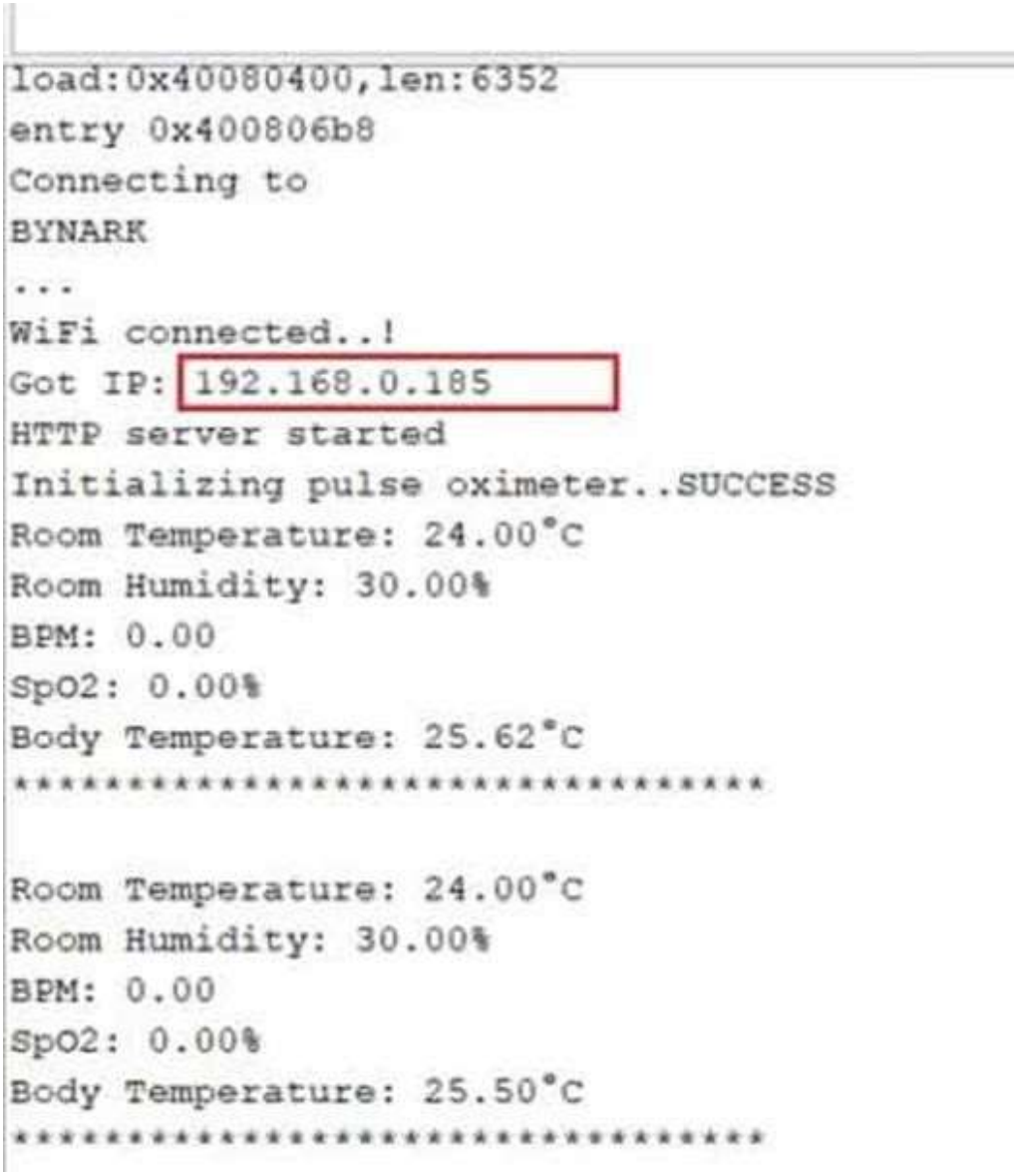
- **MAX30100 PULSE OXIMETER SENSOR:** The MAX30100 pulse oximeter sensor is a compact and low-power device used for heart rate and blood oxygen saturation monitoring. It employs PPG technology to measure changes in blood volume and calculates heart rate. By analyzing the difference in light absorption, it estimates oxygen saturation levels. The sensor communicates through I2C and integrates algorithms for signal processing and noise cancellation. It is commonly used in wearable devices, fitness trackers, and healthcare applications.

‣ **DS18B20 SENSOR (TEMPERATURE SENSOR):** The DS18B20 temperature sensor is a digital sensor with high accuracy and a 1-Wire interface. It offers a wide temperature measurement range (-55°C to +125°C) and a resolution of up to 12 bits. Each sensor has a unique 64-bit address, allowing multiple sensors to be connected on a single bus. It operates from 3.0V to 5.5V, making it compatible with various systems. It finds applications in HVAC, industrial automation, weather stations, and more.

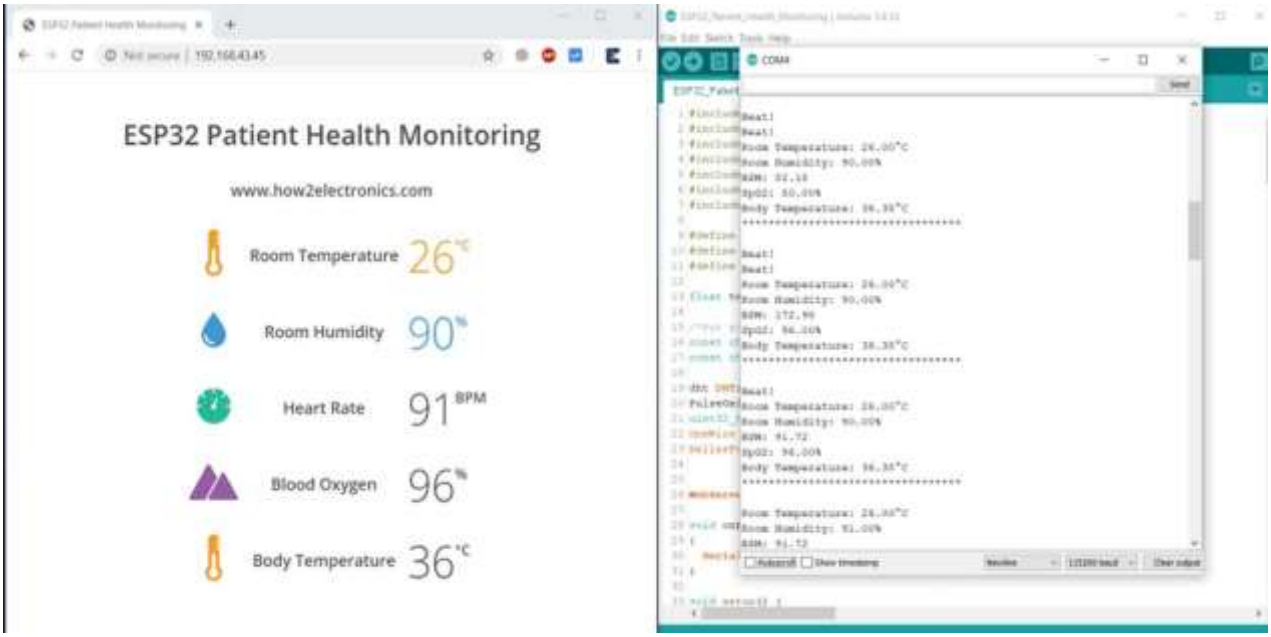
‣ **DHT11 SENSOR (HUMIDITY & TEMPERATURE):** The DHT11 sensor is low-cost digital sensor used for measuring temperature and humidity levels. It has a temperature range of 0°C to 50°C with ±2°C accuracy and measures relative humidity from 20% to 90% with ±5% accuracy. It provides digital output and uses a single-wire communication protocol. The DHT11 is commonly used in hobbyist projects and basic monitoring applications.

RESULT & WORKING OF THE PROJECT

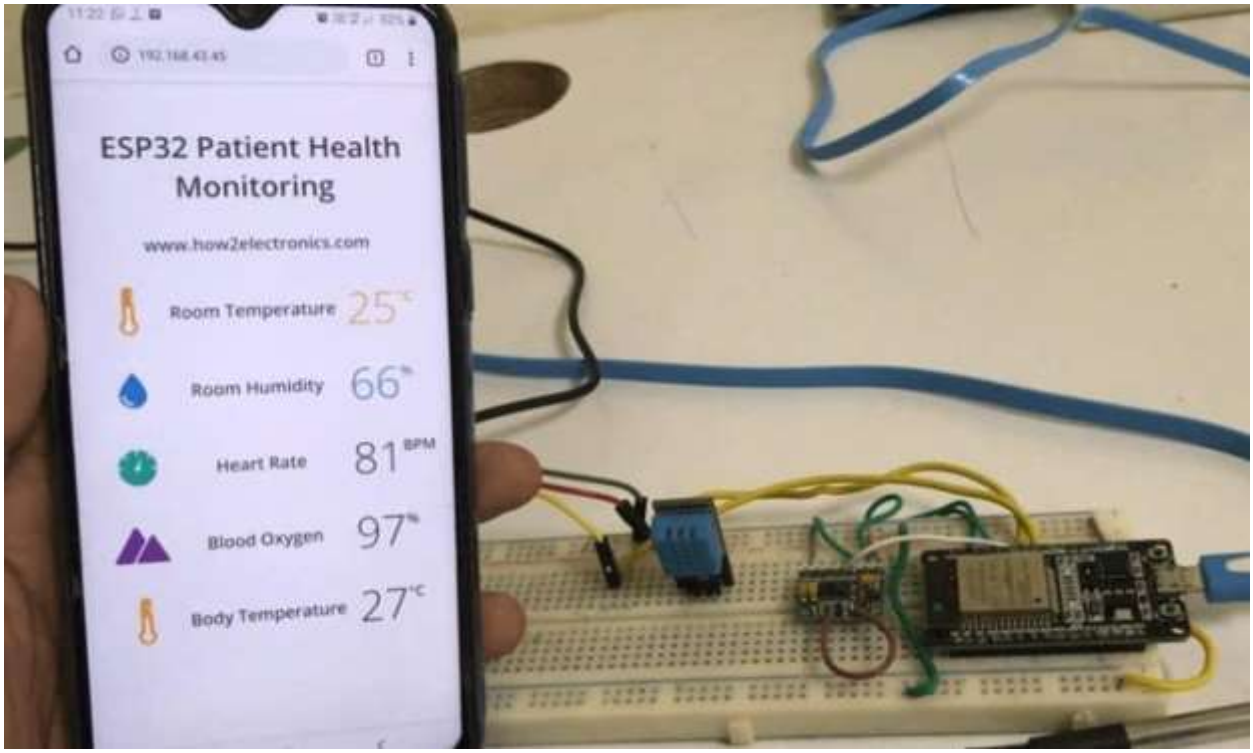
3.1 Once the code is uploaded in the software to run the project, the serial monitor can be opened. The ESP32 will try to connect to a network. Once connected, it will display the IP Address.



3.2 Copy the IP Address and paste it on any of the Web Browser and hit enter. Then you will see the room temperature, room humidity, Heart Rate, Blood Oxygen Level, Body Temperature, etc.



3.3 Similarly you can also view the Patient Health Status on Mobile Phone. Simply just copy the IP Address and paste on the browser of Mobile Phone.



FUTURE ENHANCEMENT

- Real-time alerts and notification for immediate response .
- Data analytics and machine learning for perconailized care and predictive insights
- Cloud integration for scalability, security,and easy data access.
- Integration of wearable devices for additional health data collection.
- Enable telemedicine and remote consultations for virtual healthcare service.

LIMITAIONS OF THE PROJECT

- Connectivity dependency for real-time monitoring .
- Accuracy limitations for sensors comared to medical -grade device.
- Power supply requirements for continuous operation.
- Data security concerns and potential vulnerabilities.

CONCLUSION

In IoT-based patient health monitoring system on an ESP32 web server offers a seamless and convenient solution for real-time monitoring of patient health parameters. By leveraging the ESP32's Wi-Fi capabilities and web server functionality, healthcare providers and caregivers can access and monitor patient data remotely, enhancing patient care and enabling timely interventions when needed. This project combines IoT technology, web development, and healthcare to create a powerful and accessible patient monitoring system.

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