

Real-Time Remote Patient Health Surveillance System Using Arbuino

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Abstract-The Patient Health Monitoring System using Arduino is designed to continuously monitor important health parameters such as heart rate and body temperature. Traditional healthcare systems often measure these parameters manually at intervals, which may delay the detection of serious health conditions. In the proposed system, sensors like a pulse sensor and temperature sensor collect the patient's physiological data and send it to the Arduino microcontroller for processing. The processed data is then displayed on an LCD screen, allowing doctors or caregivers to monitor the patient's condition in real time. This system enables continuous monitoring, helps in early detection of health problems, and improves patient safety. It is simple, reliable, and cost-effective, making it suitable for use in hospitals, clinics, and home healthcare environments.

Keyword- Patient Health Monitoring Heart Rate Sensor Temperature Sensor Real-Time Monitoring Biomedical Sensors.

1. INTRODUCTION

Healthcare monitoring plays a very important role in modern medical systems. Continuous observation of a patient's health condition helps doctors and caregivers provide better treatment and respond quickly during emergencies. Vital parameters such as heart rate, body temperature, and other physiological signals are important indicators of a patient's health status. In many hospitals and home healthcare environments, these parameters are often measured manually at regular time intervals. However, manual monitoring may not provide continuous updates and can sometimes lead to delays in identifying sudden changes in the patient's condition. With the advancement of technology, automated health monitoring systems have become an effective solution for improving patient care. These systems use electronic sensors and microcontrollers to measure and monitor the patient's vital parameters continuously. By using such systems, the patient's health data can be observed in real time, which helps medical staff take immediate action when abnormal values are detected. This reduces the workload of healthcare professionals and improves the efficiency of patient monitoring. The Patient Health Monitoring System using Arduino is designed to provide a simple and cost-effective solution for monitoring patient health. In this system, sensors such as a pulse sensor and temperature sensor are connected to the Arduino microcontroller to measure the patient's heart rate and body temperature. The collected data is processed by the Arduino and displayed on an LCD screen so that doctors or caregivers can easily observe the patient's condition.

2. LITEARATURE REVIEW

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3. METHODOLOGY

The proposed system is designed to continuously monitor important physiological parameters of a patient using biomedical sensors, a microcontroller, and IoT technology. The methodology of the system consists of several stages including data acquisition, data processing, data display, and remote monitoring.

A. System Design and Architecture

The Real-Time Remote Patient Health Surveillance System Using Arduino uses biomedical sensors to measure vital parameters such as heart rate and body temperature. These sensors are connected to the Arduino Uno, which processes the sensor data and converts it into readable values. The processed information is displayed on a 16×2 LCD Display for local monitoring. In addition, the data is transmitted through the ESP8266 to an IoT cloud platform, allowing doctors or caregivers to monitor the patient's condition remotely. Overall, the system architecture integrates sensors, a microcontroller, and IoT communication to enable continuous, real-time monitoring of patient health parameters, improving early detection of medical issues and enhancing healthcare services.

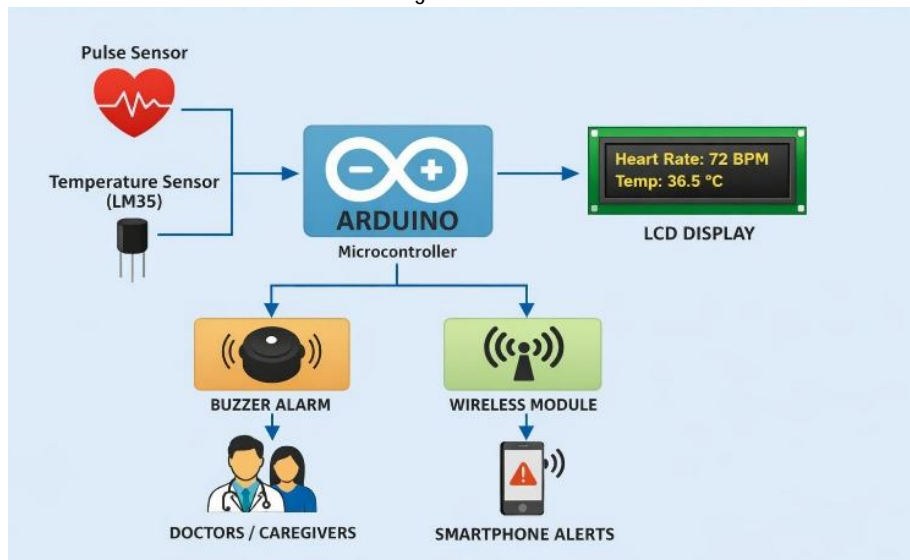


Fig1.1 Block Diagram

B. Hardware Components

The hardware components used in the proposed system include the Arduino Uno, pulse sensor, LM35 Temperature Sensor, ESP8266, 16×2 LCD Display, and a regulated power supply unit. These components work together to monitor and transmit the patient's vital health parameters in real time. The Arduino Uno acts as the central control unit of the system. It receives input signals from the biomedical sensors and processes the data using programmed instructions. The pulse sensor measures the patient's heart rate, while the LM35 temperature sensor measures the body temperature. The processed data is displayed on the 16×2 LCD display so that caregivers or medical staff can easily observe the patient's vital parameters. The ESP8266 Wi-Fi module provides internet connectivity and enables the transmission of the patient's health data to an IoT platform for remote monitoring. All the hardware components are interconnected to form a compact monitoring unit. The system continuously collects, processes, and transmits patient health data, allowing doctors or caregivers to monitor the patient's condition efficiently and take timely medical action when necessary.

C. Data Acquisition and Processing

The system continuously receives control commands from the caregiver through the Bluetooth-based mobile application. These commands include movement instructions such as forward, backward, left, and right, up, down. The Bluetooth module receives the wireless signal and transmits the data to the Arduino microcontroller. The microcontroller processes the received command and determines the required motor action. Based on the command, the system activates the relay module to control the rotation direction of the DC motors. Signal processing within the microcontroller ensures that the commands are interpreted accurately and executed without delay. This process allows the system to respond quickly to user instructions and ensures smooth operation of the hospital bed.

D. IoT-Based Monitoring System

The IoT-based monitoring system enables wireless transmission of patient health data from the monitoring device to a remote platform. This allows doctors or caregivers to observe the patient's vital parameters in real time using a smartphone or computer. A Wi-Fi module such as the ESP8266 is used to establish an internet connection between the system and the IoT platform.

The module is connected to the Arduino Uno, which collects and processes the health data from sensors. After processing, the Arduino sends the measured parameters such as heart rate and body temperature to the Wi-Fi module. The ESP8266 then transmits this data to an IoT cloud server where it can be accessed remotely. Through this wireless communication mechanism, healthcare professionals can monitor the patient's health condition continuously without being physically present. This IoT-based system improves healthcare monitoring by enabling real-time data access and timely medical response.

E. Monitoring and Data Transmission Mechanism

The monitoring mechanism is responsible for collecting physiological signals from the patient and converting them into meaningful health information. The system uses biomedical sensors to measure vital parameters such as heart rate and body temperature. The sensors send electrical signals to the Arduino Uno, which processes the signals and converts them into readable values. The heart rate is calculated in beats per minute (BPM), and the body temperature is measured using the LM35 Temperature Sensor in degrees Celsius. After processing, the measured health parameters are displayed on the 16×2 LCD Display for local monitoring by caregivers. At the same time, the processed data is transmitted through the ESP8266 to an IoT cloud platform. This mechanism enables continuous monitoring and remote access to patient health data. By observing the transmitted data, healthcare professionals can quickly identify abnormal conditions and provide timely medical assistance.

F. System Operation and Testing

The system operation begins when the patient health monitoring device is powered on. The biomedical sensors start measuring the patient's vital parameters such as heart rate and body temperature. These sensors continuously send the measured signals to the Arduino Uno for processing. The Arduino processes the received sensor data and converts it into readable values. The measured parameters are then displayed on the 16×2 LCD Display for local monitoring. At the same time, the processed health data is transmitted through the ESP8266 to an IoT platform, allowing doctors or caregivers to observe the patient's condition remotely. System testing is carried out to verify the performance and reliability of the monitoring system. The sensors are tested to ensure accurate measurement of heart rate and body temperature. The communication between the Arduino and the Wi-Fi module is also evaluated to confirm stable data transmission to the IoT platform. The testing results demonstrate that the system successfully monitors the patient's vital parameters and transmits the data for real-time observation. This ensures continuous health monitoring and helps healthcare providers respond quickly to any abnormal conditions.

G. System Operation and Testing

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H. Expected Outcome

The proposed methodology aims to develop a simple, efficient, and cost-effective patient health monitoring system for continuous observation of vital parameters. By integrating biomedical sensors, a microcontroller, and IoT communication, the system enables real-time monitoring of important health data such as heart rate and body temperature. The Arduino Uno processes the data collected from sensors and displays the results on a 16×2 LCD Display for local monitoring. At the same time, the health data is transmitted through the ESP8266 to an IoT platform, allowing doctors or caregivers to monitor the patient's condition remotely. The developed system improves patient safety by enabling continuous monitoring and early detection of abnormal health conditions. The project demonstrates the feasibility of implementing a reliable and affordable IoT-based health monitoring system that enhances healthcare services and supports remote patient observation.

I. Result

The proposed Smart Multi-Parameter Patient Health Monitoring System was developed and tested to evaluate its performance in monitoring patient vital parameters in real time. The system was tested under different operating conditions to analyse sensor accuracy, data processing capability, and wireless communication reliability. Experimental results show that the system effectively measures and displays health parameters using the integrated Arduino Uno, biomedical sensors, and IoT communication module. During testing, the sensors successfully measured the patient's heart rate and body temperature. The LM35 Temperature Sensor provided stable temperature readings, while the pulse sensor accurately detected heart rate values. The processed data was displayed on the 16×2 LCD Display, allowing caregivers to easily observe the patient's health status. The IoT communication using the ESP8266 was also tested to ensure stable wireless data transmission. The health data was successfully transmitted to the IoT platform, enabling remote monitoring through a smartphone or computer.

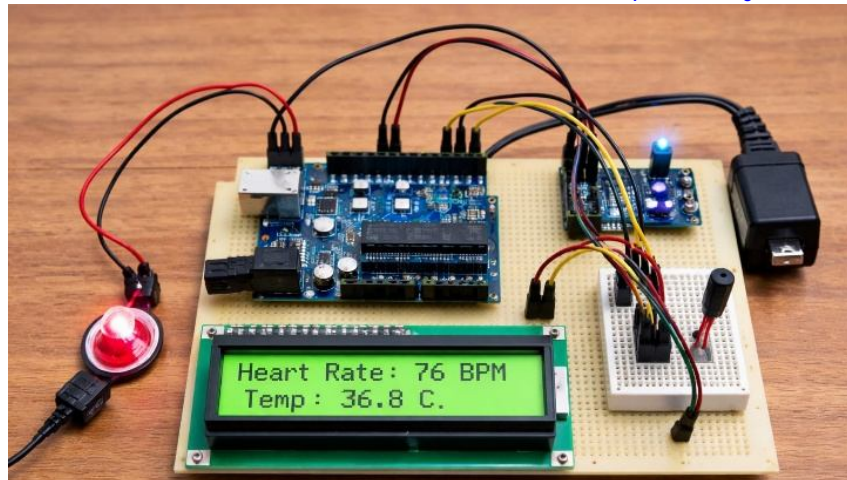


Fig1.2 Real-Time Remote Patient Health Surveillance System Using Arduino

The data transmission process was reliable and maintained continuous connectivity during the testing phase. The response time from sensor data acquisition to display and transmission was observed to be very fast, allowing real-time monitoring of patient health parameters. This capability helps healthcare professionals detect abnormal conditions quickly and provide timely medical attention. The experimental results confirm that the proposed system operates efficiently and provides reliable monitoring of patient vital signs. Overall, the developed system demonstrates improved patient health monitoring, early detection of abnormal conditions, and a practical solution for real-time healthcare monitoring in hospitals and home healthcare environments.

4. CONCLUSION & FUTURE SCOPE

The proposed Smart Multi-Parameter Patient Health Monitoring System was successfully developed to monitor important physiological parameters such as heart rate and body temperature in real time. The system uses components such as the Arduino Uno, biomedical sensors, a 16x2 LCD Display, and the ESP8266 to collect, process, display, and transmit patient health data. The testing results show that the system accurately measures vital parameters and provides reliable real-time monitoring both locally and through IoT communication. The developed system offers a simple, low-cost, and efficient solution for continuous patient health monitoring in hospitals and home healthcare environments. In the future, the system can be improved by integrating additional biomedical sensors such as blood oxygen (SpO₂), blood pressure, and ECG sensors to monitor more health parameters. Advanced IoT platforms and cloud databases can also be incorporated for secure storage and long-term analysis of patient health data. Mobile applications with alert notification features can be developed to notify doctors or caregivers immediately when abnormal conditions are detected. Further improvements may include wearable sensor integration, artificial intelligence-based health analysis, and enhanced data security mechanisms. These developments can transform the system into a comprehensive smart healthcare monitoring solution that improves patient care and supports remote medical services.

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