

HEART RATE MONITORING SYSTEM

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Abstract— Globally, cardiac illnesses are to blame for millions of deaths due to an aging population and rising healthcare costs. Furthermore, people in rural areas need high-quality medical treatment. The cost of healthcare can be reduced with the aid of technological developments in the fields of medical electronics and communication. This research introduces a real-time monitoring method for cardiac disease. IoT is turning into a wonderful platform for many offerings & packages, moreover the use of a sensor node but additionally a controller proper here. The paper suggests a general health monitoring system as a step up from the advancements made so far in this field. We have created a prototype for a portable, remote heart rate monitoring device in light of this. The patient can check his heart rate via this hardware having sensors. With the help of the heartbeat sensor, heartbeat readings can be verified and sent over to the OLED. This system will have a high and low heartbeat limit set. Once these limits are established, the system can start keeping track of the patient's heartbeat. As soon as the readings go above or below the limit, the system will keep track of it and display the results on an OLED when the threshold is crossed. Consequently, doctors may offer prompt services from a distance or, if the patient is being watched by a guardian, they can quickly take the required action to preserve the patient's life.

Keywords—Heart rate sensor, Monitor, Detection, Herat beat sensor, Arduino.

I. INTRODUCTION

Heart rate monitoring, which recognizes the heartbeat, is extremely important today. In this investigation, we've tried to offer a comprehensive paper on spotting heart attacks by keeping an eye on a person's heartbeat. While electrocardiography is the most accurate method for measuring heart rate, a heartbeat sensor is a simpler way to keep track of your pulse. Chest straps, smartphones, wristwatches (smartwatches), and other devices all have heartbeat sensors. There are several ways to check pulse rate, including these two: One method is to check your pulse at your wrists or neck, and another is to use a heartbeat sensor. The number of times the coronary heart contracts or increases in a minute is indicated by the heartbeat's measurement in beats per minute or bpm. These days, health issues like cardiac failure, lung failure, and diseases related to the heart are developing at an extremely rapid rate. Health monitoring is very important because of these issues occasionally. Wireless patient health monitoring is a contemporary idea. It is a significant advancement in the medical field. Here's a brilliant and affordable concept: using cutting-edge technologies like wireless communications, wearables, and portable remote health monitoring devices, the system would help people with various diseases live more comfortably. According to recent data, India experiences nearly two million heart attacks annually, with one person passing away every 33 seconds. According to the World Health Organization (WHO), by 2030, the global rate of heart

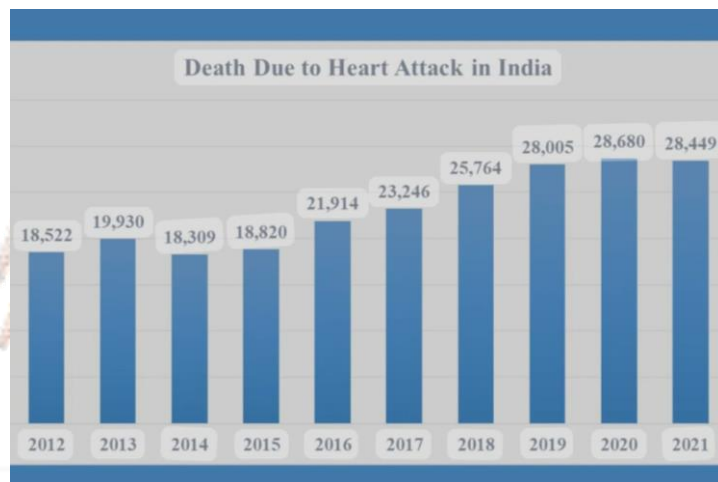


Fig 1. Heart Attack Deaths In India Last Year Occurred In 30-60 Age Group

disease could reach 23.3%. Such chronic diseases must be treated with ongoing, long-term monitoring to be effectively controlled. IoT facilitates the transition from manual to remote heart rate monitoring systems.

In this paper, we present the design and implementation of a heart rate monitoring system using an Arduino-based heartbeat sensor and MQTT cloud technology. The system is designed to be low-cost, portable, and easy to use, making it suitable for use in hospitals and remote monitoring applications. In recent years, cloud computing technology has been used in healthcare for data storage, processing, and analysis. MQTT (Message Queuing Telemetry Transport) is a lightweight messaging protocol that is widely used for IoT (Internet of Things) applications, including healthcare. MQTT provides a reliable and efficient way of transmitting data over the internet, making it suitable for remote monitoring applications. The proposed heart rate monitoring system consists of an Arduino-based heartbeat sensor, an ESP8266 Wi-Fi module, and a cloud server. The heartbeat sensor is used to measure the heart rate of the patient, and the ESP8266 Wi-Fi module is used to transmit the data to the cloud server. The cloud server receives the data and stores it in a database for processing and analysis.

The heartbeat sensor is based on the photoplethysmography (PPG) technique. The PPG sensor consists of an infrared LED and a photodiode that detects the reflected light from the skin. The reflected light varies with the blood flow, which corresponds to the heart rate. The Arduino board reads the analog signal from the PPG sensor and converts it into a digital signal. The ESP8266 Wi-Fi module is used to connect the heartbeat sensor to the cloud server using the MQTT protocol. The MQTT protocol provides a lightweight and reliable way of transmitting data over the internet. The data is sent in the form of MQTT messages, which contain the heart rate value and a timestamp.

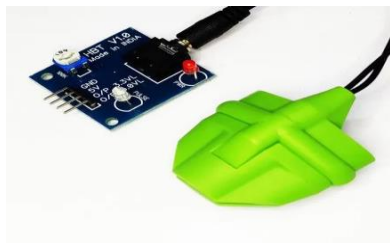


Fig 2. Pulse Sensor

II.LITERATURE REVIEW

Heart rate monitoring is an important aspect of healthcare as it provides vital information about the cardiovascular system of the patient. A variety of heart rate monitoring systems have been developed using different sensors and technologies. In recent years, cloud computing technology has been used in healthcare for data storage, processing, and analysis.

Heart rate monitoring systems based on photoplethysmography (PPG) sensors have been widely used in healthcare. The PPG sensor measures the blood flow through the skin, which corresponds to the heart rate. Arduino-based PPG sensors have been used to develop low-cost and portable heart rate monitoring systems for remote monitoring applications (Chen et al., 2020).

Wireless communication technologies have been used to transmit heart rate data to remote servers for storage and analysis. Wi-Fi, Bluetooth, and cellular technologies have been used for this purpose. MQTT (Message Queuing Telemetry Transport) protocol has emerged as a popular messaging protocol for IoT applications, including healthcare. MQTT provides a lightweight and reliable way of transmitting data over the internet, making it suitable for remote monitoring applications (Mensah et al., 2021).

Cloud computing technology has been used in healthcare for data storage, processing, and analysis. Cloud-based systems provide a scalable and secure way of storing and processing large amounts of data. The data can be accessed from anywhere and can be visualized using web-based dashboards. Cloud-based systems have been used for various healthcare applications, including remote monitoring, telemedicine, and medical diagnosis (Li et al., 2018).

In the context of heart rate monitoring, cloud-based systems have been used for storing and analyzing heart rate data. The data can be processed using machine learning algorithms for medical diagnosis and treatment. Cloud-based systems have also been used for real-time monitoring of heart rate data, allowing healthcare professionals to detect abnormal heart rates and intervene in a timely manner (Kumar et al., 2020).

In conclusion, heart rate monitoring systems based on PPG sensors and wireless communication technologies have been widely used in healthcare for remote monitoring applications. Cloud computing technology has emerged as a popular platform for storing and analyzing heart rate data. The proposed heart rate monitoring system using an Arduino-based heartbeat sensor and MQTT cloud technology is a low-cost, portable, and easy-to-use

system suitable for use in hospitals and remote monitoring applications. The system provides a reliable and efficient way of transmitting heart rate data over the internet, making it suitable for real-time monitoring and medical diagnosis.

III.METHODOLOGY

The goal of the suggested strategy is to create a wireless, automatic health monitoring system. The goal is to keep track of the patient's body's heartbeat rate (or pulse rate), which should be visible to the doctor (or in this system we say displayed on OLED). The hospital staff is responsible for keeping an eye on the patient's health in hospitals. The patient's heart rate is monitored continuously, and a record of it is kept. The following elements are needed for this system:

COMPONENTS USED

- Arduino Board (Nano) Atmega328
- Heartbeat Sensor (Pulse Sensor)
- NodeMCU
- Board
- OLED Display
- Power Supply
- Connecting Wires
- Breadboard

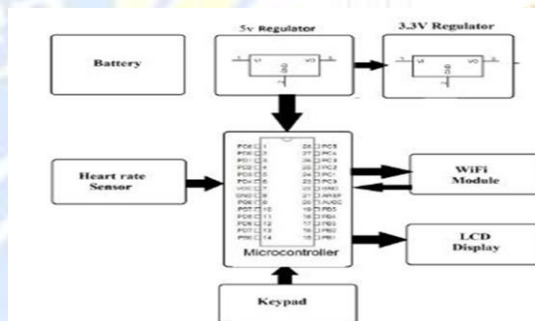


Fig.3 Block diagram.

The ATmega328 microcontroller, which has an interface with a heartbeat sensor, serves as a CPU for monitoring the patient's body. With the aid of a block diagram, the operation of this proposed health monitoring system can be described. A pulse sensor and a power supply block that powers the entire circuit are both included in this block diagram. The ATmega328 microcontroller, which has an interface with a heartbeat sensor, serves as a CPU for monitoring the patient's body. With the aid of a block diagram, the operation of this proposed health monitoring system can be described. A power supply block that provides power is shown in this block diagram.

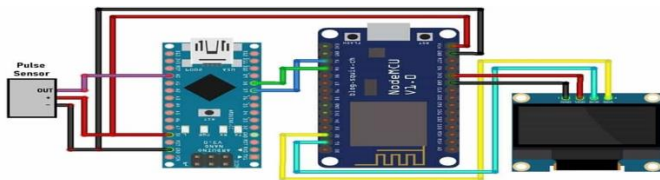


Fig 4. Schematic simulation diagram of Heart Rate Monitoring System

to the whole circuit, and a pulse sensor OLED that will display the output in BPM (beats per minute). Further, it will check whether the heartbeat goes above a certain limit or not. If yes, then it will show an alert. Here is the output which shows the heart rate in BPM.



Fig 5. Output in BPM

Patient monitoring is applicable in different situations when a patient is in the following conditions:

- In unstable physiological regulatory systems, such as those that result from anesthesia overdose.
- In a critical physiological state, such as when a patient is showing signs of a heart attack; • In a life-threatening condition
- Also, it can be a purpose of a routine checkup.

IV. FUTURE APPLICATIONS AND DEVELOPMENTS

- The device's serial output port allows it to be connected to a PC, where the temperature and heartbeat readings can be sent for additional online or offline analysis. It is possible to display a warning for health condition anomalies.
- The device can have sound added so that it plays a sound each time it detects a pulse and sounds the alarm in the event of an abnormal health condition.
- The output can be transferred to mobile devices via Bluetooth or the GSM module for additional analysis.
- The LCD and Wi-Fi Module allow it to send SMSs and show the heart rate (pulse). Using Wi-Fi Module and LCD it can send SMS and display the heart rate(pulse).
- The system can also offer multiple numbers so that multiple users can receive emergency messages.
- In addition the system can also provide more than one

number so that more than one user can receive an emergency message.

V. Results and Discussions

The primary goal of a heart rate monitoring system is to keep an eye on a person's health (Heart Rate). With today's cutting-edge technologies, we have developed a very creative method of treating a patient while seated at home. Further study and calculations of the accuracy of all simulation cases' results revealed that this design is superior to the system based on the Arduino Nano Board. Additionally, it is demonstrated that the design is less expensive, uses less energy, and is smaller. facilitating the acquisition of a diverse user base, elderly healthcare facilities, and small hospitals. Additionally, it offers trustworthy outcomes to support making the best choice for this system could be available at a reasonable cost with great effect and accuracy.

CONCLUSION

In this paper, we discuss heartbeat sensors' use in heart attack detection and prevention. Through this project, we can manage to get the health status of a person. It would be incredibly effective for people who live in various sectors and are not tech-savvy to reap the rewards of technology. The introduction of this heart rate monitoring system would be advantageous for all of us as it will cut down on time spent and the cost of using expensive machines, among other things. This project's implementation will be reasonably priced. Wireless communication was chosen because it allows for greater sensor equipment mobility and lowers costs when there are multiple transmitting sections. It might lower costs while increasing access to medical facilities and services.

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REFERENCES

- [1] Heartbeat and Temperature Monitoring System for Remote Patients using Arduino Vikram Singh R. Parihar¹, Akash Y. Tonge², Pooja D. Ganorkar³, Issue -5 May 2017. B. Rieder, *Engines of Order: A Mechanology of Algorithmic Techniques*. Amsterdam, Netherlands: Amsterdam Univ. Press, 2020.
- [2] Heart Attack Detection and Heart Rate Monitoring Using IOT Nikunj Patel, Prince Kumar Patel, Nehal Patel, Issue 4 April 2018.
- [3] Gowri Shankar, S.M.Y Prachita, and Arvind Prakash. "IoT-based Heart Attack Detection, Heart Rate, and Temperature Monitor."
- [4] Heart rate Monitoring System, Mr. Ved Prakash, Mr. Manoj Kumar Pandey, Assistant Professor, ECE Department, Amity University Gurgaon, Haryana, May 2018.
- [5] Heart Monitoring Using IoT, Savan Banerjee Souptik Paul, Rohan Sharma, Abhishek Brahma, 2016.
- [6] IoT on Heart Attack Detection and Heart Rate Monitoring, Mimidi Manisha, Karakam Neeraja, Vemuri Sindhura, 2013.
- [7] Heart Attack And Alcohol detection Sensor Monitoring In Smart Transportation System Using IoT, Surendra V, Subhash Chander S, Balajis, 2012.

