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IOT-INTEGRATED HEART HEALTH ASSISTANT FOR PROACTIVE DETECTION OF CARDIAC ABNORMALITIES

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ABSTRACT
This project involves the development of a system for monitoring heartbeats and detecting heart attacks through the use of the Internet of Things. Currently, there is a growing prevalence of heart conditions, which includes a heightened likelihood of experiencing heart attacks. A microcontroller is subsequently connected to the sensor, enabling the monitoring of heart rate measurements and their transmission via the internet. The user is able to establish both the upper and lower thresholds for heart rate limits. Once these parameters are established, the system begins its monitoring process. If the patient's heartbeat exceeds a specified threshold, an alert is generated and sent to the controller, which subsequently transmits the information via the internet, notifying both doctors and relevant users. The system also notifies users when heartbeats drop. Each time the user accesses the monitoring system, it concurrently shows the patient's current heart rate. As a result, individuals concerned about health can track heart rates and receive immediate notifications of a heart attack for the patient, allowing timely intervention and potentially saving the individual's life.

Keywords:
Pulse, Temperature, Internet technology and IoT.

INTRODUCTION

In the contemporary age of communication and technology, the rapid expansion of electronic devices, smartphones, and tablets, which can communicate either physically or wirelessly, has emerged as an essential component of everyday life. The forthcoming generation of a connected world is characterized by the Internet of Things (IoT), which links devices, sensors, appliances, vehicles, and various other 'things.' These objects may encompass radio-frequency identification (RFID) tags, mobile phones, sensors, actuators, and much more. Through the utilization of IoT, we can connect anything, access information from anywhere at any time, and efficiently obtain services and details regarding any object. The heart is one of the most vital organs in the human body, functioning as a pump to circulate oxygen and blood throughout the body, thereby maintaining its functionality. A heartbeat can be described as a two-part pumping action of the heart that occurs approximately every second, resulting from the contraction of the heart muscle. When blood accumulates in the upper chambers, the sinoatrial (SA) node emits an electrical signal that prompts the atria to contract. This contraction subsequently propels the blood through the tricuspid and mitral valves; this phase of the pumping mechanism is referred to as diastole. The subsequent phase commences when the ventricles are fully filled with blood. The electrical signals originating from the SA node reach the ventricles, inducing their contraction. This phase of the pumping mechanism is known as systole. The tricuspid and mitral valves close tightly to avert the backflow of blood, while the pulmonary and aortic valves open. This system is capable of regularly detecting pulse and temperature with the assistance of sensors. Doctors can establish thresholds for all parameters, and if these parameters exceed the maximum limit, the system sends a notification to the server via Wi-Fi. In the contemporary

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age of communication and technology, the rapid expansion of electronic devices, smartphones, and tablets, which can communicate either physically or wirelessly, has emerged as an essential component of everyday life.
The forthcoming era of interconnectedness is characterized by the Internet of Things (IoT), which facilitates the connection of devices, sensors, appliances, vehicles, and various other "things". These items or objects may encompass tags, mobile phones, sensors, actuators, and much more. Through the utilization of IoT, we can connect virtually anything, access it from any location and at any time, and efficiently obtain services and information regarding any object. The primary objective of IoT is to enhance the advantages of the Internet by incorporating remote control capabilities, data sharing, and continuous connectivity, among other features. By employing an embedded sensor that is perpetually active and gathering data, all devices can be linked to both local and global networks. The term IoT, frequently referred to as the Internet of Everything, was first introduced by Kevin Ashton in 1999, who envisioned a system in which every physical object is interconnected via the Internet through ubiquitous sensors. IoT technology has the potential to generate vast amounts of data concerning humans, objects, time, and space. The integration of current Internet technology with IoT offers extensive opportunities for innovative services based on low-cost sensors and wireless communication. The advancements in IPv6 and cloud computing facilitate the integration of the Internet and IoT. This integration is yielding greater possibilities for data collection, data processing, port management, and other novel services. Each object that connects to IoT necessitates a unique address or identification through IPv6. There exists a significant population globally whose health may be adversely affected due to inadequate access to hospitals and health monitoring. Fig-1 illustrates the Internet of Things, which is defined as the internetworking of physical devices, vehicles (also known as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity, enabling these objects to collect and exchange data. In 2013, the Global Standards Initiative on Internet of Things (IoT-GSI) characterized IoT as "the infrastructure of the information society." The Internet of Things (IoT) enables the remote sensing and/or control of objects through established network infrastructure, facilitating a more seamless integration of the physical environment with computer-based systems, which leads to enhanced efficiency, precision, and economic advantages.

IOT-BASED SYSTEM FOR MONITORING HEART RATE AND DETECTING HEART ATTACKS

Monitoring heart rate is crucial for preserving cardiovascular health. Different age demographics exhibit varying maximum and minimum heart rate thresholds, necessitating a monitoring system that can adapt to these differences. This paper presents an IoT-based system designed to track heartbeats using data from a hardware setup that includes a NodeMCU and a pulse sensor. Additionally, an alert mechanism is integrated, which activates if the heartbeat deviates from the acceptable range defined in the algorithm. The alert notification is sent to the physician via a mobile application. This prototype enables doctors to access patient heartbeat information remotely. Nurses or on-duty physicians at the hospital can observe the patient's heart rate in real-time through a serial monitor.

HEART ATTACK DETECTION AND HEART RATE MONITORING USING IOT

Currently, there is a rising prevalence of heart-related ailments, including an increased likelihood of heart attacks. Our proposed system utilizes sensors to detect an individual's heart rate, even when the person is at home. The sensor is connected to a microcontroller that facilitates the monitoring of heart rate readings and their transmission over the internet. Users can establish both upper and lower heart rate limits. Once these thresholds are configured, the system commences monitoring, and if the patient's heart rate exceeds a specified limit, an alert is sent to the controller, which then relays this information online to notify doctors and relevant parties. The system also provides alerts for low heart rates. Whenever the user logs in for monitoring, the system displays the patient's current heart rate live. Consequently, concerned individuals can monitor heart rates and receive immediate alerts regarding potential heart attacks from any location, thereby enabling timely intervention.

DETECTION OF HEART ATTACK THROUGH HEARTBEAT MONITORING UTILIZING THE INTERNET OF THINGS (IOT)

It is widely recognized that a heart attack can be fatal within three attempts; however, in contemporary times, it can prove to be perilous even on the first attempt. By routinely monitoring our health on a daily basis, we can identify numerous diseases at an early stage. Life is invaluable. Many individuals succumb to heart attacks, primarily due to factors such as diet, age, insufficient physical activity, and various other influences. Detecting a heart attack is challenging, and to mitigate this issue and assist our community in combating heart diseases and attacks, we are in the process of developing a system. This system aims to reduce mortality rates and facilitate the early detection of heart

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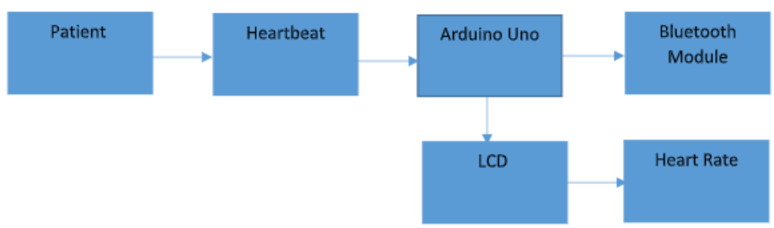
attacks. We are implementing a heartbeat monitoring and heart attack detection system that leverages the Internet of Things. The sensor is connected to a microcontroller, enabling the monitoring of heart rate readings and their transmission over the Internet.

HEARTBEAT MONITORING AND HEART ATTACK DETECTION THROUGH THE INTERNET OF THINGS (IOT)

In this initiative, we are establishing a heartbeat monitoring and heart attack detection system utilizing the Internet of Things. Currently, there is a rising prevalence of heart diseases, including an increased likelihood of heart attacks. The sensor is interfaced with a microcontroller, which allows for the monitoring of heart rate readings and their transmission via the Internet. Users can set both high and low heartbeat thresholds. Once these thresholds are established, the system begins monitoring, and if the patient's heartbeat exceeds a specified limit, an alert is sent to the controller, which subsequently transmits this information over the Internet to notify doctors and relevant users. The system also provides alerts for low heart rates. Whenever the user accesses the monitoring system, it displays the patient's live heart rate. Consequently, concerned individuals can monitor the heart rate and receive immediate alerts regarding potential heart attacks, enabling timely intervention to save the patient.

Existing System



The Heart Rate Monitoring system has been developed utilizing IOT technology with the aim of detecting the patient's heartbeat to monitor the risk of heart attacks as well as for regular check-ups. Monitoring body health is crucial for ensuring that our health remains in optimal condition. One of the key parameters for this device is the heart rate (HR). In this project, we outline the design of an affordable heart rate monitoring device that operates from the fingertips and is based on Bluetooth technology. The complete system consists of several components, including the Heart Rate module, an Android application, and a Bluetooth module. The Heart Rate (HR) module captures the heart rate signal through a non-invasive method known as Photoplethysmography from the subject (patients) and transmits this signal wirelessly to a computer or Android application via the Bluetooth module. The data obtained from the heart rate module can be stored and accessed for future medical applications. The outcomes from this device prototype can be employed for various clinical studies, as these Bluetooth signals can be transmitted over a distance of 15 to 20 meters.

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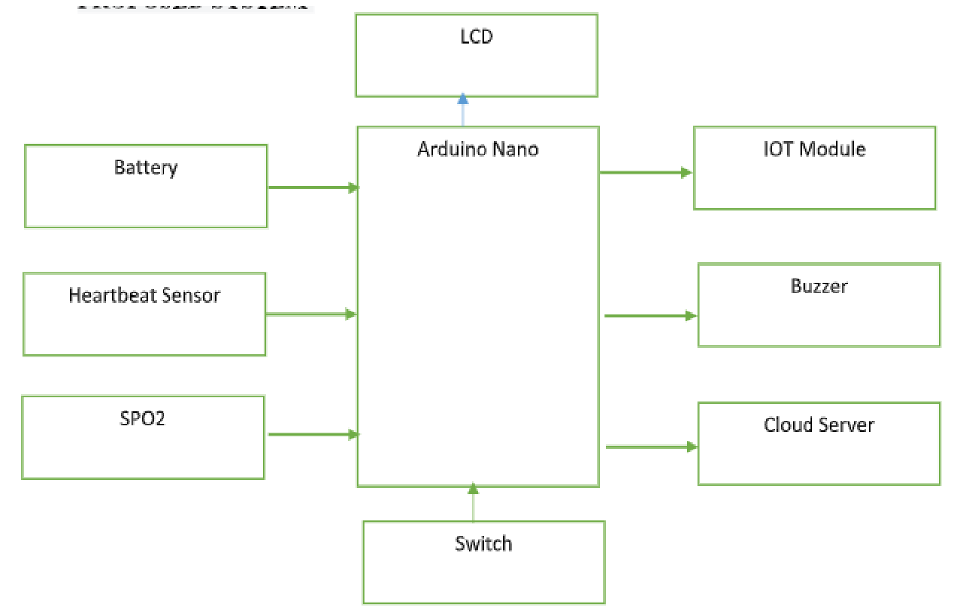
PROPOSED SYSTEM



This paper presents a technique for measuring heart rate utilizing a pulse sensor, an Arduino microcontroller, and an Android smartphone. The method is founded on the principle of assessing the fluctuations in blood volume within the body through the use of a light source and a detector. The sensor is composed of an infrared light-emitting diode (LED) and a photodiode. The LED emits infrared light into the fingertip, which is then reflected back from the blood within the finger's arteries. The system employs a heartbeat sensor to determine the current heart rate and displays this information on an OLED screen. The transmitting circuit consists of an AVR family microcontroller connected to the OLED screen, powered by a 12V transformer. In a similar manner, the receiving circuit also incorporates an AVR family microcontroller and an RF receiver, along with a 12V transformer. Additionally, the receiver circuit features an LED light and a buzzer, which serve to alert the individual monitoring the patient's heartbeat rate, activating the LED light and buzzer if the patient's heart rate deviates from the established normal range. This system is designed to be universally applicable across all hospital rooms, allowing the operator to monitor multiple patients from a single location. The sensor requires less than 15 seconds to ascertain the heart rate value. Notifications regarding the heart rate will be dispatched under normal conditions (BPM, Beats Per Minute).

HARDWARE COMPONENTS

Arduino Nano
OLED 7805
Regulators
Panic Switch
Pulse Sensor
Esp8266
Module Buzzer

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Spo2 Sensor
Temperature Sensor

CONCLUSION

Currently, there is a rising prevalence of heart diseases, including an elevated risk of heart attacks. Our proposed system utilizes sensors that enable the detection of an individual's heart rate through heartbeat sensing, even when the individual is at home. The sensor is connected to a microcontroller, which facilitates the monitoring of heart rate readings and their transmission over the internet. Users can establish both high and low heartbeat limits. An IoT-based system for monitoring and controlling human heartbeat rates has been developed. This system leverages the capabilities of a heart pulse sensor for data acquisition. A person's heartbeat is captured as data signals and processed by the microcontroller. The processed data is then transmitted to the IoT platform for further analysis and visualization. The experimental results obtained were found to be accurate, as the system successfully sensed and recorded the user's heartbeat rate, transmitting the collected data via Wi-Fi to an Android mobile application. From the results, it was determined that the heartbeat rate is considered low if it falls below 40 and above 60 and 100.

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