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Iot-Based Smart Health Monitoring System

M. Suguna
St. Joseph's College of Arts and Science for Women, Hosur, Tamil Nadu, India.
Corresponding Author Email: sugunanet369@gmail.com

Abstract

The primary purpose of the Internet of Things-based Smart Healthcare Monitoring System (SHS) is to provide emergency medical assistance. It can show how to integrate flexible IoT data interoperability with medical implementation. It provides patients in intensive care units (ICUs) with effective assistance for emergency medical services. The doctor can quickly install the Blynk app on their phones and gain access by using it. This system performs well and responds quickly, yielding effective and efficient results. By gathering, evaluating, and disseminating a vast amount of data in real-time, the smart healthcare system improves health-related issues and lowers healthcare costs. The primary motivation is to lessen the burden on physicians who must visit patients frequently to assess their physical state. SHS helps both patients and doctors save time. The temperature, drip level, and heartbeat sensors' accurate and useful results are provided by this real-time medical service.

Keywords: Smart Healthcare Monitoring, IoT, Blynk application, Heartbeat sensor, Temperature sensor, Drip level sensor.

1. Introduction

The wireless network of devices that are linked to one another to exchange data and information is known as the Internet of Things, or IOT. It will use the network to gather and distribute vital data. It will be easier to record and analyze it using SHS for later use. The utilization of multiple sensors and actuators to perceive different parameters of the patient's body and ward is made possible by the Internet of Things. The cloud serves as a communication route between the PC unit and the Blynk app, allowing access to patient information. It is an open-source Internet service that engages with people. In addition to being sturdy and cozy, this connects everyone on the planet. A key component of smart healthcare systems is the Internet of Things. The primary goal is to lessen the burden on doctors to see patients regularly.

Related works: [1] Businesses that make consumer goods have started developing methods for giving their items IP (internet protocol) control. A sizeable portion of the lines of multinational electronics companies are being marked by technologies such as RF ID, which is the IP network's front end. The primary function of the home automation systems already in place is to enable control over all integrated equipment from a single central unit. The suggested fixes based on this concept are quite costly and challenging to set up. The main requirement for IP-based systems is proximity to a direct internet connection, which should make them easier to access and control. In light of this, SHS has created an affordable hardware/software framework centred on a device known as the IPAC Box, which enables direct internet connection access and management of residential and industrial automation systems straight out of the box, even in dynamic IP settings. In [2], Using an INTEL GALILEO 2ND generation development board, the design and implementation of an IOT-aware architecture for a smart healthcare system for emergency medical services that can demonstrate the flexible collection, integration, and interoperability of IoT data and support emergency medical services like intensive care units (ICU) [9]. The suggested methodology gathers, records, analyses, and shares massive data streams effectively and in real-time, allowing users to save healthcare expenses and improve health-related risks. The concept was born out of a desire to lessen the burden of patients needing to see a doctor each time they needed their blood pressure, heart rate, temperature, etc. checked. This concept allows doctors to aid as much as possible in emergencies while also saving time for both patients and doctors. [6] By connecting and gathering data through health status monitors—which would include the patient's heart rate, blood pressure, and ECG—and sending an emergency alert to the

patient's doctor with all of his medical records, the project aims to provide patients with appropriate and effective medical care. [3] S.M. Rajesha discussed "Automation System Products and Research" in this work. These days, the majority of buildings employ it. They were mostly employed in industry in the past to monitor and regulate vital systems. [4] "Lab view-based real-time patient monitoring system." A fast-growing area of clinical medicine is called telemedicine, which transfers medical data over the phone, the Internet, or other networks.[5] This approach involves taking the patient's vital signs, such as their temperature, heart rate, breathing rate, and ECG, and entering the data into a database.

Drawbacks of Bluetooth*: [10]*
The main drawback of Bluetooth is low energy. It covers a small area distance, and Time consuming while transferring big data.

Proposed methodology:

3.1. Working:

The Figure 1 consists of three component modules:

1. Aurdino microcontroller
2. PC unit
3. Blynk app

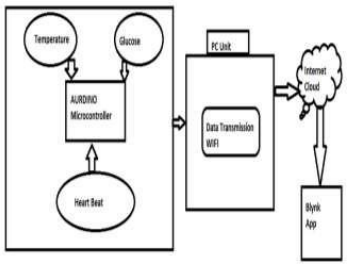


FIGURE 1. Working of SHS.

The microcontroller is attached to three sensors, they are:

1. Temperature sensor
2. Glucose sensor
3. Heartbeat sensor

A schematic illustration of the Smart Health Care System is shown above in Figure 1. Three separate sensors will be connected here by the microcontroller. They are as stated above. These sensors record and sense the appropriate parameters. The PC unit receives these records after that. The data is thereafter sent using the internet cloud and Wi-Fi. It will serve as a gateway to the cloud and the Blynk application, which is the doctor's mobile app. The patient's details will be sent to the doctor using this. The primary difference between this location and the last one is that WiFi will be used in place of Bluetooth.

3.2. Blynk Software:

An Android software platform called Blynk is used to control Arduino. The Arduino compatibility will be provided by the Blynk app. The doctor can obtain patient data and continue to avoid frequent trips to the patient ward by utilizing the Blynk app [8]. Both the patient and the doctor will save time and money using this software.

3.3. A temperature sensor:

The temperature sensor determines the precise room temperature of the patient ward, which varies based on the meteorological conditions. Notification is issued to the doctor if the temperature exceeds the threshold. This facilitates taking the necessary actions in emergency scenarios. The hospital's management has constant access to see and review patient records. In this healthcare system, the contact type of sensor is employed out of the two. These sensors are accurate, never wear out, require no calibration, function in a variety of climatic situations, and maintain consistency between sensors and readings because they are devoid of moving parts. They are also incredibly simple to use and reasonably priced.

There are two temperature sensing methods:

Contact

- Non-contact

Types of Contact Temperature Sensors: These temperature sensors employ conduction to measure temperature changes and must be in direct contact with the object being sensed. They are useful for a broad range of temperature detection of solids, liquids, and gases.

Types of Non-Contact Temperature Sensors: These sensors monitor temperature variations using radiation and convection. They can be used to detect radiant energy being transmitted from an item in the form of infrared radiation or liquids and gases that emit it when heat rises and cold sinks in convection currents.

3.4. Glucose Sensor:

The drip sensor is all that the glucose sensor is. The sensor is integrated during production. The liquid in the glucose vial will float when it is full, indicating a NORMAL result. The result is displayed as LOW when the liquid is emptied. This is how the smart healthcare system's glucose or drip sensor will function in real-time.

3.5. Heartbeat Sensor:

The patient's heartbeat's pulse rate will be detected by this sensor. Because light is scattered or absorbed as it passes through the blood when the heartbeat varies, the optical power variation can be used to quantify the heartbeat.

Experimental Results

Heartbeat sensor:

Figure 2 depicts the patient's body's pulse rate. The doctor's smartphone app will receive a message from the heartbeat sensor once it detects movement in the body. The patient's heartbeat is in an ABNORMAL condition since the heartbeat rate in Figure 4.1 is 40. The glucose level sensor's readings will be displayed in the LOW state. It displays the precise measurement of the patient ward's room temperature. The heart beats at a normal bit rate of 60. It will display abnormally if it arrives at a bit rate lower than this.

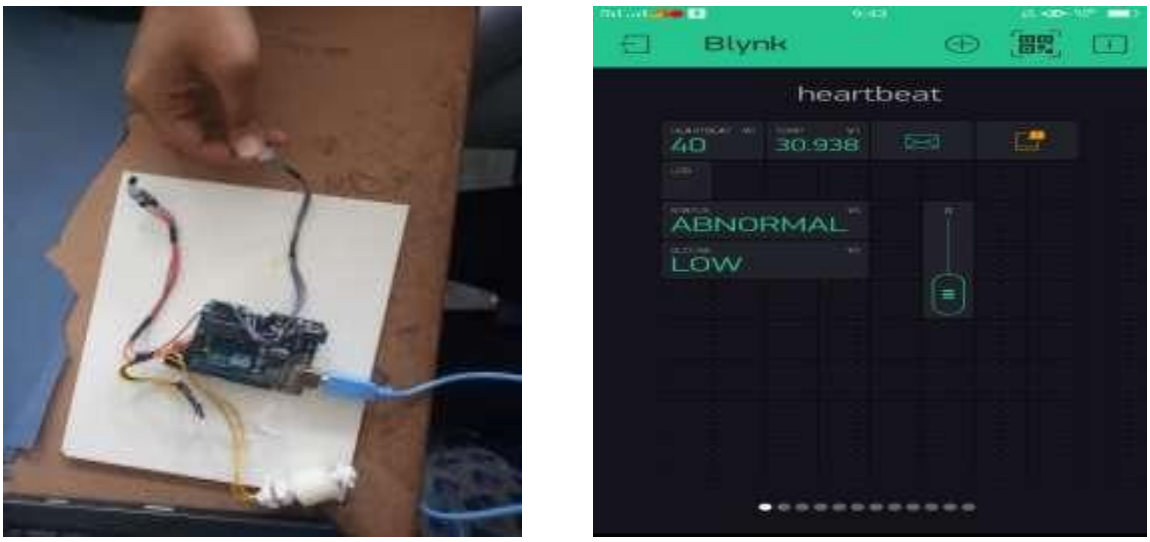
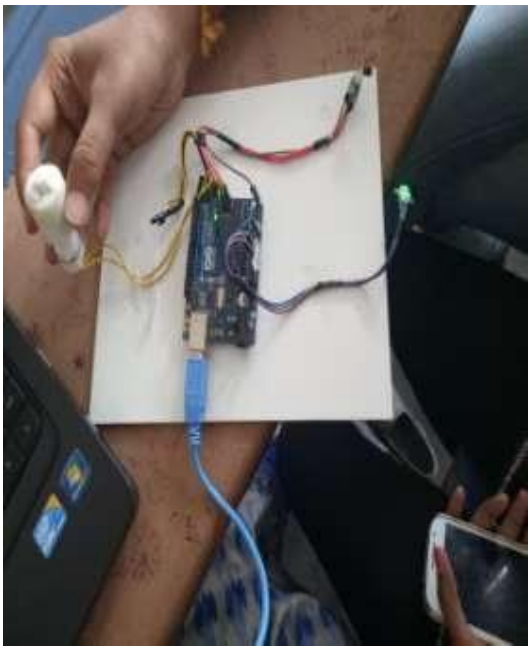


FIGURE 2. Working of Heartbeat Sensor

Glucose sensor:

Figure 3 displays the patient's blood glucose level in terms of normal or low, and it notifies the doctor's cell phone. The outcome will be low if the Glouse level is empty; otherwise, it will be normal. To illustrate, a water level sensor is utilized.



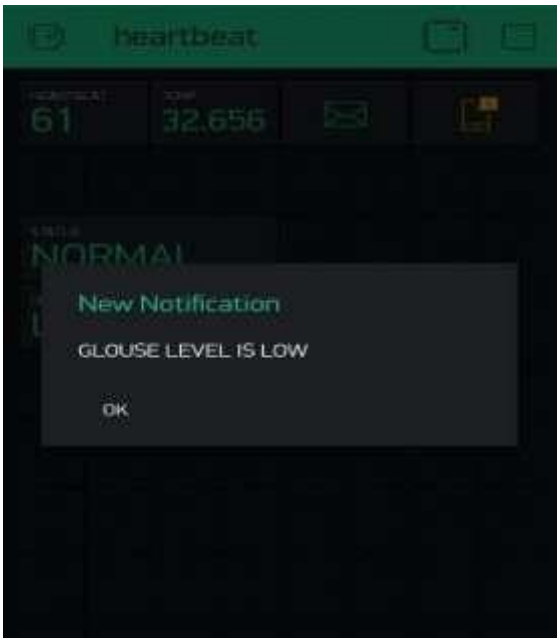


FIGURE 3. Preprocessing stages of

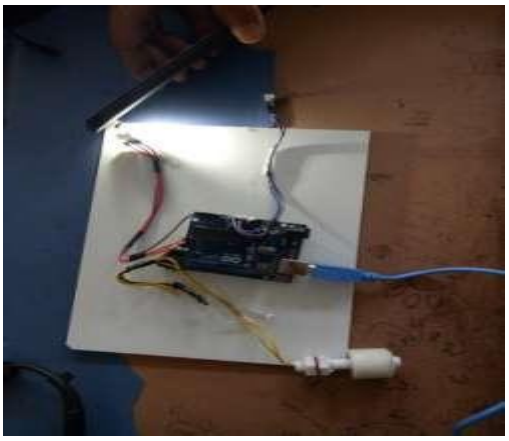


FIGURE 3. Working of Glucose Sensor

Temperature sensor:

Figure 4 illustrates how a temperature sensor functions. The temperature sensor notifies the doctor's mobile application and provides an accurate reading of the patient's ward. The patient's state is ABNORMAL and their heart rate is 59 in Figure 4.3. The glucose level is within normal limits. The ward's room temperature is 31. 367. It varies depending on the type of weather.

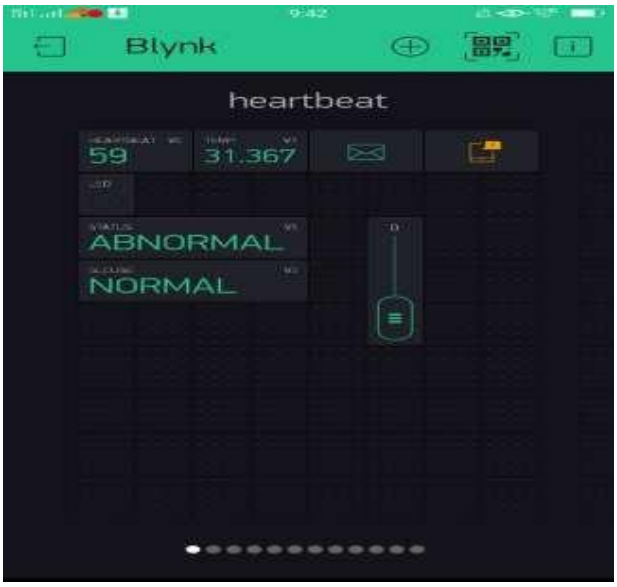


FIGURE 4. Working of Temperature Sensor

2. Conclusions

If the doctor is not present, an effective SHS is designed to keep track of and transmit the patient's most recent information. The technology takes the patient's temperature, blood pressure, and pulse rate and sends the data to the physician. Through patient data collection and monitoring, the system confirms the patient's status. After assessing and tracking the patient's health, the physician gives them health-related advice. The system can be expanded by adding more functions through the Blynk mobile application. Doctors can raise knowledge about diseases and their symptoms by using this smartphone application.

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