IoT BASED SECURED REAL-TIME HEALTH MONITORING SYSTEM USING ARDUINO

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ABSTRACT:

One of the biggest challenges to health care is how digital health systems are able to engage everyone and every citizen around the world, to help them stay healthy. Healthcare information technology enhances patient safety by reducing medication errors and improving adherence to adherence guidelines. Health information technology is an important tool for improving the quality and safety of health. This IoT-based secure real-time health monitoring system uses ARDUINO to keep track of a patient's health at home is a daunting task due to the busy schedule and daily routine. A person can monitor his or her health from the comfort of his or her home with this life-saving device that quickly reduces production time and efficiency using an app that includes a Login ID and a Password system. In particular, elderly patients should be monitored from time to time. Patient health parameters such as Heart Rate / Pulse (BPM) and body temperature, ECG and blood pressure are measured using nerves. The data is then processed and stored in the application by encryption to the end.

I.INTRODUCTION:

Health technology is vital during this global epidemic. This includes helping to prevent people from becoming infected or controlling other chronic diseases. This is the heart of where the digital health ecosystem plays an important role. Digital health technology has played a key role in promoting a home-based care system that makes this task easier for patients with disabilities and the elderly. These devices use an IoT-based secure system to track the health of patients using a tracking system. Uses login and password to access medical data and data is stored in the cloud for periodic access through a secure database. A person can monitor his or her health from the comfort of his or her home with this life-saving device that quickly reduces the time to minimize productivity and performance improvements. It can be widely used in the medical field so that patients can consult their appropriate doctors. It gives patients quick access to providers and improves medication adherence. Make patient monitoring as easy and convenient as possible. Increases the accuracy of medication interactions, which improves patient safety. Improves provider communication and communication.

II.LITERATURE SURVEY:

A growing amount of research work is being conducted on this field so that the system can be operated on an individual level i.e. after the patient has been discharged from the hospital. Also, for the proper functioning of the system, research work is being done to try to overcome any runtime restriction and system errors of the various remote advancements being used. A growing amount of research work is being conducted in Health monitoring field so that this system can be operated on individual levels that is after the patient has been discharged from the hospital after getting treated but also should be monitored frequently. Also, for the proper functioning of the healthmonitoring system, research work is being done to try to overcome any runtime restriction, technical problems and system errors of the various remote advancements being used.

2.1 Roy et al.

They have presented an RF based remote patient monitoring system which is used to enable the user to use medical care information through the web and the mobile application platforms. The system is built up with the sensor nodes, coordinator node, web and database server and graphical user interface (GUI). The sensor node is used for collecting the data andthe acquired data is uploaded to the central server. Users can observe the data and analyse result through the GUI. Due to the delay in the transmission and slow server response, this system is unable to support real-time mode. Lee et al. proposed a smartphone based remote patient monitoring system [5]. In this system, a smartphone application (app) is implemented. Patient can have a video conference with the doctor by using a smartphone to discuss the treatment process. This system is collaborating with Skype's AES-style encryption to secure the patient's video data. This system does not support real-time mode. Patient is required to upload the collected vital sign to the server manually.

2.2 Le et al.

They have proposed a smartphone based remotely monitoring patientSystem.In this proposed system, a smartphone application (app) is implemented. Patient can easily have a video conference by using a smartphone to discuss the treatment process with the doctor. This system is collaborating with the Skype's AES-style encryption to secure the patient's video data with privacy. This system does not support real-time mode. Patient is advised to upload all the collected vital sign to the server manually individually.

2.3 Dwiveedi et al.

They have developed a amazing framework in order to secured clinical information that have to be transmitted over the internet for Electronic Patient Record (EPR) systems in which they should propose a multi-layered healthcare information system framework which is the combination of the Public Key Infrastructure, the Smartcard and the Biometrics technologies.

III.METHODOLOGY:

The core objective of project is the design or model and implementation of a smart patient health tracking system. This system consists of basic vital sensors interfacing with the mobile application.

Patient health parametres such as Heart Rate/Pulse (BPM) can be monitored using the MAX30100 Pulse-Oximeter sensor and DHT11 temperature sensor to measure the body temperature and the Blood pressure is measured using pressure sensor. The sensors acquire datas from the Patients body and transmit it to the application via the Wi-Fi module there the data is processed.If the processed data is not in acceptable or limited range then an alert message is sent to the patient or their relatives mobile and their respective doctor.The, doctor can take the action as soon as possible for helping the patients.The system measures the parameters in real-time and displays on the LCD and in the application.Also, the data is stored in the cloud for future references.

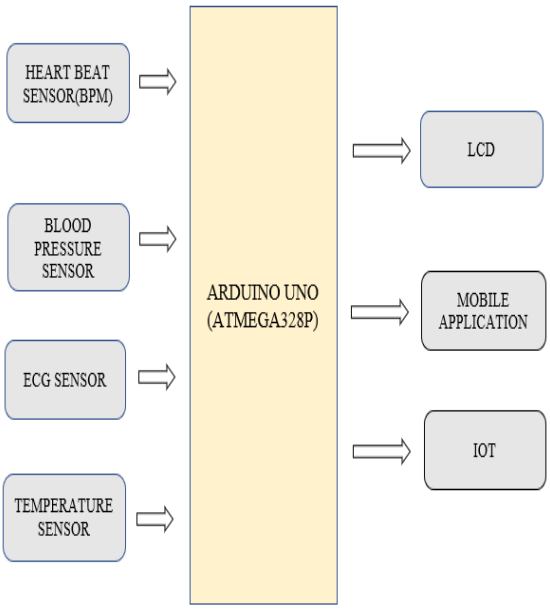

Figure 1: Block diagram of proposed system

Thesensors are embedded on the patient body to sense the temperature and heartbeat of the patient. Two more sensors are placed at home to sense the humidity and the temperature of the room where the patient is staying. These sensors are connected to a controller unit, which calculates the values of all of the four sensors. It also contains an Arduino with 14-digital input/output pins can be used as input or output pins by using pin Mode (), digital Read () and digital Write () functions in the Arduino programming. Arduino can also be used to communicate with a computer, another Arduino board or other microcontrollers. The ESP8266 is also a very user friendly and low-cost device to provide internet connectivity. The, module can work both as the Access point (can create hotspot) and as a station (can connect to Wi-Fi), and hence it can be able to easily fetch data and upload it to the internet making Internet of Things as easy as possible. It can be also used to fetch the data from internet using API's so the project could be able to access any information that is available in the internet, thus making it smarter. These calculated values are then transmitted through an IoT cloud to the base station. From the base station the values are then accessed by the doctor at any other location. Thus, based on the patient's temperature and heart beat values the doctor can decide the state of the patient and appropriate measures can be taken. The proposed model allows the doctors to monitor patient's health from anywhere. It helps people to consult the specialist all over the world. The system is implemented in such a way that if the sensor data exceeds the threshold values, a message is sent to the doctor. This system can also be applied to COVID-19 patients. The data collection increases as the number of patients increase. To manage this bigdata with cloud computing techniques can be used.

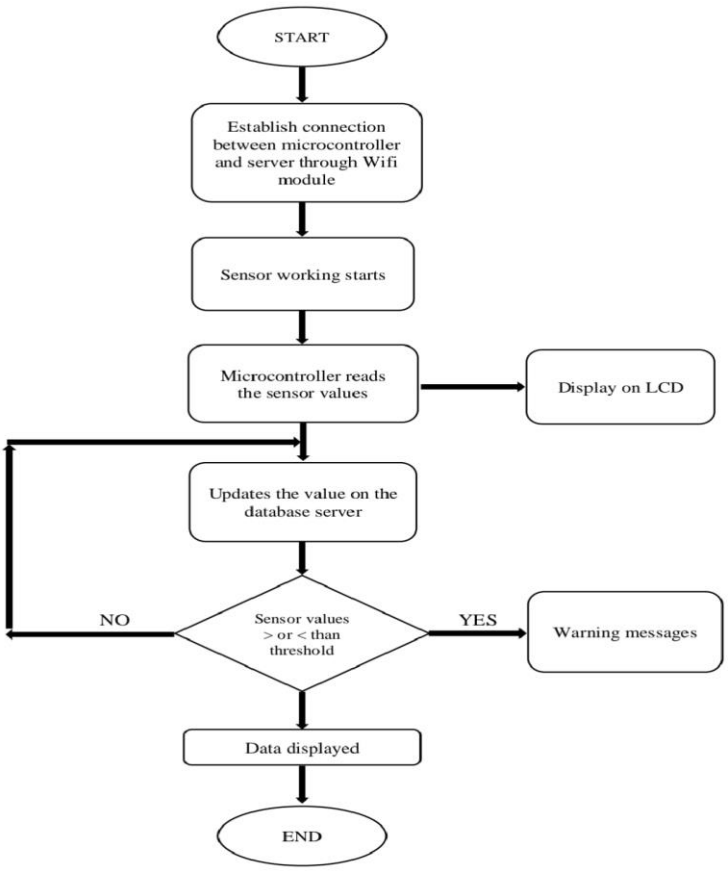

Figure 2: Flowchart/Algorithm

IV.HARDWARE DESCRIPTION:

4.1Arduino:

Arduino is a friendly platform for making electronic products. It has a well-organized Regional Board and a piece of Software or Integrated Development Environment (Arduino IDE) that works on a computer to compose, edit (edit) and upload program code to a subfolder. Arduino is a small controller and is designed to collect information on the sensor and process it and restore it to the LCD for display and send data to an advanced application and store it.

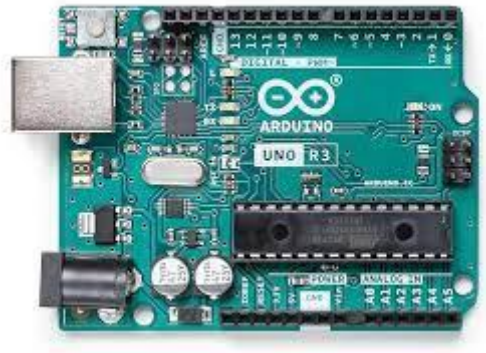

Figure 3: Arduino

4.2 Pulse Sensor

The Pulse Sensor is a small Arduino heart rate sensor. It is a sight to behold. The sensor has two sides. On one side the LED is fitted with an ambient light sensor and on the other side there is a circuitry responsible for noise extinguishing and magnification function. The LED on the front side is placed over a vein in our human body. This particular LED is designed to read data

Figure 4 : Pulse sensor

from the fingertip.

4.3 Blood Pressure Sensor

Blood pressure sensors measure blood pressure using insane technology. In an automatic blood pressure measurement system, a pressure in the arteries is detected by a pressure transducer and produces a result. Blood pressure is displayed on the LCD with the serial output of the embedded project.

4.4 DHT11 Temperature sensor

DHT11 measures temperature sensor mounted with a Negative Temperature Coefficient (thermistor) built into the unit. NTC temperature sensors are flexible resistance sensors when resistance decreases with increasing temperature. It is a cheap digital sensor and moisture sensor.

4.5 AD8232 ECG Sensor

ECG is the technique of gathering the electrical signals from the heart.AD8232 ECG sensor is a circuitry board used to measure the electrical movement of the human heart. It extracts, amplifies and filters the biopotential signals. It consists of three electrode which is placed on different parts of the body. Electrodes are colour coded for easy identification.

Colour	**Part of Body**
Red	Right Arm
Yellow	Left Arm
Green	Right Leg

4.6 ESP8266 Wi-Fi Module

ESP8266 Wi-Fi Module is a self-contained SOC. The TCP/IP protocol is integrated within the chip stack to give the microcontroller the power to give access to the Wi-Fi Network. It is an important component for IoT systems. It is a low cost and user- friendly device to provide internet connectivity. ESP8266 provides the path to communication between the mobile and the health monitoring device.

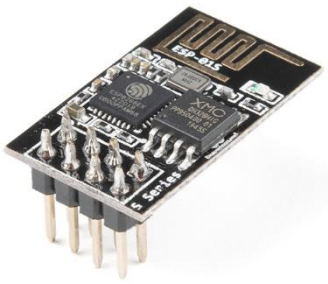

Figure 5 : ESP8266 WIFI Module

V. RESULT AND DISCUSSION:

Currently, the online telemedicine system is useful because it enables timely and efficient medical care. Real-time health monitoring systems are very useful for patients and doctors who need regular monitoring to track patients. Data received from the various sensors is sent to the application via the Wi-Fi module. The Arduino is coded to validate the data it receives within its normal parameter range. If the received data is greater or less than the normal range, a warning message can be sent to the doctor and the doctor can also advise the patient through the app. This compact product is very beneficial to society due to the rapid increase in patients.

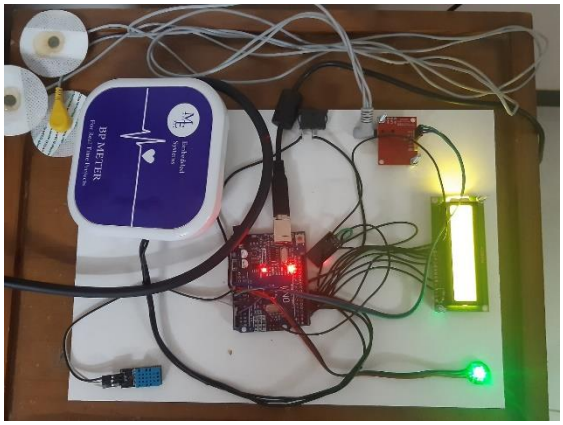

Figure 6: Hardware model

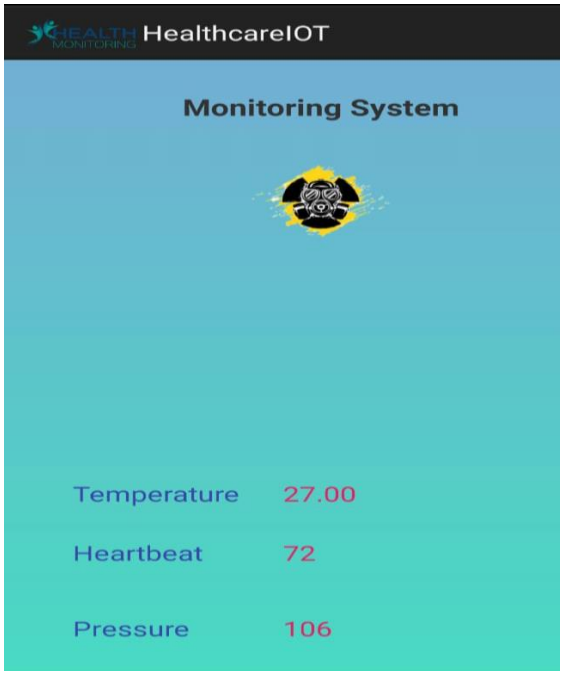

Figure 7: Sensor readings

Figure 8: ECG readings

VI.CONCLUSION AND FUTURE SCOPE:

The online community is widely regarded as one of the best solutions for tracking long-distance prices in the healthcare sector. Each of the parameter data is highly cloud-based, hospital-based, and lowers standard diagnostic tests, and can track health, and infections can be diagnosed by doctors on all roads. IoT monitoring system according to health.

The system uses body temperature, heart rate, and room temperature and temperature using the sensors displayed on the used LCD display. These sensors are transmitted to the medical server using a wireless communication system. This data is then sent to an authorized personal smartphone with the required IoT platform. Depending on the criteria, the doctor evaluates the patient's condition and the patient's condition, respectively.

Future scope:

- Implemented in large scale for real time use in hospitals.
- Create a large cloud database for accompanying more people.
- Reduce the cost as much as possible.

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