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Medical Assistance for Health Using IoT

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ABSTRACT

The Internet is a revolution in information technology. Internet of Thing plays important role in health care application. In our system, body temperature sensor , heart rate monitor sensor, ECG sensor and pulse sensor are used for collecting the vital sign of a patient. The collected information is get transmitted via ESP32 over the internet. As a result, the doctor can examine his patient from anywhere and anytime. The system allows doctors ,nurses as well as patient easily to use the computer for checking and to save in the database. The doctor or patient can see the analyzed data on IoT web page or in Android App (Blynk App).With the help of IOT we can make it possible. This paper highlights and identifies the application of IOT in healthcare system using ARDUINO. In this project the critical condition of the patient can send to the doctors present in nearby hospital. By using a different sensors are connected in the ambulance will give the overall information of patient and notification will be generate in the application which is already downloaded in doctors smart phone. All these sensors are connected to the cloud.

Keywords—Arduino, ESP32, Heartbeat Sensor, Temperature Sensor, IoT, ECG sensor.

INTRODUCTION

Now a days use of IOT increasing day by day. The Heath-Monitoring system present in ambulance useful in road accident, bleeding, Heart attack, Burns, Asthma attacks, Diabetes, etc. Almost all the monitoring applications in this digital world totally depend on wireless sensor networks (WSNs) due to their undeniable advantages such as different network topologies, less maintenance, less infrastructure, etc. The sensors will sense and analyze such activities in hassle free manner. This health-care system does not require any human interventions so that system will work fast in real time and speed will exponentially increase. Here the different kind of sensor will work differently such as Temperature sensor will help to monitor and controls the temperature of the air delivered to the patient. It can also monitor the humidity and control the moisture content of the air. Heart rate monitor sensor are used to monitor heart rate, pressure sensors can be used for non-invasive, high-fidelity, continuous radial artery pulse wave monitoring.

The embedded technology in the objects helps them to interact with internal states or the external environment, which in turn affects the decisions. Internet of Things can connect devices embedded in various systems to the internet.

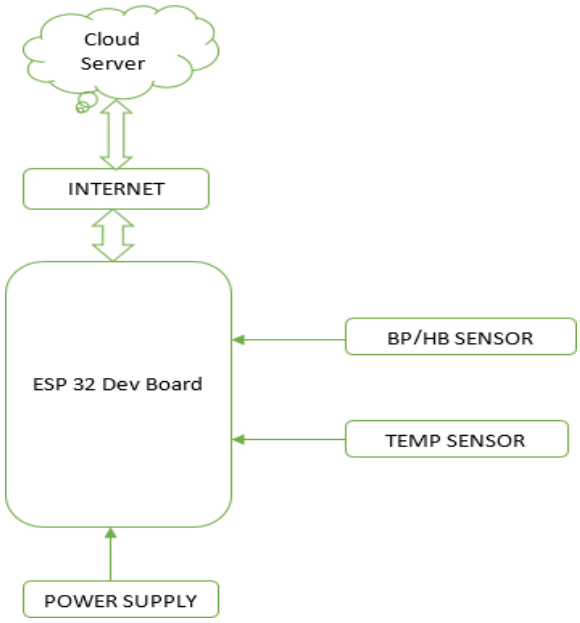
When devices/objects can represent themselves digitally, they can be controlled from anywhere. The connectivity then helps us to capture more data from more places.Healthcare monitoring systems have become an integral part of modern healthcare services. The traditional healthcare monitoring systems are limited in their scope and efficiency. However, the emergence of IoT technology has opened new avenues for healthcare monitoring systems.

The IoT-based healthcare monitoring system is a network of devices, sensors, and software that enables real-time monitoring of patients' health conditions. The system collects data from sensors and devices, processes it, and presents it to healthcare professionals for analysis and decision-making. The IoT-based healthcare monitoring system has the potential to revolutionize the healthcare industry by providing cost-effective, efficient, and accurate healthcare services.

HARDWARE COMPONENTS

- ESP 32 microcontroller
- ECG
- Pulse heart rate sensor
- Humidity and temperature sensor
- LED

BLOCK DIAGRAM OF HARDWARE



1. **Sensors**: The sensors are the first component of the system, which collect the data from the patients. The sensors include temperature sensors, blood pressure sensors, heart rate sensors, glucose sensors, and oxygen sensors, which measure various vital signs of the patients. The sensors can be attached to the patients' body or can be placed in the environment to monitor the patients' activity levels and environmental factors.

2. **ESP32**: The ESP32 is the second component of the system, which acts as a gateway between the sensors and the cloud. The ESP32 is a low-cost, low-power microcontroller that provides Wi-Fi and Bluetooth connectivity. The ESP32 collects the data from the sensors and sends it to the cloud using Wi-Fi or Bluetooth communication protocols.

3. **Cloud**: The cloud is the fourth component of the system, which stores and processes the data collected from the sensors. The cloud provides the scalability and flexibility required to handle large amounts of data generated by the sensors. The cloud can also perform data analytics and machine learning algorithms to generate insights and predictions based on the data.

4. **Application**: The application is the fifth component of the system, which presents the data to the healthcare professionals for analysis and decision-making. The application can be a web-based dashboard or a mobile app, which provides a user-friendly interface for the healthcare professionals to view the patients' data, set alerts and notifications, and communicate with the patients.

5. **Communication Protocol**: The communication protocol is the sixth component of the system, which enables the data transfer between the various components of the system**.** The communication protocol can be Wi-Fi, Bluetooth, ZigBee, or any other wireless protocol, depending on the requirements of the system.

6**. Data Security**: The data security is the seventh component of the system, which ensures the confidentiality, integrity, and availability of the data generated by the sensors. The data security component can include various measures such as encryption, access control, and authentication.

Overall, the block diagram of an IoT-based healthcare monitoring system using ESP32 and depicts a network of interconnected devices, sensors, and software components that work together to provide real-time monitoring and analysis of patients' health conditions. The system enables healthcare professionals to make informed decisions based on the data generated by the sensors, which can lead to improved healthcare outcomes for the patients.

HARDWARE REQUIREMENT

- Microcontroller (ESP 32)
- Power Supply
- Temperature Sensor (DHT11)
- Humidity sensor
- Pulse rate
- ECG
- Internet

- Microcontroller (ESP 32)

Controller (ESP32) is developed and designed for wearable electronics, mobile phones and internet of things (IOT) functions. It details the entire modern attributes of low consumption chips, which counts fine grained clock gating, multiple power modes, dynamic power scaling etc.. For example assume the low power IOT sensor hub function.ESP32 controller is awaken every so often when a particular condition is recognized Low duty cycle is utilised to reduce the consumption of energy that the chip dissipate. The out turn of the power amplifier is also adjustable. Hence offering to an optimal trade mark ranging in the middle of data rate, communication Range and energy consumption. Microcontroller ESP32 is a combination of Bluetooth attached chip and a single 2.4 GHz WI-Fi developed with the TSMC ultra low consumption 40nm technology. It is basically developed to reach the better power and RF production and performance robustness, power consumption, reliability in a huge basis of Acquisition, power scenes and versatility.

- Power Supply

It is defined as an electronic device which segregates thermometer ranges between 9-12bit Celsius temperature measurements and also has an additional application alarm convertible user programmable, upper and activate points. The DS18B20 connects around 1 wire bus that interpreter's one data line (earthen) in order to contact the main microprocessor. Plus this also passes through the power directly from the data line by excluding the requirements of external power supply. Every DS18B20 has an exclusive serial code of 64-bit, that allows varies DS18B20 to operate simultaneously. Hence it is easy to monitor multiple thermistors dispersed over a huge area to practice one microprocessor. Applications that has a profit from which a parameter counts in advantage which consist of HVAC environmental controls , temperature control systems , Apparatus , and process controlling and monitoring systems.

- Temperature Sensor (DHT11)

the DHT11 sensor is often used with Arduino in IoT (Internet of Things) projects. The Arduino can easily interface with the DHT11 sensor to monitor and transmit temperature and humidity data to cloud-based services or other IoT devices. For example, you can use the DHT11 sensor with an Arduino board and an ESP8266 wi-fi module to create a temperature and humidity monitoring system that can be accessed and controlled remotely via the internet. You can also use the DHT11 sensor with an Arduino and a Bluetooth module to create a wireless temperature and humidity monitoring system that can be accessed.

- Humidity

Humidity sensors can be useful inpatient healthcare monitoring systems, particularly in monitoring the environmental conditions in hospitals and other healthcare facilities. Excessive humidity levels can promote the growth of bacteria, mold, and other harmful organisms, which can increase the risk of infections in patients. By using humidity sensors, healthcare providers can monitor and control the humidity levels in patient rooms and other areas of the facility to ensure that they remain within safe and healthy ranges. Additionally, humidity sensors can be used in other medical devices such as respiratory equipment, to ensure that they are functioning properly and delivering the correct amount of moisture to patients.

- Pulse rate

The term "heart rate monitor" refers to devices that can detect either your heart rate or your pulse rate. These devices use two different approaches: Electrical (electrocardiography): Your heart generates a small electrical current with every heartbeat.

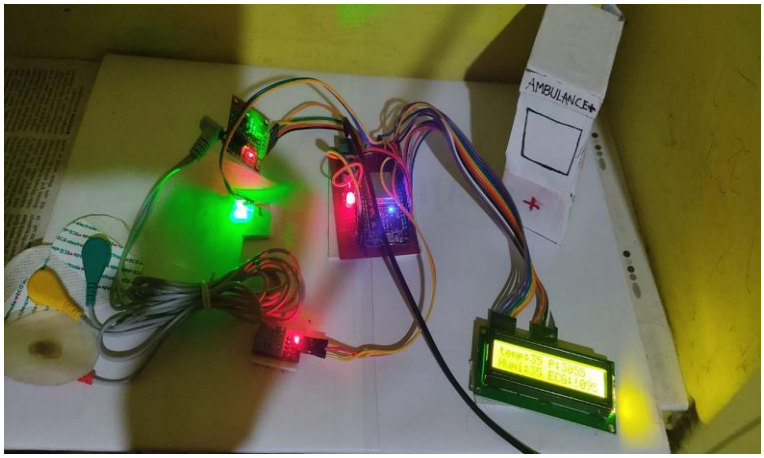
- Electrocardiogram sensor

An ECG is considered the best method for detecting heart abnormalities. The available ECGs vary from single to 12-lead ECG recording devices. On one hand, hospital ECG acquisition devices are usually big in size and support high-precision and long-term monitoring

- Internet

IOT is a modern technology which is implemented in every field in order to improve the lifestyle which makes easy and effortless. The classification of internet of things are QR Codes, Wireless technology, sensor technology which is detected with the term RFID. IOT plays a major role on monitoring a device.

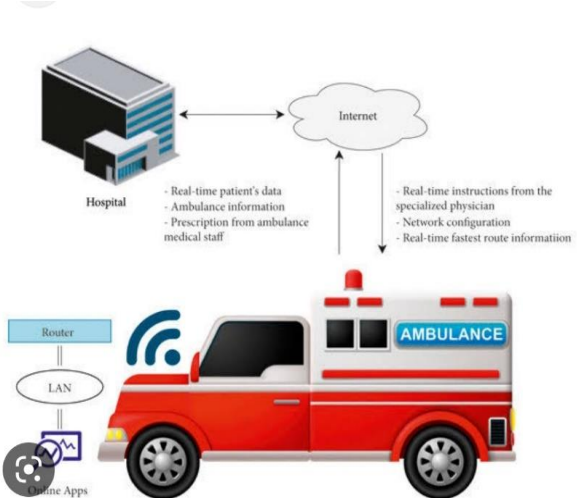
EXPERIMENTAL SETUP



SOFTWARE REQUIREMENT

- Open Source Arduino app
- Embedded C
- Arduino IDE

SYSTEM ARCHITECTURE



In this figure the system architecture of IOT based emergency health care monitoring system in ambulance is shown. Where in the ambulance the patient in critical situation transfer to the hospital and the doctor can get access of patient health through app in local area network which is connected through the internet. The data which is sense by the sensor is send to the nearby hospitals present in that particular area. the sender and receiver can connect and get access through the cloud.

MODULES DEVELOPED

1.Sensor Module: This module would consist of various sensors to capture patient health data such as temperature, heart rate, humidity, and ECG. The sensors can be connected to the IoT device via Bluetooth, Wi-Fi, or other wireless protocols. All the sensors should be connected to the main microcontroller ESp32 so the electronic signals where converted into digital format.

2. Readings display on LCD : This module would process the data collected by the sensor module and show on LCD screen. The data is shown in binary form

3. Create a Blynk account for showing data: In this module we are creating our account. This application is available on play store after you have to connect with the wi-fi with our hotspot username and password and all the members can be connected with the same id password so that the real time changes can be monitor by everyone.

4.Cloud Connectivity Module: This module would enable the IoT device to connect to the cloud, where the patient's health data can be stored and accessed by healthcare professionals. Cloud connectivity module would also allow for remote monitoring of patients by healthcare professionals.

5.User Interface Module: This module would provide an interface for patients and healthcare professionals to access and view the patient's health data. It would need to be intuitive, user-friendly, and customizable to meet the needs of different users.

6.Data Security Module: This module would ensure the security and privacy of patient data by implementing strong encryption and access control mechanisms.

APPLICATIONS

- Patient monitoring is done at every 50 seconds.
- Shortest path is provided for ambulance.
- Doctors can monitor patient from remote location.
- Patients get prescription easily without delay.

CHALLENGES AND FUTURE DIRECTIONS

The IoT-based healthcare monitoring system faces various challenges such as data security, privacy, and interoperability. The future directions of IoT-based healthcare monitoring systems include the development of advanced sensors, communication protocols, and data processing techniques. The integration of IoT-based healthcare monitoring systems with other healthcare systems such as electronic health records and medical devices will also be a future direction.

FUTURE SCOPE

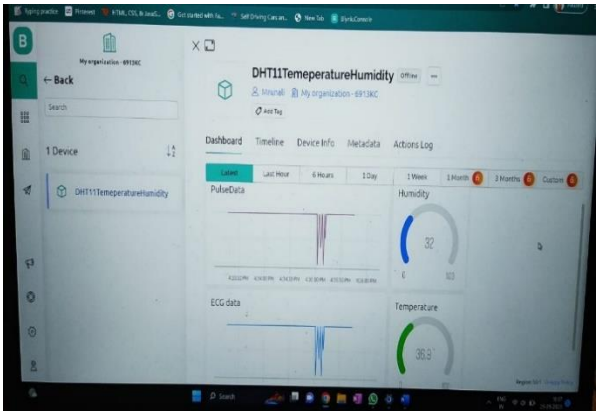
- Advanced analytics
- Predictive maintenance
- Telemedicine
- Personalized medicine
- Wearable technology
- Remote patient monitoring
- Integration with electronic health records (EHRs)
- Virtual reality (VR) and augmented reality (AR)
- 5G connectivity
- Improved data security

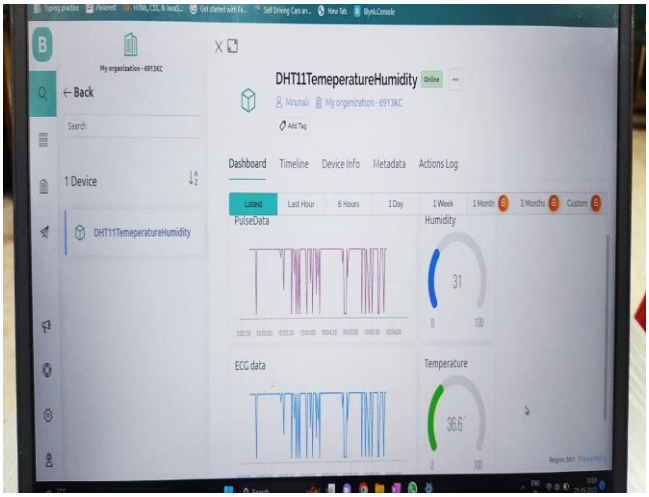
CODE

```
#define BLYNK_TEMPLATE_ID "TMPL3oI5xIClb"

#define BLYNK_TEMPLATE_NAME "DHT11TemeperatureHumidity"

#define BLYNK_AUTH_TOKEN "AEryWjD8UrxfhYAGIYjB5yRoFodLNrdg"

#include < Wi-Fi h >

#include < Wi-Fi Client .h >

#include <BlynkSimpleEsp32.h>

#include <Liquid Crystal h >
```

```
Liquid Crystal lcd (2,4,5,18,19,21);

#include "DHT h"

#define DHTPIN 22     // Digital pin connected to the DHT sensor

#define DHTTYPE DHT11   // DHT 11

DHT (DHTPIN, DHTTYPE);

char auth [] = BLYNK_AUTH_TOKEN;

char SSID [] = "……..";

char pass [] = "…….";

delay (500);

 Blynk Virtual Write (V0, t);

 Blynk Virtual Write (V1, h);

 Blynk Virtual Write (V2, Signal);

   Blynk Virtual Write (V3, Analog Read (32));

 Delay (500);  Blynk NUM ();

}
```

RESULT





CONCLUSION

In this system our main concern was ensuring the health monitoring system for the patient. The doctors can monitor, advice and diagnosis their patient and family member before the emergency situation. So, the doctors and family members can monitor their patient from a remote location at any time. In emergency situation ambulance can be reach to the patient location. Through this application, patients can ask query to the doctor related to their health at any time. And gets the suggestion from doctors. The data is stored and published online. The final result is transferred to the cloud using Arduino, and the users got the output from system using message. We can use our system in real time and people will get the benefit of it. Our system is user-friendly and also cost effective.

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