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IOT Based Health Care System

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Abstract: *An IoT-based healthcare system uses connected devices to monitor patients' health in real-time. Wearable sensors track vital signs like heart rate, blood pressure, and temperature. This data is sent to the cloud, allowing doctors to access it remotely. Alerts are triggered when health parameters go beyond safe limits. IoT devices are especially useful for elderly care, chronic disease management, and remote diagnosis. The system improves healthcare efficiency and reduces hospital visits. It ensures timely interventions, enhancing patient care and convenience*

Keywords: Arduino UNO , IOT

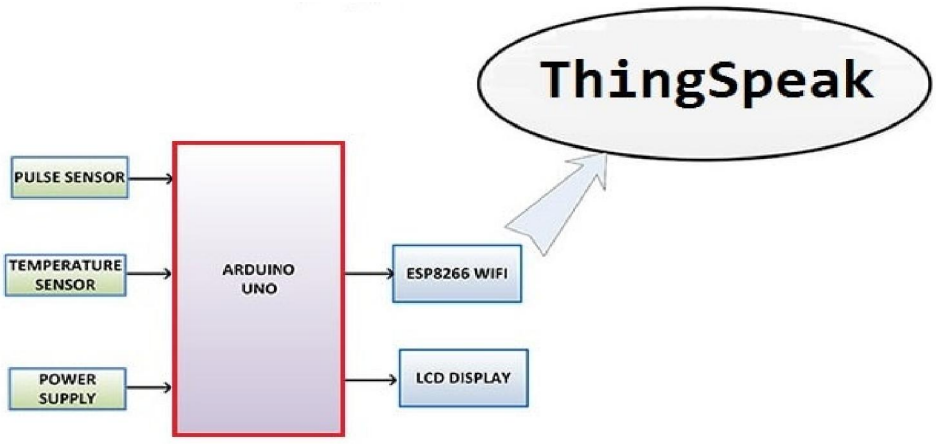
I. INTRODUCTION

The Internet of Things (IoT) has revolutionized healthcare by enabling connected devices to monitor and manage health efficiently. IoT-based healthcare systems use sensors, wearable devices, and smart equipment to track vital health metrics like heart rate, blood pressure, and temperature. These devices collect real-time data and transmit it to cloud platforms, making it accessible to doctors and caregivers. The system enables continuous monitoring, reducing the need for frequent hospital visits. It is particularly effective for managing chronic diseases, elderly care, and remote patient monitoring. Alerts are generated for abnormal health readings, ensuring timely medical intervention. This approach enhances healthcare accessibility, especially in rural or underserved areas. IoT technology improves the quality of care, patient safety, and healthcare efficiency. Overall, it creates a smarter and more patient-focused healthcare ecosystem.

II. LITERATURE SURVEY

[1] Bhat Ramesh (2006).Financial Health of Private sector hospitals in India.Working Paper No 2006-01-01,Indian Institute of Management, Ahmedabad.

A literature survey on IoT-based healthcare systems highlights the integration of smart devices and sensors for real-time health monitoring. Studies have explored wearable devices for tracking vital signs like heart rate, blood pressure, and glucose levels. Research emphasizes cloud-based platforms for storing and analyzing health data, ensuring remote access for doctors. IoT systems are proven effective in chronic disease management, elderly care, and emergency alerts. Several works focus on the security and privacy of patient data in IoT networks. Challenges like interoperability and scalability have also been studied to improve system efficiency. Overall, IoT healthcare systems show significant potential in enhancing patient care and heathcare delivery



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1. Sensors capture data (pulse and temperature).
2. Arduino processes sensor data.
3. ESP8266 transmits the processed data to ThingSpeak over WiFi.
4. LCD displays the live sensor readings locally.

II. PROGRAMMING FOR HEALTH CARE SYSTEM

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
#include <SoftwareSerial.h>
float pulse = 0;
float temp = 0;
SoftwareSerial ser(9,10);
String apiKey = "OO707TGA1BLUNN12";
// Variables
int pulsePin = A0; // Pulse Sensor purple wire connected to analog pin 0
int blinkPin = 7 ; // pin to blink led at each beat
int fadePin = 13; // pin to do fancy classy fading blink at each beat
int fadeRate = 0; // used to fade LED on with PWM on fadePin

// Volatile Variables, used in the interrupt service routine!
volatile int BPM; // int that holds raw Analog in 0. updated every 2mS
volatile int Signal; // holds the incoming raw data
volatile int IBI = 600; // int that holds the time interval between beats! Must be seeded!
volatile boolean Pulse = false; // "True" when User's live heartbeat is detected. "False" when nota "live beat".
volatile boolean QS = false; // becomes true when Arduoino finds a beat

// Regards Serial OutPut -- Set This Up to your needs
static boolean serialVisual = true; // Set to 'false' by Default. Re-set to 'true' to see Arduino Serial Monitor ASCII Visual
Pulse
volatile int rate[10]; // array to hold last ten IBI values
volatile unsigned long sampleCounter = 0; // used to determine pulse timing
volatile unsigned long lastBeatTime = 0; // used to find IBI
volatile int P = 512; // used to find peak in pulse wave, seeded
volatile int T = 512; // used to find trough in pulse wave, seeded
volatile int thresh = 525; // used to find instant moment of heart beat, seeded
volatile int amp = 100; // used to hold amplitude of pulse waveform, seeded
volatile boolean firstBeat = true; // used to seed rate array so we startup with reasonable BPM
volatile boolean secondBeat = false; // used to seed rate array so we startup with reasonable BPM

void setup()
{
lcd.begin(16, 2);
pinMode(blinkPin,OUTPUT); // pin that will blink to your heartbeat!
pinMode(fadePin,OUTPUT); // pin that will fade to your heartbeat!
Serial.begin(115200); // we agree to talk fast!
interruptSetup(); // sets up to read Pulse Sensor signal every 2mS

// IF YOU ARE POWERING The Pulse Sensor AT VOLTAGE LESS THAN THE BOARD VOLTAGE,
// UN-COMMENT THE NEXT LINE AND APPLY THAT VOLTAGE TO THE A-REF PIN
```

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```
// analogReference(EXTERNAL);
lcd.clear();
lcd.setCursor(0,0);
lcd.print(" Patient Health");
lcd.setCursor(0,1);
lcd.print(" Monitoring ");
delay(4000);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Initializing....");
delay(5000);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Getting Data....");
ser.begin(9600);
ser.println("AT");
delay(1000);
ser.println("AT+GMR");
delay(1000);
ser.println("AT+CWMODE=3");
delay(1000);
ser.println("AT+RST");
delay(5000);
ser.println("AT+CIPMUX=1");
delay(1000);

String cmd="AT+CWJAP=\"Alexahome\",\"98765432\"";
ser.println(cmd);
delay(1000);
ser.println("AT+CIFSR");
delay(1000);
}

// Where the Magic Happens
void loop()
{
serialOutput();
if (QS == true) // A Heartbeat Was Found
{

// BPM and IBI have been Determined
// Quantified Self "QS" true when arduino finds a heartbeat
fadeRate = 255; // Makes the LED Fade Effect Happen, Set 'fadeRate' Variable to 255 to fade LED with pulse
serialOutputWhenBeatHappens(); // A Beat Happened, Output that to serial.
QS = false; // reset the Quantified Self flag for next time
}
ledFadeToBeat(); // Makes the LED Fade Effect Happen
delay(20); // take a break
read_temp();
```

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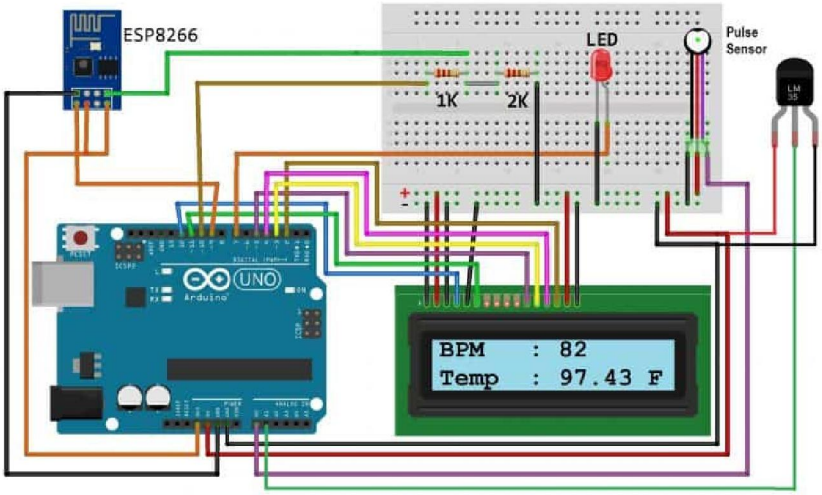
```
esp_8266();
}
void ledFadeToBeat()
{
fadeRate -= 15; // set LED fade value
fadeRate = constrain(fadeRate,0,255); // keep LED fade value from going into negative numbers!
analogWrite(fadePin,fadeRate); // fade LED
}
void interruptSetup()
{
// Initializes Timer2 to throw an interrupt every 2mS.
TCCR2A = 0x02; // DISABLE PWM ON DIGITAL PINS 3 AND 11, AND GO INTO CTC MODE
TCCR2B = 0x06; // DON'T FORCE COMPARE, 256 PRESCALER
OCR2A = 0X7C; // SET THE TO…
```

III. CIRCUIT DIAGRAM



IV. RESULTS

An IoT healthcare system based on Arduino can provide real-time monitoring, efficient data collection, and remote health services, especially in areas with limited access to healthcare professionals. Here's a breakdown of the potential results and outcomes from such a system:

1. Real-Time Health Monitoring:

- Vitals Monitoring: Sensors connected to Arduino can monitor key health parameters like heart rate, body temperature, oxygen saturation (SpO2), and blood pressure in real-time. These data can be sent wirelessly to caregivers or stored for later analysis.
- Continuous Monitoring: Patients can be continuously monitored at home or in remote areas, reducing the need for frequent hospital visits.

2. Early Detection & Alerts:

- Anomaly Detection: The system can be programmed to detect abnormal readings, such as high blood pressure, irregular heartbeats, or fever. When an abnormal value is detected, the system can trigger an alert.

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- Immediate Notifications: Using IoT capabilities, the system can send alerts via SMS, email, or mobile apps to healthcare providers or family members in case of emergencies or critical conditions.

3. Remote Patient Monitoring:

- Telemedicine Support: Data from the Arduino system can be transmitted to a cloud-based platform where doctors can access and review it remotely. This enables telemedicine consultations without requiring the patient to visit a clinic or hospital.
- Patient Data Accessibility: Patients and caregivers can access health data from anywhere via mobile applications or web dashboards.

IV. CONCLUSION

The IoT-based healthcare system has transformed traditional healthcare by enabling real-time monitoring, early diagnosis, and efficient patient management. It improves accessibility and promotes personalized care through connected devices and seamless communication. However, challenges like data security, privacy, and infrastructure limitations must be addressed for broader adoption. Despite these challenges, IoT holds immense potential to revolutionize healthcare delivery, ensuring better outcomes and resource optimization. Continuous innovation and policy support are essential for its success. This system represents a significant step toward smart, connected, and patient-centric healthcare.

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