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OF TECHNOLOGY

Health Monitoring System

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Certificate

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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

CERTIFICATE

Certified that the project work entitled “ Health Rate and Body Temperature Monitoring System” is a bonafide work carried out by Nived Ajith(4NM21IS099), Prajwal P(4NM21IS105), and Pratham G N(4NM21IS107 in partial fulfilment of the requirements for the award of Bachelor of Engineering Degree in Information Science and engineeringprescribed by Visvesvaraya Technological University, Belagavi during the year 2022-2023.

It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of the project work prescribed for the Bachelor of Engineering Degree.

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Signature of the Guide ***Signature of the HOD*** ***Signature of the Principal***

Semester End Viva Voce Examination

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Abstract

The Heart Rate Health Monitoring System is an Internet of Things (IoT) project designed to provide real-time monitoring and analysis of an individual's heart rate and body temperature. This system employs a combination of hardware components, including a pulse rate sensor, LM35 temperature sensor, ESP8266-01 Wi-Fi transceiver, and Arduino Uno R3 microcontroller. The integration of these components allows for continuous and remote monitoring of vital signs, enabling timely health interventions. The pulse rate sensor is utilized to capture the user's heart rate, while the LM35 temperature sensor measures the body temperature. These sensors are interfaced with the Arduino Uno R3, which acts as the central processing unit. The Arduino processes the sensor data and transmits it wirelessly using the ESP8266-01 Wi-Fi module. The ESP8266-01 establishes a Wi-Fi connection, enabling the system to transmit data to a designated server or cloud platform. Overall, the Heart Rate Health Monitoring System leverages the power of IoT to create a scalable and efficient solution for continuous health monitoring. By combiningsensors, microcontrollers, and wireless communication, this project offers a versatile platform that can be expanded to include additional health parameters and functionalities, contributing to the advancement of remote healthcare monitoring systems.

Introduction

In a world inundated with fast-paced living and perpetual demands, the pursuit of a healthier lifestyle has become more crucial than ever. As the journey of crafting a health monitoring system using an LM35 temperature sensor, a pulse rate sensor, an Arduino board, and an ESP8266-01 module unfolded, the motivation behind this endeavour was fuelled by a potent desire to make a tangible impact on personal well-being.

The LM35 temperature sensor, a cornerstone of the system, acts as the vigilant guardian of body temperature. In a world grappling with health uncertainties, the monitoring of subtle variations in temperature is deemed a precursor to identifying potential health issues. This capability becomes even more pertinent in today's context, where rapid temperature fluctuations can signal the onset of various ailments.

Complementing the LM35, the pulse rate sensor adds another layer of comprehensive health monitoring. The ability to track heart rate in real-time provides a holistic view of cardiovascular well-being. This, in turn, aids in immediate health management and contributes to long-term preventive care.

The heartbeat of this system lies in the Arduino board, serving as the brain orchestrating the symphony of health data. With its programmable prowess, the Arduino interprets and processes the data from the sensors, transforming raw numbers into meaningful insights. This intelligent processing capability sets the stage for a user-friendly interface that can be accessed via the ESP8266-01 module.

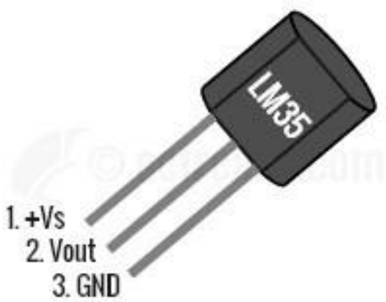
The integration of the ESP8266-01 module propels this project beyond the confines of personal health management. By enabling data transmission to external devices or cloud platforms, the system becomes a catalyst for community health awareness. The potential to share anonymized data or contribute to collective health studies underscores the societal impact that a simple Arduino-based health monitoring system can wield.

In essence, the motivation for embarking on this health monitoring system journey is rooted in the belief that technology, when harnessed purposefully, can be a force for positive change. By providing individuals with the tools to monitor and understand their health in real-time, the aim is to empower others to take charge of their well-being, fostering a culture of proactive health management in an ever-evolving world.

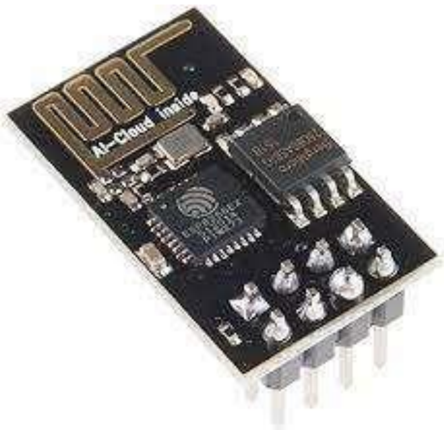
Components Used and Working Principle

1. Pulse Rate Sensor: The pulse rate sensor is designed to detect and measure the user's heart ratein beats per minute (BPM). It typically uses optical sensors to capture changes in blood volume, providing a real-time representation of the user's pulse.

2. LM35 Temperature Sensor: The LM35 temperature sensor is used to measure the user's body temperature. It provides an analog voltage output proportional to the Celsius temperature. This datais crucial for monitoring variations in body temperature, which can be indicative of health conditions.

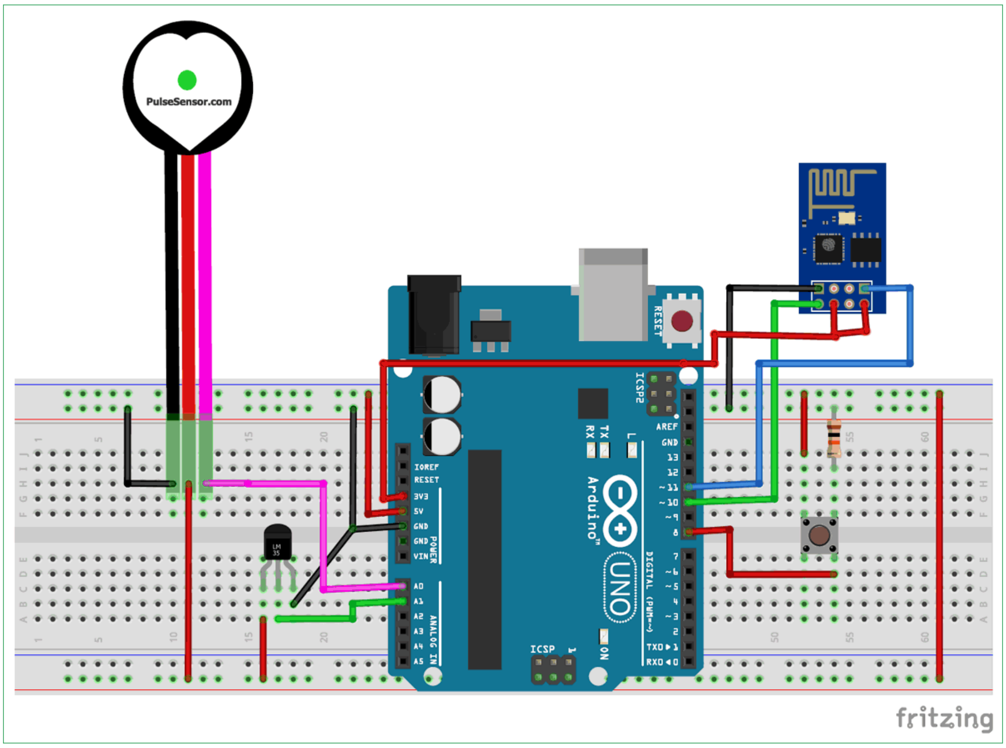


3. **ESP8266-01 Wi-Fi Transceiver**: The ESP8266-01 WiFi module enables wireless communication between the monitoring system and external devices or servers. It establishes a Wi-Fi connection and facilitates the transmission of processed health data to a remote location, such as a cloudserver or a mobile application.



4. **Arduino Uno R3 Microcontroller:** The Arduino Uno R3 serves as the central processing unit in the system. It receives data from the pulse rate sensor and temperature sensor,processes the information using programmed algorithms, and manages the overall control flow of the system. It can also store and transmit the processed data to the next component.

Code and Circuit Diagram




```
#include <PulseSensorPlayground.h>
#include <OneWire.h>
#include <DallasTemperature.h>
#include <SoftwareSerial.h>

SoftwareSerial nodemcu(2, 3);
SoftwareSerial blue(7, 8); // Bluetooth module connected here

// Variables
const int PulseWire = A0; // PulseSensor PURPLE WIRE connected to ANALOG PIN 0
const int LED13 = 13;     // The on-board Arduino LED, close to PIN 13.
int Threshold = 550;      // Determine which Signal to "count as a beat" and which to ignore.

PulseSensorPlayground pulseSensor; // Creates an instance of the PulseSensorPlayground object
//called "pulseSensor"
```

```
// for DS18B20 temperature sensor
#define ONE_WIRE_BUS 4
OneWire oneWire(ONE_WIRE_BUS);
DallasTemperature sensors(&oneWire);
float Celsius = 0;
float Fahrenheit = 0;

String cdata; // complete data, consisting of sensor values
char buff[10];
String tempc;
String tempf;

void setup()
{

  Serial.begin(9600); // For Serial Monitor
  nodemcu.begin(9600);
  blue.begin(9600);

  // Configure the PulseSensor object, by assigning our variables to it.
  pulseSensor.analogInput(PulseWire);
  pulseSensor.blinkOnPulse(LED13); // auto-magically blink Arduino's LED with heartbeat.
  pulseSensor.setThreshold(Threshold);

  // Double-check the "pulseSensor" object was created and "began" seeing a signal.
  if (pulseSensor.begin())
  {
    Serial.println("We created a pulseSensor Object!"); // This prints one time at Arduino power-up,
or on Arduino reset.
  }
}

void loop()
{

  int myBPM = pulseSensor.getBeatsPerMinute(); // Calls function on our pulseSensor object that
returns BPM as an "int".
                                               // "myBPM" holds this BPM value now.

  if (pulseSensor.sawStartOfBeat())
```

```
{ // Constantly test to see if "a beat happened".
  Serial.println(myBPM);
}
delay(20);

sensors.requestTemperatures();
Celsius = sensors.getTempCByIndex(0);
Fahrenheit = sensors.toFahrenheit(Celsius);

// TEMPERATURE SENSOR DS18B20
tempc = dtostrf(Celsius, 3, 2, buff);
tempf = dtostrf(Fahrenheit, 3, 2, buff);

cdata = cdata + tempc + "," + tempf + "," + myBPM; // comma will be used as a delimiter
Serial.println(cdata);
nodemcu.println(cdata);
blue.println("Patient Monitoring.");
blue.println(cdata);
delay(20);
cdata = "";
}
```

Future Scope

To advance the future work of this IoT project, several enhancements and considerations can be implemented to improve functionality, user experience, and overall effectiveness. Here are some points toconsider:

1. **Multi-Parameter Monitoring**: Expand the system to monitor additional health parameterssuch as blood pressure, oxygen saturation, and ECG data. Integrating more sensors allows for a comprehensive health assessment.

2. **Machine Learning Algorithms**: Implement machine learning algorithms to analyze the collected data. This can help in predicting health trends, identifying patterns, and providing personalizedhealth recommendations.

3. **Mobile Application Integration**: Develop a user-friendly mobile application to provide individuals with easy access to their health data. The app can also include features such as historical datatracking, trend analysis, and personalized health insights.

4. **Cloud Integration**: Utilize cloud platforms for data storage and analysis. Cloud integrationenables scalability, real-time updates, and easy access to health data from anywhere in the world.

5. **Security Measures:** Implement robust security protocols to safeguard sensitive health data. Encryption and secure communication protocols should be employed to protect user privacy and complywith data protection regulations.

6. **Wearable Devices**: Explore the integration of wearable devices for continuous monitoring without restricting user mobility. Wearables can provide a more seamless and unobtrusive monitoringexperience.

7. Remote Consultation: Incorporate features that facilitate remote consultations with healthcare professionals. This can include video conferencing capabilities within the application, enabling healthcareproviders to remotely assess the user's health status.

8. User Alerts and Notifications: Enhance the alert system to provide more detailed and actionablenotifications. Alerts can be customized based on individual health profiles, ensuring that users and caregivers receive relevant information promptly.

9. Feedback Mechanism: Implement a feedback mechanism to allow users to report their well-being andprovide additional context to health data. This two-way communication can assist in refining the monitoring system based on user experiences and preferences.

10. Integration with Electronic Health Records (EHR): Explore options for integrating the IoT healthdata with existing electronic health record systems. This ensures seamless communication between remote monitoring systems and traditional healthcare infrastructure.

Conclusion

In conclusion, the Heart Rate Health Monitoring System presented in this IoT project demonstrates the potential of integrating technology to enable continuous and remote health monitoring. The use of a pulse rate sensor, LM35 temperature sensor, ESP8266-01 Wi-Fi transceiver, and Arduino Uno R3 creates a robust and scalable platform for capturing and transmitting vital signs data. This system addresses the growing need for proactive healthcare solutions, allowing for early detection of anomalies in heart rate and body temperature. The real- time monitoring capabilities facilitated by IoT connectivity enhance accessibility for healthcare professionals and caregivers, enabling prompt intervention when necessary. The versatility of theplatform is a key strength, as it can be expanded to incorporate additional sensors or features to monitor various health parameters. The implementation of alert mechanisms further enhances thesystem's utility, providing timely notifications in the event of abnormal readings. As technology continues to advance, projects like this contribute to the evolution of healthcare towards more personalized, remote, and proactive approaches. The Heart Rate Health Monitoring System serves as an example of how IoT can be harnessed to improve healthcare outcomes, offering a glimpse into the possibilities of smart, connected devices in the realm of health monitoring and management.

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