DEPARTMENT OF MECHATRONICS ENGINEERING

Mechatronics System Integration (MCTA3203)

WEEK 8: Remote Temperature Monitoring and Control

Section 1

(Group E)

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Abstract

This experiment investigates the integration of Bluetooth and WiFi technologies with a microcontroller and computer-based system for remote temperature monitoring and control. By connecting temperature sensors to the microcontroller and transmitting data wirelessly, the setup enables real-time data processing on a computer. The system analyzes the received information and triggers actuators to maintain predefined temperature ranges. This experiment aims to showcase the practicality and efficacy of these interfaces in facilitating remote monitoring and control, offering potential applications in diverse fields such as home automation and industrial processes.

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1.1 Introduction

This experiment explores the fusion of Bluetooth, WiFi, a microcontroller, and a computer-based system for remote temperature monitoring and control. By integrating temperature sensors with these technologies, the study aims to demonstrate a system capable of real-time data transmission, processing, and actuator response. The experiment showcases the potential for efficient remote monitoring solutions applicable across various industries requiring precise environmental control.

Objective

1. To create a wireless temperature monitoring system using Wi-Fi, Arduino, and a temperature sensor or thermistor. The Arduino will read temperature data from the thermistor, and send it to a Python script over Wi-Fi, and the Python script will display and log the temperature.

1.2 Materials & Equipments

1. Arduino Uno
2. LM35
3. Bluetooth module (HC-06)
4. Smartphone with Bluetooth support
5. Wi-Fi network and internet access
6. Power supply for the Arduino
7. Breadboard and jumper wires
8. ESP8266

1.3 Experimental setup

Hardware Setup:
1. The temperature sensor (thermistor) is connected to the Arduino.
2. The Bluetooth module is connected to the Arduino.
3. The Arduino to your Wi-Fi network is connected using the built-in Wi-Fi capabilities.
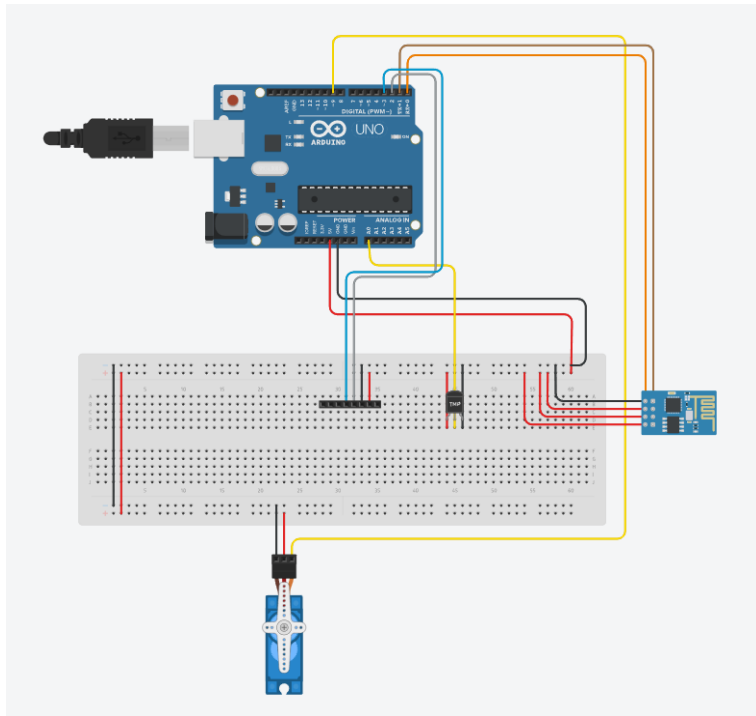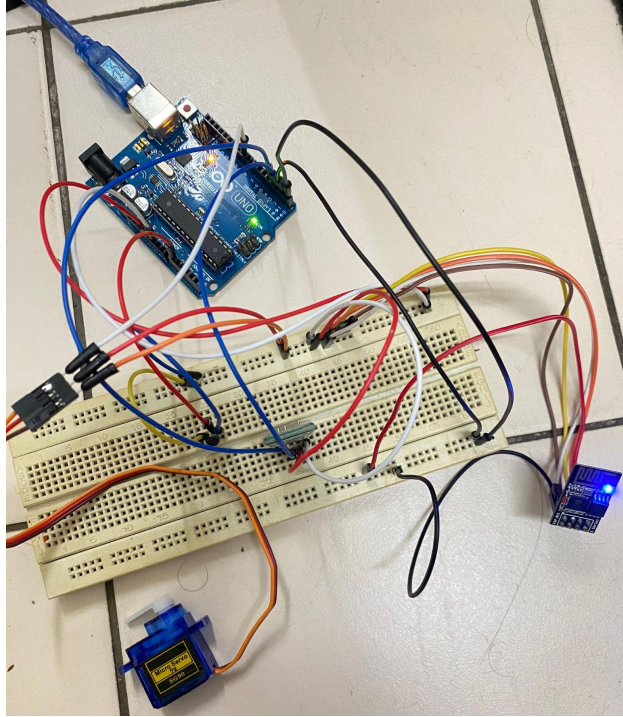
Arduino Programming:

1. An Arduino sketch that reads temperature data from the sensor was written
2. Wi-Fi connectivity was set up to send temperature data to ThingSpeak, we created a dashboard to visualize the data.

Bluetooth Programming:

1. An Arduino sketch is sketched to enable Bluetooth communication
2. Arduino was connected to the smartphone application via Bluetooth.
3. Commands were sent to control a connected device.

Remote Monitoring:

1. ThingSpeak dashboard accessed on smartphone to remotely

monitor the temperature in real-time via the internet.

1.4 Methodology

1. The temperature sensor is placed in a room to monitor and control the

temperature.

2. The Arduino is connected to a power source and ensured it is connected to our Wi-Fi

network.

3. The room's temperature is monitored in real-time using the ThingSpeak dashboard.

1.5 Data Collection

The temperature data is collected over time to see how the room's temperature changes based on our remote control inputs.

1.6 Data Analysis

The temperature data is analyzed over time to see how the room's temperature changes based on our remote control inputs.

1.7 Result

We managed to create a wireless temperature monitoring system using Wi-Fi, Arduino, and a temperature sensor. The Arduino read temperature data from the thermistor, sent it to a Python script over Wi-Fi, and the Python script displayed and logged the temperature.

Link video:

1) https://drive.google.com/file/d/1hyi7n5sSksDUMiFSPp-G8qbQrYU4FmXu/view?usp=sharing
2) https://drive.google.com/file/d/1BjQ7QPdUqBCzHDHnb3OB4uLGAdmBd2kR/view?usp=sharing

1.8 Discussion

- To test the functionality of the thermistor, when the sensor is touched, the sensor varies the reading then it sends the reading to Thingspeak via Bluetooth module.
- Based on the video in the result, when the sensor is being touched, the sensor reading increases and is shown in the ThingSpeak.
- Besides

1.9 Conclusion

In conclusion, this experiment successfully demonstrates the effective integration of Bluetooth, WiFi, a microcontroller, and a computer-based system for remote temperature monitoring and control. The system showcased reliable real-time data transmission, accurate processing, and responsive actuator control, highlighting its potential for diverse applications in industries requiring remote environmental management. The findings emphasize the feasibility and efficiency of this technology fusion, opening doors for further advancements and

implementations in fields such as home automation, industrial processes, and environmental monitoring systems. Overall, this experiment underscores the promising prospects of wireless data interfacing for remote control systems, offering innovative solutions for precise and efficient environmental regulation.

1.10 Recommendations

1.13 Acknowledgments

We would like to acknowledge our instructor, Dr. Wahju Sediono for your expert guidance, encouragement, and unwavering support throughout the project and also for your invaluable support and provision of resources crucial to the successful execution of the experiment on Bluetooth and WiFi data interfacing with microcontroller and computer-based systems. We hope to learn more from such a talented instructor if the opportunity arises.

We would also like to give thanks to Allah S.W.T. for guiding us in demonstrating this experiment successfully.

1.11 References

https://www.electronicwings.com/arduino/esp8266-wifi-module-interfacing-with-arduino-uno

https://www.youtube.com/watch?v=ByabfnnwR7w

1.12 Appendices
   - Refer to GitHub for coding and video

1.14 Student's Declaration

Declaration:

     We certify that this project/assignment is entirely our own work, except where we have given fully documented references to the work of others, and that the material in this assignment has not previously been submitted for assessment in any formal course of study.

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