

Digital Thermometer Arduino

Mini Project Report

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Acknowledgments

We would like to sincerely thank Higher school of advanced technology for their generous support and provision of materials for our Arduino mini project, "Digital Thermometer." Their contribution of essential components was invaluable to the success of our project.

We would also like to express our gratitude to "Department of Electrical Engineering and Industrial Computer Science (GEII)" for their guidance and support throughout the project, as well as the administration and staff of Higher school of advanced technology for their commitment to practical learning and financial assistance with material reimbursement.

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INTRODUCTION :

The objective of this mini project was to create a digital thermometer using Arduino Uno and temperature sensors. The thermometer would measure the temperature and, if it exceeded a certain threshold, emit an audible alarm. Additionally, a mobile application was developed to display the temperature readings on a smartphone.

HYPOTHESIS :

- The digital thermometer system implemented using Arduino Uno and temperature sensors will accurately measure and display temperature readings.
- When the temperature exceeds the predefined threshold, the alarm mechanism (LEDs and buzzer) will activate successfully, indicating a temperature breach.
- The mobile application developed for temperature visualization will establish a reliable Bluetooth connection with the Arduino and display real-time temperature data on the smartphone.
- The collaboration of a team consisting of five individuals with diverse skills and contributions will lead to the successful completion of the digital thermometer mini project.

MATERIALS :

| Component | Quantity |
|-------------------------|----------|
| Arduino Uno | 1 |
| Jumper Wires | 22 |
| Temperature Sensors | 1 |
| Arduino Cable | 1 |
| LEDs (Different Colors) | 2 |
| Buzzer | 1 |
| Breadboard (Small) | 1 |
| Bluetooth Module | 1 |
| Smartphone | 1 |

Methodology:

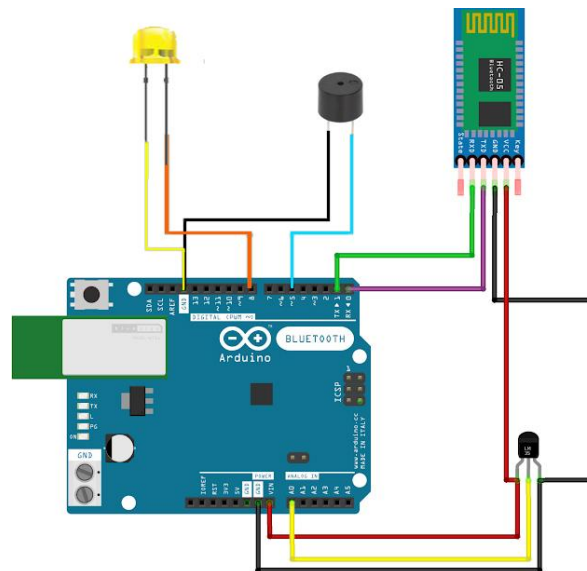
The project was implemented by following these steps:

1. Hardware Setup:

The Arduino Uno board was connected to the temperature sensors and other components using jumper wires and the breadboard.

The LEDs and buzzer were connected to the appropriate pins on the Arduino board.

The Bluetooth module was connected to the Arduino board for wireless communication with the smartphone.



2. Software Development:

The Arduino IDE (Integrated Development Environment) was used to write the code for the thermometer.

The code included reading temperature sensor data, comparing it with a predefined threshold, and controlling the LEDs and buzzer accordingly.

The code also involved establishing a Bluetooth connection with the smartphone for data transmission.

The Arduino code :

```
#include <Adafruit_Sensor.h>

int ledPin = 8;
int buzzerPin = 5;

// Define the threshold temperature
float thresholdTemp = 40.0; // in Celsius

void setup() {
  // Set the LED and buzzer pins to output mode
  pinMode(ledPin, OUTPUT);
  pinMode(buzzerPin, OUTPUT);

  // Initialize the serial communication at 9600 baud
  Serial.begin(9600);
}

void loop() {
  // Read the temperature from the sensor
  // You need to write the function to read the temperature from the sensor
  int sensorValue = analogRead(A0);
  // Convert the analog reading (which goes from 0 - 1023) to a voltage (0 - 5V):
  float voltage = sensorValue * (5.0 / 1023.0);
  float temperature = voltage*100;
  // Print the temperature to the serial monitor
  Serial.println(temperature);
  Serial.print("Temperature: ");
  Serial.print(temperature);
  Serial.println(" C");

  // Check if the temperature exceeds the threshold
  if (temperature > thresholdTemp) {
    // Turn on the LED and buzzer
    digitalWrite(ledPin, HIGH);
    digitalWrite(buzzerPin, HIGH);

    // Wait for 500 milliseconds
    delay(1000);

    // Turn off the LED and buzzer
    digitalWrite(ledPin, LOW);
    digitalWrite(buzzerPin, LOW);
  }
}
```

3. Mobile Application Development:

A mobile application was developed using appropriate software development tools (e.g., Android Studio, Swift).

The application was designed to establish a connection with the Arduino via Bluetooth and receive temperature data.

The received temperature data was displayed on the smartphone's screen.

Results and Observations:

During testing, the digital thermometer successfully measured the temperature using the sensors. The LEDs and buzzer responded correctly when the temperature exceeded the threshold. However, the Bluetooth module encountered connectivity issues, preventing the mobile application from establishing a connection with the Arduino. As a result, the temperature readings could not be displayed on the smartphone as initially intended. Further investigation and troubleshooting are required to address the Bluetooth module's functionality and ensure successful communication with the mobile application.

Challenges Faced:

Several challenges were encountered during the project, requiring troubleshooting and further investigation. These challenges included:

1. Bluetooth Module Detection:

The Bluetooth module used in the project was not initially detected by the smartphone application. Despite configuring the module, it remained undetectable. This issue could potentially be attributed to compatibility issues, incorrect wiring, or software configuration problems. Additional investigation and troubleshooting were necessary to address this challenges

2. Sensor Connectivity:

Initially, the temperature sensor posed difficulties in terms of its connectivity with the Arduino board. Establishing a stable and reliable connection between the sensor and the board required careful attention to wiring and ensuring proper connections. After resolving these connectivity issues, the temperature sensor performed as intended.

3. Arduino Programming:

As the team's first experience with Arduino, there was a learning curve in understanding the Arduino programming language. Prior to successfully writing the code, the team members needed to educate themselves on the Arduino programming language and its syntax. This initial learning phase was crucial to effectively implement the desired functionalities in the code.

It is worth noting that despite these challenges, the team's perseverance and collaborative efforts allowed for the successful implementation of the core features of the digital thermometer project.

Recommendations:

To address the challenges faced in the project and improve its functionality, the following recommendations are suggested:

1. **Bluetooth Module Troubleshooting:** Conduct further investigations to identify the exact cause of the Bluetooth module's detection issue. Verify compatibility with the smartphone's Bluetooth version, double-check wiring connections, and review software configurations. Consult online resources, forums, or the module's documentation for specific troubleshooting steps.
2. **Enhanced Sensor Connectivity:** Pay close attention to the wiring connections between the temperature sensors and the Arduino board. Ensure secure and reliable connections to avoid any intermittent or inconsistent readings.
3. **Continuous Learning:** Given that this was the team's first experience working with Arduino, continue to expand knowledge and understanding of the Arduino programming language. This will enable more effective code development and troubleshooting in future projects.
4. **Collaboration and Communication:** Maintain regular communication and

collaboration among team members to address challenges, share insights, and leverage collective expertise. This will foster a supportive environment for problem-solving and ensure smooth project progress.

By implementing these recommendations, the project can overcome the challenges faced, improve functionality, and enhance the overall performance of the digital thermometer system.

Contributions:

The mini project involved a collaborative effort from a team of five individuals, each contributing their expertise and skills to various aspects of the project. The contributions made by team members are as follows:

- Hardware Setup: **KESOUMM Mohamed walid** focused on the setup of the Arduino Uno board, connecting the temperature sensors, LEDs, buzzer, and Bluetooth module.
- Software Development: **AIT MIMOUNE Yasmine** was responsible for writing the code in the Arduino IDE, incorporating temperature sensor readings, threshold comparisons, and control of LEDs and the buzzer.
- Mobile Application Development: **ALAOUCHICHE Abderrahmane Yaakoub** specialized in developing the mobile application, implementing Bluetooth connectivity and real-time temperature visualization on the smartphone.
- Troubleshooting and Testing: **REBAHI Khadidja and BADAoui Aymen** collaborated on troubleshooting connectivity issues, conducting testing, and providing valuable insights and observations throughout the project.

Each team member's contribution was instrumental in the overall success of the mini project, highlighting the importance of effective collaboration and division of tasks.

Conclusion:

In conclusion, the digital thermometer mini project utilizing Arduino Uno and temperature sensors proved successful in accurately measuring temperature and triggering alarms when the threshold was exceeded. However, challenges were encountered with the Bluetooth module's detection, preventing the mobile application from connecting to the Arduino and displaying temperature readings on the smartphone. Further investigation and troubleshooting are required to resolve the connectivity issues and establish a functioning Bluetooth connection. Despite these challenges, the project demonstrated the team's ability to overcome obstacles and successfully implement the core functionalities of the digital thermometer.