Temperature controll documentation

Török Hunor
Számítástechnika IV. A
Assambler programozás projekt

Török Hunor
Számítástechnika IV. A

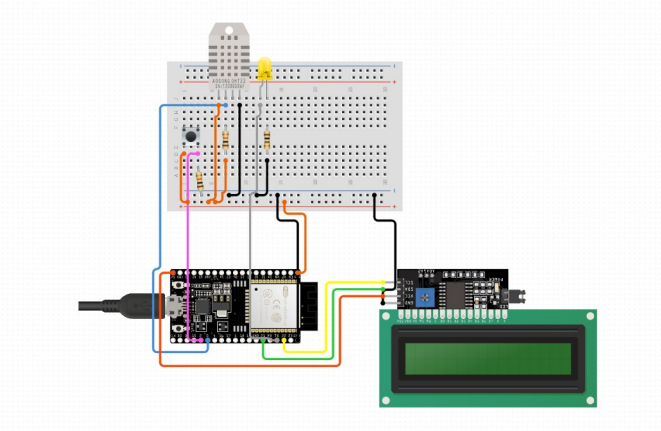
1 Introduction

1.1 Purpose

The Hardware Control System is an Arduino-based project that combines various components to monitor temperature and humidity using a DHT11 sensor and control an LED based on the temperature reading. It provides a web-based interface for user interaction and offers both automatic and manual control modes.

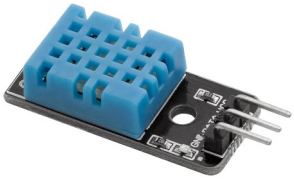
1.2 Components Used

The following components are utilized in this project:

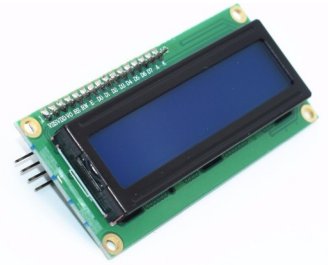


- **ESP32 WROOM**: Controls the system, manages Wi-Fi connectivity, and hosts the web interface.

- **DHT11 3-Pin Temperature and Humidity Sensor**: Measures the environmental temperature and humidity.



- **I2C 1602 LCD Screen**: Displays information, including temperature and humidity.



- **Basic LED**: Acts as an indicator and can be manually or automatically controlled.
- **4-Pin Push Button**: Used for user interaction to display the local IP address.

1.3 Overview of Operation

The system connects to a Wi-Fi network, reads data from the DHT11 sensor, and displays the temperature and humidity on the LCD screen. It allows users to switch between manual and automatic control modes. In automatic mode, the LED is controlled based on a temperature threshold. Users can also change the temperature threshold in auto mode and turn the LED on/off in manual mode through a web-based interface.

2 Setup and Configuration

2.1 Required Libraries

The code utilizes the following libraries:

- **WiFi.h**: For Wi-Fi connectivity.
- **DHT.h**: To interact with the DHT11 sensor.
- **Wire.h**: Required for I2C communication with the LCD screen.
- **LiquidCrystal_I2C.h**: Enables communication with the I2C 1602 LCD screen.
- **esp32-hal-timer.h**: For handling timer interrupts.

2.2 Hardware Setup

The code sets up pins for the LED (LED_PIN), the DHT11 sensor (DHT11PIN), and the push button (IP_BUTTON_PIN). Additionally, it configures and initializes the DHT sensor and the LCD screen.

2.3 Wi-Fi Configuration

The code connects to a Wi-Fi network, requiring the user to specify the SSID and password for network access.

2.4 Timer Setup

A timer is set up for regular data updates. It is configured to trigger the `onTimer` function every second to update temperature and humidity data.

3 Main Loop

3.1 Web Server

The code establishes a web server on port 80, allowing users to interact with the system through HTTP requests. It processes incoming client requests to control the system and provides information about the temperature, humidity, and system modes.

3.2 Data Update

The `dataUpdate` function reads data from the DHT11 sensor and updates the LCD screen. The update is controlled by a timer interrupt.

3.3 User Interface

Users can request the local IP address and port number by pressing the push button. The web interface displays the temperature, humidity, system mode, and controls for LED operation and temperature threshold adjustment.

3.4 LED Control

The `setLed` function controls the LED based on the selected mode (auto or manual) and the temperature threshold.

4 HTTP API

4.1 Modes

- `/MODE/manual`: Switches the system to manual control mode.

- `/MODE/auto`: Switches the system to automatic control mode.

4.2 LED Control

- `/LED/on`: Turns the LED on in manual mode.
- `/LED/off`: Turns the LED off in manual mode.

4.3 Temperature Threshold

- `/TRESHOLD/plus`: Increases the temperature threshold in automatic mode.
- `/TRESHOLD/minus`: Decreases the temperature threshold in automatic mode.

5 Web interface

The Hardware Control System features a user-friendly web interface that allows users to interact with the system through HTTP requests. The web interface provides a convenient way to monitor temperature and humidity readings and control the LED based on user preferences. Here are some key features of the web interface:

5.1 Temperature and Humidity Display

The web interface displays real-time temperature and humidity readings obtained from the DHT11 sensor. Users can instantly check the environmental conditions by visiting the main page.

5.2 Mode Selection

Users can choose between two operating modes:

- **Automatic Mode**: In this mode, the system automatically controls the LED based on a predefined temperature threshold. The LED will turn on if the temperature exceeds the threshold.
- **Manual Mode**: Manual mode allows users to directly control the LED. They can turn the LED on and off as desired.

5.3 LED Control

In manual mode, users can control the LED state. The web interface provides buttons to turn the LED on and off. The LED state is immediately reflected on the web page.

5.4 Temperature Threshold Adjustment

In automatic mode, users can adjust the temperature threshold for LED control. They can increase or decrease the threshold by 0.5°C using the web interface.

Török Hunor
Számítástechnika IV. A

Table of Contents

1 Introduction....2
1.1 Purpose....2
1.2 Components Used....2
1.3 Overview of Operation....3
2 Setup and Configuration....3
2.1 Required Libraries....3
2.2 Hardware Setup....3
2.3 Wi-Fi Configuration....4
2.4 Timer Setup....4
3 Main Loop....4
3.1 Web Server....4
3.2 Data Update....4
3.3 User Interface....4
3.4 LED Control....4
4 HTTP API....4
4.1 Modes....4
4.2 LED Control....5
4.3 Temperature Threshold....5
5 Web interface....5
5.1 Temperature and Humidity Display....5
5.2 Mode Selection....5
5.3 LED Control....6
5.4 Temperature Threshold Adjustment....6