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IoT Based Temperature Monitoring System UsingESP8266 & Blynk App

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Abstract
This paper addresses the design and implementation of IoT Based Temperature Monitoring System using ESP8266 & Blynk Appin. The consists of temperature sensor which can measure the temperature within 1 meter radius & shows the result on OLED Display & Blynk App. This is basically used in hospitals, air conditioners, food processing, etc. We can able to set temperature to maintain a consistent temperature within a medium. We'll becontrolling the temperature via Web dashboard or Blynk App.

Keyword: Temp Control, IOT, OLED

I. INTRODUCTION

The Internet of Things (IoT) is a new, but at the same time is an old term. It is already mentioned by Kevin Ashton in 1999. Sincethen the use of this term has blossomed andmajor companies have predicted anincrease in IoT. One prediction is that the number of connected things in the world will have thirtyfold increases between 2009and 2020, thus by 2020 there will be 26 billion components are connected in IoT devices.

The components that we will be using in our project are NodeMCU ESP8266, DS18B20 Temperature Sensor, 0.96"OLED Display, 5V 2-Channel Relay Module, Zero PCB board are the things which we need to build the device.

The main reason for using NodeMCU ESP8266 is that it works on Wi-Fi related activities. 0.96" I2C OLED Display is used because the power consumption is much less than LCD Display. And 5V 2-Channel Relay is used because it act as heater and cooler relays according to the given conditions. The main purpose of this device is control and monitor the temperature where temperature is needed from anywhere in theworld.

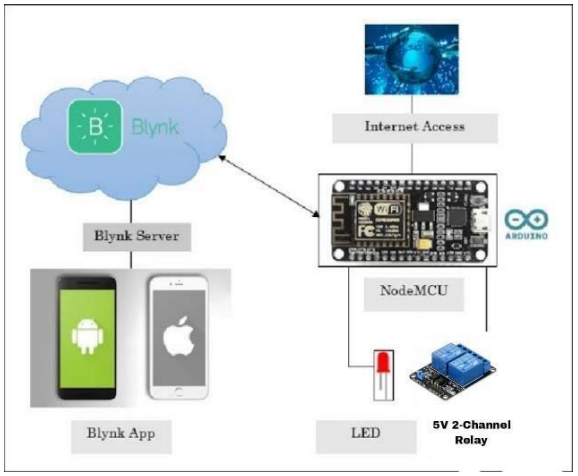

Fig. 1. Block Diagram.

II. OBJECTIVES

To control and monitor the temperature in home in the applications like geyser, microwave oven, air conditioner and manymore. This device is built with less circuit complexity and with many applications in many fields.

This device helps to save more time for userto manually operate any device. And operating manually also might vary little bitof temperature. It cannot maintain a constant temperature.

It is capable detecting the temperature andshow the value of the temperature on the OLED Display and Blynk App. It only capable of doing single task system i.e., itcannot do many works at a time and note down those values and show them on the display.

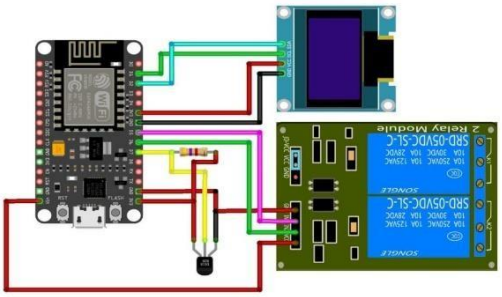

Fig. 2. Circuit Diagram.

III. METHODOLOGY

Now-a-days the control of temperature hasbecome an important task in many operations. The method that we used to build, can be operated manually and automatically.

So, the method we used to control the temperature is to initialize the serial monitor, temperature sensor test, and blynkapp connection. Then we measure the temperature threshold value or the set pointvalue i.e., we will be using the setpoint to compare the current temperature that to be measured and it switch on the heater or thecooler relay according to the given condition.

A. System Architecture & Components

The system architecture and components ofIoT based Temperature Monitoring SystemUsing NodeMCU & Blynk App. The system consists of four main components: the NodeMCU ESP8266 module, 0.96”

OLED Display, 5V 2-Channel Relay Module, DS18B20 Temperature Sensor as shown in the figure 2.

B. NodeMCU ESP8266

The NodeMCU ESP8266 module is a microcontroller development board that has Wi-Fi and Bluetooth capabilities. The DS18B20 Temperature Sensor is a temperature sensor that can measure the ambient temperature with an accuracy of 2^0C.

NodeMCU ESP8266 is an open-source Laubased firmware and development board specially targeted for IoT based applications. It includes firmware that runson the ESP8266 Wi-Fi SoC from EspressifSystem, and hardware which is based on theESP-12 module. The operating voltage of ESP8266 is 3.3V. The input voltage for ESP8266 is applied in between 7-12V. NodeMCU has 128KB RAM & 4MB of Flash Memory to store data and program. It's high processing power with in-built Bluetooth/ Wi-Fi and Deep Sleep Operatingfeatures make it ideal for IoT projects.

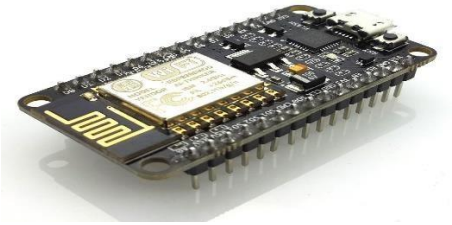

Fig. 3. NodeMCU ESP8266

C. *0.96" OLED Display*

The OLED Display that we'll use is SSD1306 model: a monocolour, 0.96" inch display with 128x64 pixels. The OLED Display doesn't require backlight or we can also say it as background light, which results in a very nice contrast in dark environments. This is the main reason for consuming less power supply and less areathan LCD Display.

Fig. 4. 0.96" OLED Display

D. *DS18B20 Temperature Sensor*

DS18B20 is a digital sensor that is manufactured by Maxim Integrated. It is a single wire protocol and can communicate with an inner microprocessor using one wire bus protocol. Sensor gets the power supply from the data line, which is eliminating the need of external power supply. It is available in different packages such as SOP, TO-92 and waterproof sensor. The sensor with waterproof can also measure the temperature of the soil.

The waterproof sensor contains the metallicsurface which protects from the environment factors like heat and water. And it is small in size which is compactablethat can be used almost everywhere.

Fig. 5. DS18B20 Temperature Sensor

E. *Software Design and Implementation*

The software tools are Arduino IDE, Blynk App, Blynk Library, DS18B20 Temperature Sensor Library, Wi-Fi Library are the libraries which need to added.

Arduino IDE is an open-source integrated development environment that can be used to program microcontroller, such as ESP8266. Blynk App is a cloud-based application that can be used to create IoT projects. Blynk library is a library that can be used to communicate with the Blynk App using ESP8266. Wi-Fi library is a library that can be used to connect ESP8266 module to Wi-Fi network. The software tools are configured with appropriate setting such as auth token, network name, password are to uploaded in the program and to be dumped in ESP8266 module written in Arduino IDE using C++ language.

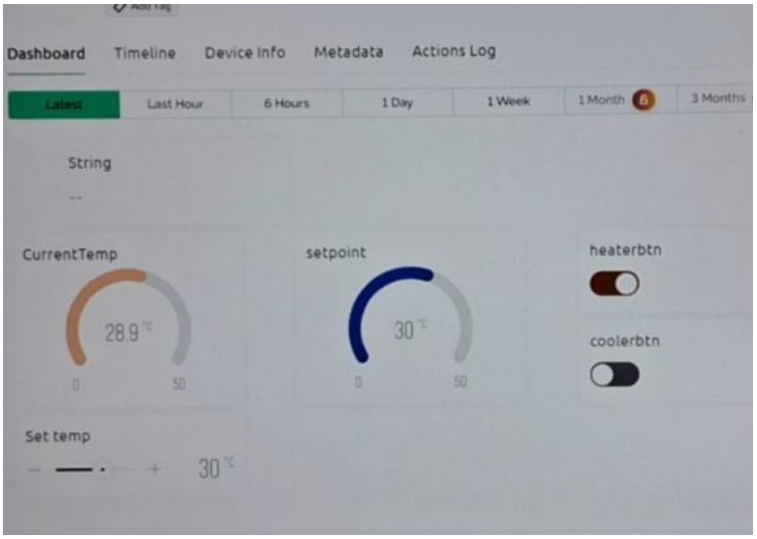

Fig. 6. Blynk App Interface and output

Blynk App using graphical user interface. The software code consists of four main widgets: 2 gauges widget, a slider widget, 2 button widgets. The gauge widget displays the current temperature in Celsius, set point temperature in Celsius. A slider widget is used to change the set point value that will automatically change the value in the setpoint temperature in gauge widget. The 2 button widgets represent the 2 relays of heater and cooler, if the heater button is switched on then the cooler button is switched off and vice versa.

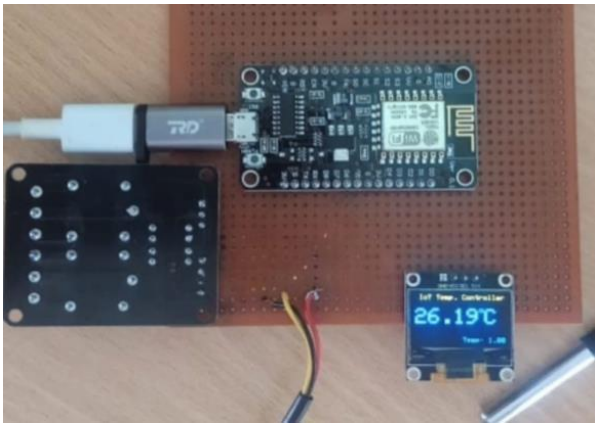

Fig. 7. Output on the OLED Display

In the fig.7 it shows the output of the device on OLED Display, where the temperature is measured from the DS18B20 Temperature Sensor. The cases shown below is the process how the device works.

Case-1: When the current temperature is less than set point (i.e., present temperature < set point) then the heater relay is switched on.

Case-2: If the current temperature is greater than set point (i.e., present temperature > set point) then the cooler relay is switched on.

Case-3: If both of them are equal then both the relays will be switched off.

On this condition whole device works.

IV. FUTURE SCOPE & CONCLUSION

This paper, gives the detail description of Temperature Monitoring System with less complex circuit, less parameters involved to develop in Blynk App.

We can also further develop this by installing two or more temperature sensors and OLED Display. We can also measure the humidity, and few other parameters.

Although we have made few contributions, but still there is a great deal of room for additional research and development to improve the system usability, security in IoT applications.

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