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Temperature and Humidity Monitoring System

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Abstract: Arduino Uno, DHT11 sensor, USB type B cable, adaptor, DC power jack, 9-V battery connector, 9-V DC battery, resistor, liquid-crystal display (LCD) screen, trimmer potentiometer, light-emitting diode (LED) bulbs, jumper wires, micro secure digital (SD) card module, printed circuit board (PCB), and other components were used to create the temperature and humidity monitoring system. The developed temperature and humidity monitoring system was field tested at various locations on the college campus. The developed system had a temperature accuracy of 2°C and a humidity accuracy of 4%. The total cost of developing a temperature and humidity monitoring system, including all accessories, was $1625.

Keywords: Arduino Uno microcontroller; DHT22 sensor; Humidity; RF 433 hc12; Temperature

I. INTRODUCTION

Monitoring is regarded as an essential aspect of changing environmental conditions. It is primarily used to assess and map biodiversity across vast areas, to alert of changes in climate conditions, and to identify zones that should be well protected. As a result, global monitoring of the earth for identifying and assessing climate changes is unavoidable. Anthropogenic climate change, caused by human activities, is regarded as the primary contributor to climate change, resulting in increased greenhouse gases and aerosols, which have a negative impact on global climate change. [1] The weather.

The primary motivation for the weather station is to track any changes in weather parameters as a result of their significant impacts on human well-being over time. As it is obvious that global warming has a negative impact on the environment at the moment, both humidity and temperature are important factors to consider when designing modern weather stations. High efficiency, compact size, portability (to measure remote areas), and low power consumption are characteristics of highly demanded weather stations. In contrast to the traditional bulky and power-hungry weather station. [2]

Hardware Connections and Connectivity

The temperature and humidity sensor, LCD screen, micro SD card module, and LED indicators are all connected to the Arduino Uno, as shown in Figure 1. (controller). The power supply is connected to the controller. Power Source Temperature and humidity sensors, as well as an LCD screen and LED, are linked to the Arduino Uno (controller), which runs on a 9-volt DC supply. The Arduino Uno is powered by a 9-volt DC @ 2-ampere supply. [3]

USB Type B Cable

USB type B connectors, also known as Standard-B connectors, are square with a slight rounding or a large square protrusion on the top, depending on the USB version. USB Type-B connectors work with all USB versions, including USB 3.0, USB 2.0, and USB 1.1. The second type of "B" connector, known as Powered-B, is also available, but only in USB 3.0.

Adaptor

An (electrical) adapter is a device that converts the attributes of one electrical device or system to those of another device or system that would otherwise be incompatible. Some change the power or signal characteristics, while others simply change the physical shape of one electrical connector to another.

DC Power Jack

A direct current (DC) connector (or DC plug, for one common type of connector) is an electrical connector used to supply direct current (DC).

9-V Battery Connector

On one end of the battery, both terminals are connected by a snap connector. The positive contact is made by the smaller circular (male) terminal, and the negative contact is made by the larger hexagonal or octagonal (female) terminal. The battery has the same connectors as the load device; the smaller one connects to the larger one and vice versa.

9-V DC Battery

The Arduino Uno board, which is based on the ATmega328, is used as a controller. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), a 16 MHz ceramic Resonator, a USB connection, and a power jack. The Arduino board is programmed using a USB-to-serial adapter chip. [4]

Controller

Arduino Uno board is used as a controller which is based on ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), a 16 MHz ceramic Resonator, a USB connection, a power jack, Arduino board is programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips.[4]

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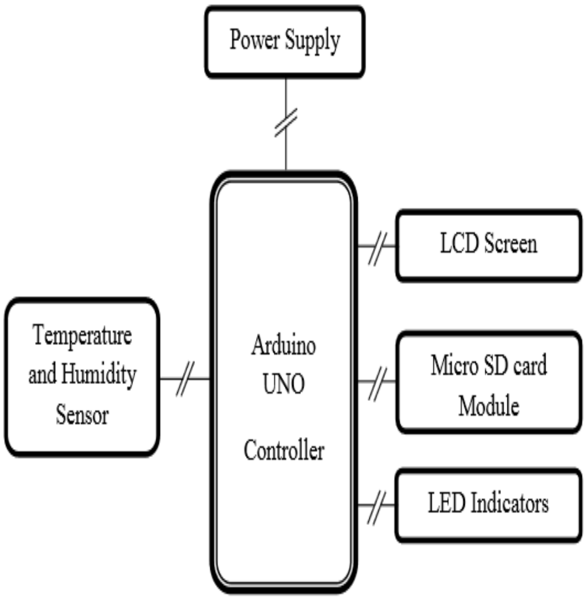

Figure 1: Hardware connections and connectivity

LCD Screen:

A liquid crystal display (LCD) screen displays alphanumeric characters.As a user interface, a 16 x 2 LCD is used.

Micro SD Card Module:

The micro SD card module is an easy way to transfer data to and from a standard SD card. The pinout is Arduino-compatible, but it can also be used with other microcontrollers. It enables the project to include mass storage and data logging.

This module has a serial peripheral interface (SPI) interface that works with any SD card and a 5V or 3.3V power supply that works with the Arduino Uno. [5]

The microcontroller (arduino):

The Arduino Uno board is a microcontroller board. Arduino has a large number of input pins that are fed from a variety of switches or sensors and control a wide range of outputs such as lights, recorders, motors, actuators, and so on. Arduino can be used to create interactive objects.

The Arduino board can be assembled by hand or pre-assembled; the open-source IDE (Integrated Development Environment) can be downloaded for free from the website. The ATmega328P microcontroller powers the Arduino UNO. The board is programmed using the Arduino IDE and has 14 input/output (I/O) pins. The board supply voltage is provided by a USB cable or an external dc supply ranging from 7 to 20 volts [6].

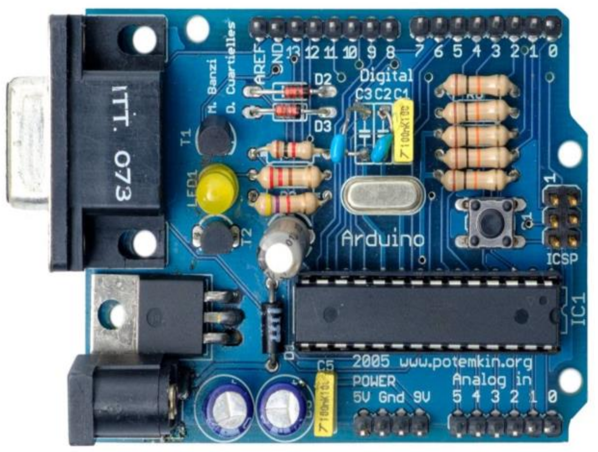

Figure2 : Arduino Uno Microcontroller

Objectives:

1. To study of design a real-time temperature and humidity monitoring.
2. To analysingArduino Uno Microcontroller circuit.
3. To obtain study of DHT22 Temperature and Humidity Sensor Combined with Arduino Uno Microcontroller.

II. RESEARCH METHODOLOGY

This study examines project implementation from three perspectives: hardware, software, and connectivity.

In this research paper, the following methodology was used. First, we installed a temperature and humidity sensor (DHT11) in the location where the monitoring will take place. The sensor connects to the Arduino UNO development board. The Arduino board's programming will convert the analogue output of the sensor to digital form. The digital temperature and humidity values would be displayed on the LCD. The digital data is then sent to the GSM Module, which is connected to Arduino as a Serial Communication Peripheral.The Arduino will send data to the GSM Module via SMS to the mobile device. Furthermore, a temperature threshold is set in the Arduino through programming, and if the temperature rises above that threshold, then automatically the measures to maintain the temperature are taken by triggering the Cooling Peripherals (here a 5V DC Motor acting as a Fan), and a warning SMS is sent to the Mobile device, and the same is displayed on the LCD as well.

III. REVIEW OF LITERATURE

The Arduino controller system is used to compute unit temperature, humidity, pressure, and height. The setup includes a height measurement unit and a measuring or monitoring tool. In this paper, they proposed an Arduino UNO with a Raspberry Pi data processing unit. A Cube satellite is also used in this configuration to provide weather data when network coverage is unavailable.

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This method has several advantages, including ease of design, portability, low cost, low strength, and a reliable device. Kaspar et al. (2013) created a pan-European open data base for plant phenology. PPODB also incorporates phonological data from other sources.

Over many decades, detecting humidity and temperature has been a major issue. [7]Lim et al. created a screen-printable humidity sensing film made of two components: a thermally curable epoxy resin and a photocurable polyelectrolyte. Because sole polyelectrolyte humidity-sensitive films have poor anchoring to polyimide, this combination (interpenetrating polymer network—IPN) is being studied for its adhesion to polyimide. [8]

IV. RESULT AND DISCUSSION

As shown in Figure 3, the transmitter part consists of Arduino, the board connected with, sensor, and 10K resistor for reducing voltage difference and protecting the sensor from high current, as well as sending piece hc12.

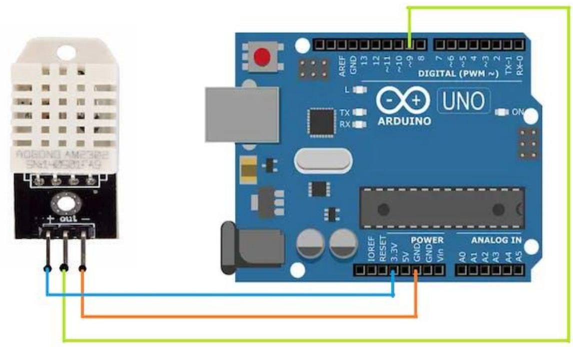

Figure 3: DHT22 Temperature and Humidity Sensor Combined with Arduino Uno Microcontroller

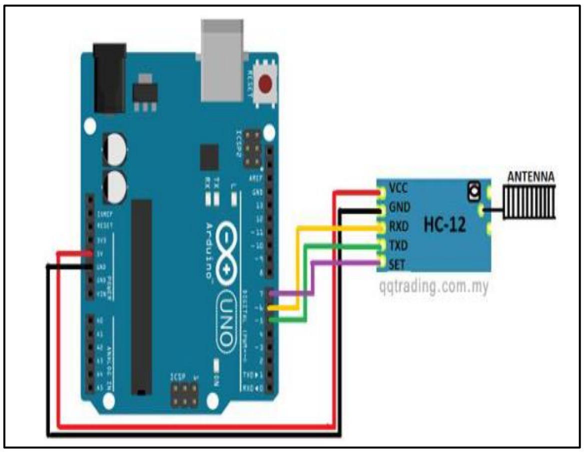

Figure 4: The RF 433 Hc12 Combined with Arduino Uno Microcontroller

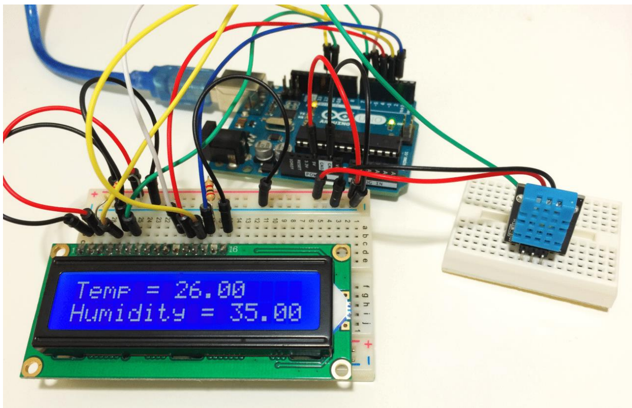

Figure5: Final Assembly (Sensors and Receiver) Through the Arduino Uno with the LCD Screen.

The system went through several iterations of operation testing and correction. This section displays the final results for each component of the system. [9]

The DH22 sensor detects humidity and sends it to the first Arduino via hc12 sender, which then receives it via hc12 receiver and displays the output in LCD. Figure 6 shows the Arduino IDE serial monitor.

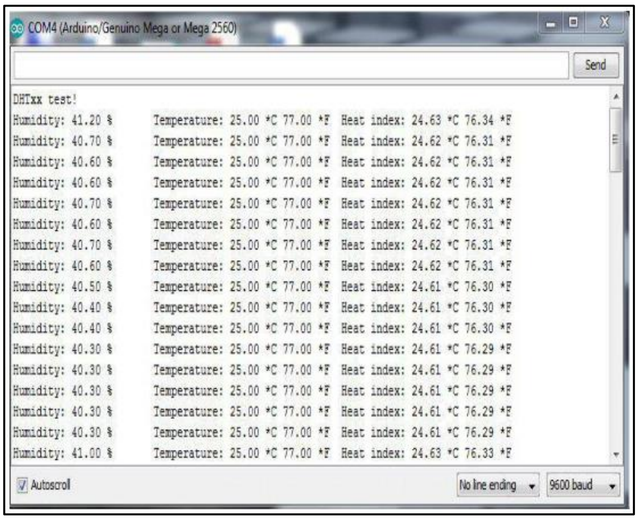

Figure 6: Humidity and Temperature System Results

The figure above depicts a sample of the humidity and temperature readings obtained. [10]

V. CONCLUSION

Arduino Uno, DHT11 sensor, USB type B cable, adaptor, DC power jack, 9-V battery connector, 9-V DC battery, resistor, LCD screen, trimmer potentiometer, LED bulbs, jumper wires, micro SD card module, PCB, and other components were used to create the temperature and humidity monitoring system. The temperature and humidity monitoring system was created for only 1625 dollars. The developed system had a temperature percent variation of 0 to 8% and a humidity percent variation of 0 to 5.97%. As a result, the system had an accuracy of 2°C for temperature and 4% for humidity.

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