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"Humidity and temperature monitoring and controlling system"

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This project made us realize that theoretical studies have no relevance unless they are applied in real world, and this project has demonstrated the importance of doing so.

Yours Sincerely,

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2 ABSTRACT

The objective of this project is to develop a workable hardware and software system for measuring temperature and humidity. The amount of water in the air is referred to as humidity. If the humidity is high, you will feel hotter. For instance, if it is too hot in the summer, the water vapors in the air will decrease; causing the humidity level will rise. If the humidity level is low, your skin will become drier. This indicates that if it's too cold in the winter, the water vapors in the air will increase, causing the humidity level to drop. We make a system to regulate this humidity and to make relative humidity, which is normal humidity between 20 and 60 degrees Fahrenheit. Hardware is actually designed to control the humidity because in this the DHT-11 sensor is used to sense the humidity level, and the sensor will display the humidity and temperature to the software application and on the LCD that is coupled to the hardware and here Arduino Uno is used which is mini computer that will control the whole hardware, and the software basically has the option to switch on or off the humidifier and dehumidifier when the humidity is not relative. This humidifier and dehumidifier is directly connected to hardware and is used to control humidity levels. We will do coding on Arduino IDE and on Android Studio using language Java and database SQL Lite. Arduino program will sent to the Arduino microcontroller for running the system of the hardware.

Keywords – *humidifier, dehumidifier, Arduino IDE, DHT11 sensor, Arduino microcontroller*

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5 INTRODCUTION

Temperature and humidity are two of the most closely studied environmental factors since they have such a big influence on our lives. According to the connection formula, humidity and temperature are inversely proportional. When the temperature rises, the relative humidity falls, causing the air to become drier, and when the temperature drops, the air becomes moist, causing the relative humidity to rise. Humidity, on the other hand, may have both beneficial and negative effects on your health.

5.1 Purpose of the Project:

Our project's goal is to create a humidifier and dehumidifier system that allows users to monitor and adjust temperature and humidity with a single integrated system. This system will automatically detect the temperature and humidity in your area or surroundings and determine if the temperature is too high or too low. It can also help to control the level of humidity in the area, lowering the humidity or balancing the temperature. It provides two options for humidifying or dehumidifying the air. Humidity levels that are just right make your home seem cool in the summer and warm in the winter. When the air is dry, a humidifier will add moisture to the air, causing the temperature to return to normal and the humidity to automatically balance, whereas a dehumidifier will remove moisture from the space, causing the temperature to return to normal and the humidity to automatically balance.

5.2 Scope of the Project:

Humidifier and dehumidifier are helpful in various places like; In order to work efficiently in industries, site engineers must take humidity and temperature values into account, the driver of ambulances and other vehicles should be aware of the environmental conditions in which they operate. So, we build a system that can monitor and manage the temperature and humidity of a room. The overall purpose of the app is to check humidity and temperature via Bluetooth connection, and if humidity rises, there is an option for a dehumidifier, which the user ma y uses to adjust the temperature, and if humidity falls, the user can use a humidifier.

Some features of app/ device:

5.2.1 Register Via E-mail:

First the user has to register him via e-mail address or any other social media account. Once they register him then it doesn’t require the user again to register. But the user has to remember the password and user name to secure the information of past humidity and temperature results.

5.2.2 Automatically Saved Password:

When the user registers him the information they gave it would save automatically.

5.2.3 Forgot Password:

If the user forgot the password then this option will help the user to change the password by using email address.

5.2.4 Change Email/Password:

If the user wants to change their email address or password, they can easily do it.

5.2.5 Shows Humidity:

It shows the humidity level at that time of the room or an environment.

5.2.6 Shows Temperature:

It shows the temperature level at that time of the room or an environment.

5.2.7 Shows Time/Date:

It shows the time and date of that time when humidity and temperature displays.

5.2.8 Bluetooth For On/Off:

This option is for the users to connect or disconnect the Bluetooth with device. Then when Bluetooth is connected it will shows above that Bluetooth is connected and vice versa.

5.2.9 Bluetooth Pairing :

It displays the last connected device name and its mac address.

5.2.10 Bluetooth Connection:

This is not an option to choose this is the line or statement written there showing if the Bluetooth is connect turns the humidifier and dehumifier on or off after monitoring.

5.2.11 Automatically On/Off humidifier and dehumidifier:

It automatically turns the humidifier and dehumifier on or off after monitoring.

5.3 Overview Of The Project :

Low humidity may be found in hot, dry desert conditions, as well as indoors in artificially heated environments. Humidity levels can decrease to as low as 10–20 percent in the winter, especially when chilly outside air is heated within. For most dwellings, a relative humidity range of 30% to 50% is suggested. [24] Some benefits of humidifier and dehumidifier give for making the relative humidity.

Benefits of humidifier are:

5.3.1 Prevent Dry Skin:

If hands and skin get dry and crack easily, adding moisture to the air will also help to add moisture to having a good skin.

5.3.2 Relieve Dry Eyes:

Dry eyes are caused by dry air. Running a home humidifier will assist to keep everything in the house wet, including eyes, especially if users use contacts and their eyes become dry.

5.3.3 Prevent Nose Bleeds:

Nasal bleeding can be caused by dry air passing through the sinuses. Keeping more moisture in the air prevents airways from drying out too much, which can lead to nosebleeds.

5.3.4 Improve Hair and Scalp Healthy:

Dry air can cause dandruff and hair breakage by causing a dry scalp. The scalp and hair are less prone to dry out if the air has the appropriate amount of moisture.

5.3.5 Protect Flooring and Furniture:

Wood furniture may split and break over time if exposed to dry air. Preventing the wood from drying out requires maintaining a healthy moisture level in the home.

Benefits of dehumidifier are:

5.3.6 Prevent Asthma Attacks:

When people with chronic asthma are exposed to excessive humidity, mould, mildew, and dust mites, their symptoms generally worsen. Dehumidifiers can actually

help asthma sufferers avoid attacks by producing an atmosphere that is less prone to provoke episodes.

5.3.7 Food Stays Fresh For Longer:

Food that is exposed to excessive humidity rapidly becomes stale. Consider using a dehumidifier instead of opening your favorite chips only to discover they've lost their crisp. This simple method will assist to keep food fresher for longer, saving your grocery price and reducing wastage.

5.3.8 Lower Energy Costs:

That's correct, using a dehumidifier can actually save you money on electricity since your HVAC system won't have to work as hard to remove humidity from the air; instead, it can focus on chilling the room.

5.3.9 Deter Insects

Insects, like mould, thrive in wet environments. Reduce the humidity in your house to create a dryer, less welcoming environment, which will keep creepy crawly occupants away. When it comes to ants, this method is particularly successful.

Literature Review:

The goal of a research project is to develop a wireless hand gesture-controlled fan. The Bluetooth module is the essential component that transmits and receives data. To determine the change in hand coordinates, the researchers employed a gyro sensor. It is linked to a microcontroller, in this case an Arduino [1]. Arduino UNO with Raspberry Pi, HTU 211D sensor device, and ESP8266 Wi-Fi module are used in the system. The data acquired might be put to good use in the creation of activities such as distantly dominant cooling, heating devices, or long-term statistics of any type [2]. The gadget detects soil moisture, temperature, and humidity, which are three of the most crucial and fundamental elements for plant growth. The data is read by the sensors and transmitted to the microcontroller board. The board then analyses and maps the data according to the code before displaying it on the LCD display [3] . Due to growing urbanisation and population expansion, China's building energy consumption has surged. To explore the impact of external wall insulation on energy consumption, two experimental rooms were built. During the summer test period, the energy efficient chamber saved up to 23.5 percent on air conditioning energy use [4]. The goal of the research is to use Arduino, temperature, and humidity sensors to adjust the fan speed automatically. The project is based on the Internet of Things (IOT) idea. It requires extra devices, an external clock, and a development environment for programming [5] . The most important feature of soil is its moisture content. Irrigated farms rely on the management of two key basic materials: water and soil. The FC-28 soil moisture sensor has also been validated via (60) sixty experiments with various soils, and the results are consistent with other soil moisture measuring devices on the market [6]. Desalination systems with humidification-dehumidification are difficult to optimise. The limitations of energy recovery and water recovery in closed air water heated cycles are studied in this paper. Only big heat and mass exchangers are found to benefit from a single extraction [7]. On whole wheat kernels, a constantly mixed, aseptic paddle mixer was effectively employed for solid-state fermentation (SSF) with Aspergillus oryzae. Temperature control was enhanced and inhomogeneities in the bed were avoided by mixing. The enthalpy balance can be used to automate process control [8]. At temperatures below 30°C and humidity levels of 60–90%, oyster mushrooms can develop their best fruit bodies. Temperature and humidity are used as inputs in a fuzzy system. To meet the overall system's control purpose, a Mamdani inference system is used [9]. The IoT 'Thingspeak' web service, which is a liberal open API service that acts as a host for a range of sensors, is the focus of the project. This project also includes an Arduino UNO board and an ESP8266 Wi-Fi Module for processing and transferring data to the Thingspeak Cloud [10]. A

wireless solution for monitoring a remote location is proposed in a paper. It is a very effective and precise approach to communicate useful information using GSM module. At the receiver's end, a mobile phone is required to obtain the value of the parameters. The ability to have someone check the settings 24 hours a day, 7 days a week is the most useful feature of this system [11]. The humidification method uses an air mass flow rate of 0.0186 kg/s and a water layer thickness of 3.5–4.5 cm. To better understand the impact of mist generated on relative humidity and dry [12]. A humidity and temperature prototype may be built using a few components such as a DHT 11 sensor, an Arduino UNO R3, a 2x16 LCD, and an I2C LCD. This prototype may be used to provide correct findings every second, and data will be supplied every second utilising an internet connection [13]. Three wire resistance temperature devices (RTDs) of type PT-100, an XBee Pro module, a 2.4 GHz antenna with gain of 5dBi, an Arduino Uno R3 microcontroller board, and a LabVIEW application make up the system. The system's maximum range is around 500 metres [14]. The system incorporates a variable flow-rate zone that takes into account the ambient temperature and humidity. The Artificial Neural Fuzzy Interface System (ANFIS) approach was used to estimate damper gap rates in a single-zone HVAC system. The created ANFIS approach was put to the test, with a mean recognition success rate of 99.98 percent [15]. A study attempts to develop an automated humidifier and dehumidifier controller. It aids with the regulation and monitoring of humidity levels in order to reduce room humidity. The study employs a humidity sensor to monitor the humidity in the space and gives the gadget two options [16]. The FBG humidity sensor is made up of two parts: a PI-coated FBG and a temperature compensation FBG. The humidity system is based on the FBG strain sensing network, which can be utilised to analyse the relationship between stratum subsidence and soil humanity in real time [17]. Temperature and humidity are crucial factors in determining how a substance or item changes over time. Sensors have been designed to meet a variety of requirements. DHT11 temperature and humidity sensor that acts as a temperature gauge for four different things. At a maximum distance of 0.4 cm from the item, measurements are taken [18]. Humidity and temperature are critical conditions for biological systems to respond optimally; for example, each has its own influence on crop development and productivity. A Temperature and Humidity sensor, LCD, Micro SD card Module, piezo buzzer, and LED were all connected to an Arduino Nano board, which could save data as a text file [19]. The state of heated air induced by the sun's heat is referred to as air temperature. The temperature of the earth's surface air changes due to the unequal distribution of sunlight on the planet's surface. The greatest day temperature recorded by a telegram-measurement system was 34°C, while the lowest was 23°C [20].

Anatomical data measurement necessitates physical effort to record values, and human error is a possibility. This paper shows how to communicate data from a wireless sensor utilising DHT11, Arduino, SIM900A GSM module, a mobile smartphone, and a Liquid Crystal Display (LCD) [21]

6 REQUIREMENT ANALYSIS

6.1 Domain requirements:

The major goal of this project is to build an autonomous humidity controller. The concept can help regulate the amount of humidity in a room using a user-friendly mobile application that control humidifier and dehumidifier system to reduce humidity or balance the temperature.

For the construction of hardware we are using Arduino UNO [21] which is the central hardware component of our system that controlled and managed all other parts. The Arduino Uno board can be programmed in C++ language using the software Arduino (IDE) integrated development environment. The Arduino board will be used to run the software.

Other hardware which will be we using to build up the system are Hc-05 Bluetooth module that is used to connect the application with hardware device, DHT-11 sensor that detect the humidity and temperature and send the data to the database and in this system we will be using Firebase. It is a cloud hosted NoSQL database that lets you store and sync data between your users in real-time. When a user registers, this database will be utilised to capture user information and then store it for future use.

A software is made with the help of Android Studio is used to develop the user interface design. It is powered by IntelliJ IDEA. Java will be used, which is an open-source and free language that will be used with the Java JDK5 and Java Runtime Environment (JRE).

6.2 Functional Requirements

- To utilize the software, register yourself using an e-mail. When the user logs in, all of the prior humidity and temperature data will be displayed.
- To use the app, an active internet connection on your phone can help to run the app.
- The user can connect the hardware system with software application using the Bluetooth system.
- The user can switch on the humidifier is turned on anytime the device shows low humidity.
- The user can switch on the dehumidifier whenever the gadget shows a high humidity level.
- Using social media platforms, the user may also share past data or graphs of humidity and temperature with others.
- The device should be connected to the power supply in your to work.

6.3 Non-Functional Requirements

- With a nice graphic user interface, the software is efficient, convenient, and simple to use (GUI).
- The software is really safe to use. Until the user logs in with their own personal account, the software may refuse to allow access.
- This software's large storage capacity allows users to save all prior data without risk of losing it.
- The software is both portable and compatible.
- Users may easily understand the app's flow without the need for professionals or instructions.
- The software may be accessed from anywhere in the globe as long as there is an active internet connection.
- External factors such as humidity, water exposure, and other weather conditions may have no effect on the speed or reliability of the application.
- The device includes both humidifier and dehumidifier in a single integrated system.
- System automatically turns the humidifier or dehumidifier on or off after monitoring.
- The software responds quickly to user input. Users may open and close the humidifier/dehumidifier in seconds because to the rapid speed.

7 DESIGNING ISSUES

7.1 Software development model:

The agile methodology will be used since our top priority is to complete project goal on time and on budget. The agile approach is to focus process on efficiency and customer satisfaction. Every week, we examine our work to ensure that are we on the right spot? We also ran tests on a regular basis to ensure that we were doing the job correctly. This model does not allow for detailed documentation; instead of implementation is the most important factor. It's also possible to change the plan and add multiple things in the middle or in the end of a project. In this project, we communicate with each other face to face rather than relying on external documents. To put the concept into action, we employ the Scrum methodology. Scrum is an agile framework that is designed to provide value to the customer throughout the project's development. It is adaptable, fast, flexible, and effective.

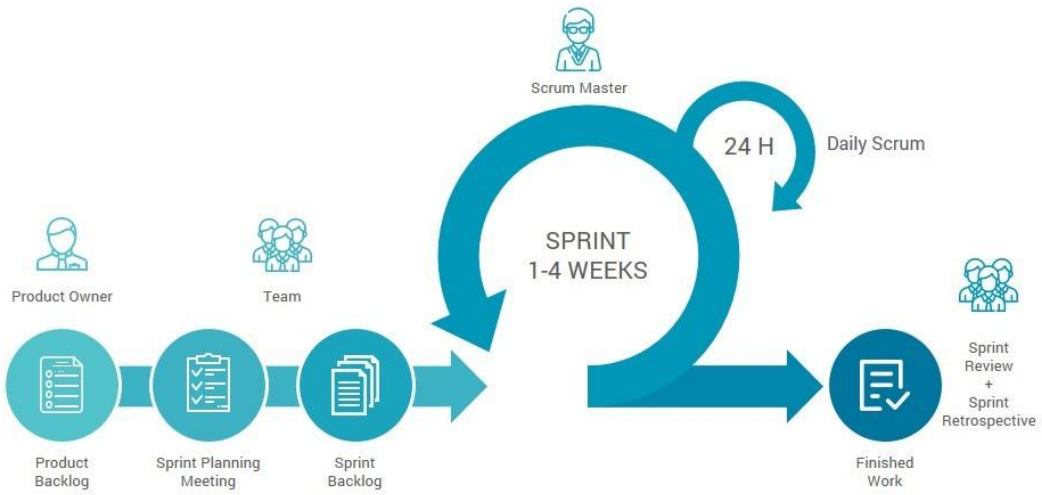

Figure 1: Scrum

7.2 Software development tools:

7.2.1 Android Studio:

Android Studio is being utilized to create our user interface. Android Studio is an integrated development environment (IDE) for the Google Android platform. Android Studio comes with a full set of tools for creating projects. It introduces additional features to help us work more efficiently when designing Android apps. Android Studio is compatible with Mac OS X, Windows, and Linux computer systems.

Features of Android studio are:

- Using Android Studio's integrated environment, we can create for all Android devices.
- It is compatible with C++, C language, Java and the Kotlin.

- It has Google Cloud Platform built in, which makes connecting Google Cloud Messaging and App Engine a breeze.
- Testing tools and frameworks are included with Android Studio.

7.2.2 Arduino IDE:

The Arduino board is a piece of hardware that stores and runs the code that has been uploaded to it. The Arduino-Uno board is programmed using the Arduino software. The Arduino IDE is a cross-platform Java programme that may be used as a compiler, code editor, and for serial firmware transfer to the board.

7.2.3 Java Language:

The Java programming language is used to create the software. Java is one of the most extensively used programming languages for application development. It's a fantastic web building tool. Java can operate on any hardware platform, reducing technical dependence and making setup and maintenance less expensive.

7.2.4 C++ Language:

In order to add the object-oriented paradigm to the C language, the general-purpose programming language C++ was created. It is a compiled language that is imperative. Because C++ is a middle-level language, it has the benefit of enabling the development of both low-level (drivers and kernels) and even higher-level applications (games, GUI, desktop apps etc.). Both C and C++ share the same fundamental syntax and coding structure.

7.3 Hardware Development Tools:

7.3.1 Arduino Uno:

Arduino is a microcontroller-based open source electronic prototyping board which can be programmed with an easy-to-use Arduino IDE. Due to its simplicity, resilience, and low price, the Arduino UNO microcontroller is a good fit for our needs [21]. Arduino consist of both a physical programmable circuit and a piece of software, or IDE. The Arduino IDE uses a simplified version of Java, C, C++, making it easier to learn. The UNO is one of the more popular boards in the Arduino family and the major components the Arduino UNO board are type B USB connector to upload program, Power port to supply power, Microcontroller Atmega328 , 6 Analog Pins to Connect input (Sensors), 14 Digital pins (LED, LCD, Relay etc), Reset switch, 16 MHz quartz Crystal oscillator, USB interface chips, TX RX LEDS.

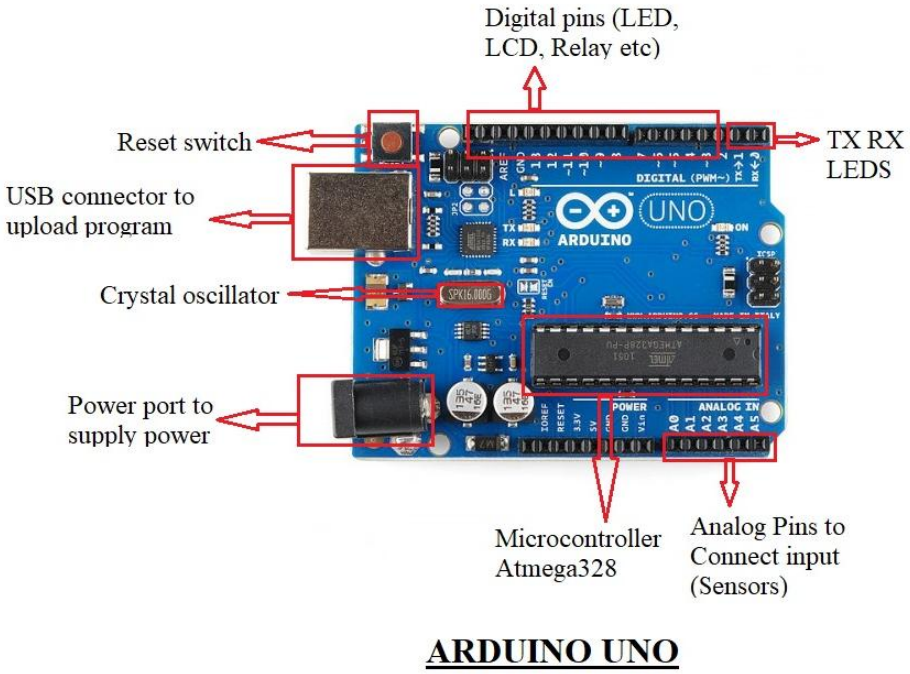

Figure 2: Arduino UNO

7.3.2 DHT-11Sensor:

It is a temperature and humidity sensor. It gives reading for both humidity and temperature same time. It has a high level of dependability and long-term stability. Small dimensions, low cost, good quality, quick response, strong anti-interference ability, digital signal output, and perfect calibration are all features of this device. With the help of the DHT library and connecting wires, it may be simply interfaced with the Arduino UNO board. To connect it to

the Arduino UNO, we wired the DHT11 sensor's Ground and Vcc to the Arduino's Ground and 5V. The Data pin of the DHT11 is then connected to pin 2 of the Arduino. It has a temperature range of 0 to 50°C and a relative humidity of 20 to 90% RH [21]. It has a 20-meter signal transmission range.

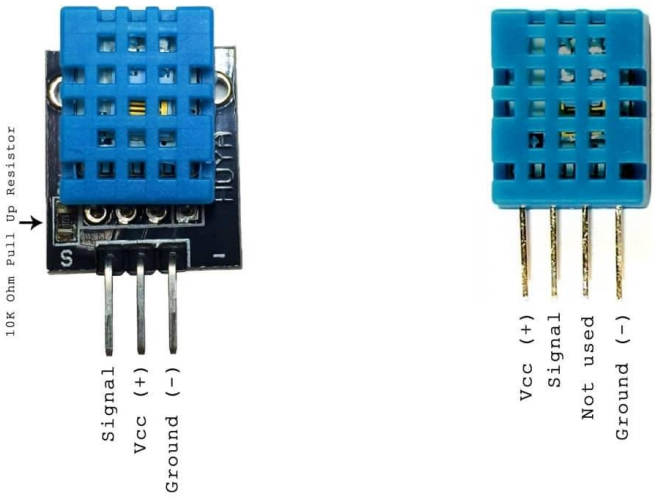

Figure 3: DHT-11 sensor

7.3.3 Hc-05 Bluetooth Module:

The HC-05 module is implemented in this project for Bluetooth communication. It is required for wireless, transparent communication setup; the module's Master/Slave configuration may be implemented as a superior wireless communication solution. Bluetooth V2.0 with EDR is the module. It also has a 2.4 GHz transceiver and a baseband.

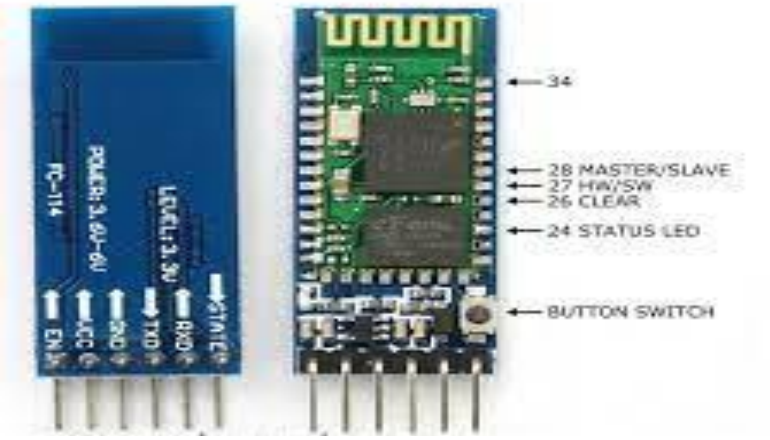

Figure 4: Bluetooth module

*7.3.4 16*2 LCD:*

An LCD (Liquid Crystal Display) screen is a type of electronic show that may be used in a variety of ways. A 16x2 LCD display is a relatively simple module that may be found in a variety of devices and circuits. A 16x2 LCD can show 16 alphanumeric characters per line on each of its two lines. Each character is presented in a 5x7 pixel matrix on this LCD. Command and Data are the two registers on this LCD. Various commands issued to the display are stored in the command register. The data register holds the information that will be shown [21].

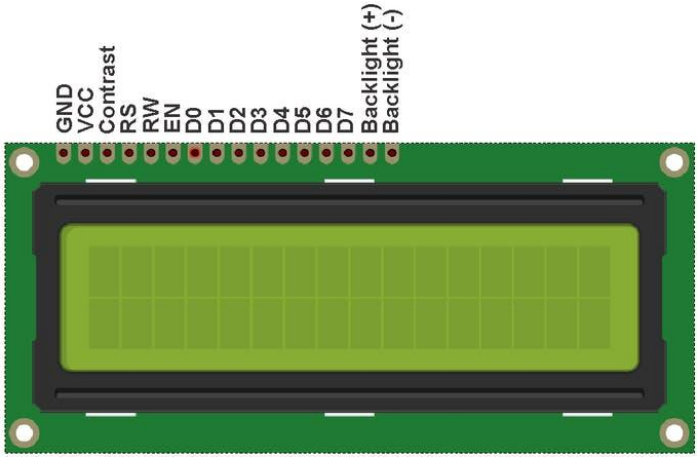

Figure 5: LCD Display 16*2

7.3.5 Peltier:

A thermal control module with both "warming" and "cooling" effects is the Peltier module (thermoelectric module). The surface temperature can be changed and maintained at the desired temperature by running an electric current through the module.

Figure 6:Peltier

7.3.6 Relay Module:

An electrical switch controlled by an electromagnet is known as a power relay module. A distinct low-power signal from a microcontroller activates the electromagnet. The electromagnet pulls to either open or close an electrical circuit when it is activated.

Figure 7: Relay Module

7.3.7 Heat Sink:

A heat sink is a heat reservoir that can hold any amount of heat in thermodynamics without significantly changing temperature. To effectively transfer heat via convection, radiation, and conduction, practical heat sinks for electronic devices must be hotter than their surroundings.

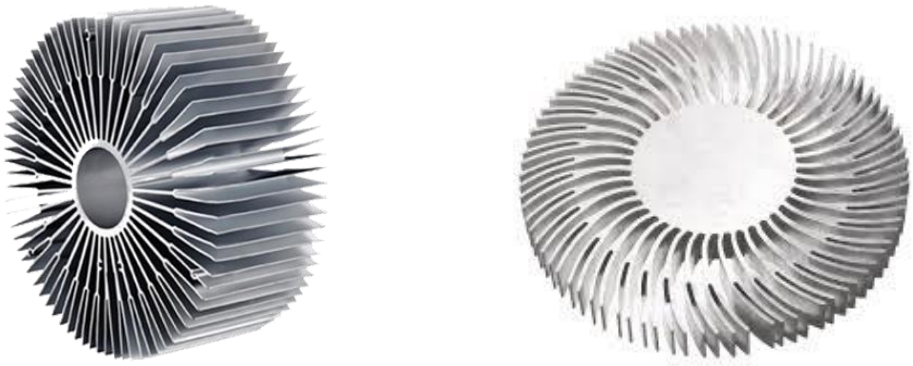

Figure 8: Heat Sink

7.3.8 Cooling Fan:

Because it is mounted directly to the radiator in some engine layouts, the cooling fan is also known as a radiator fan. As it draws heat to the atmosphere, the fan is typically installed above the heat sink

Figure 9: 5V Fan

7.3.9 Spray Module:

The spray module is used when there is dryness in the air. The sophisticated microchips used in the humidifier module are lightweight and tiny in size.

Figure 10:Spray Modue

7.4 Architectural design:

In this project a system diagram of the hardware system is made in order to make the system more understandable. The network design for the system developed in this project is shown in Figure 11. The transmission of data from device to the smartphone and store in firebase is done using by using Hc-05 bluuetooth module. The device will send a serial data via the bluetooth which in turn will forward the reading to the smartphone while the smartphone will send this sensor data to the firebase databse in the same fashion.

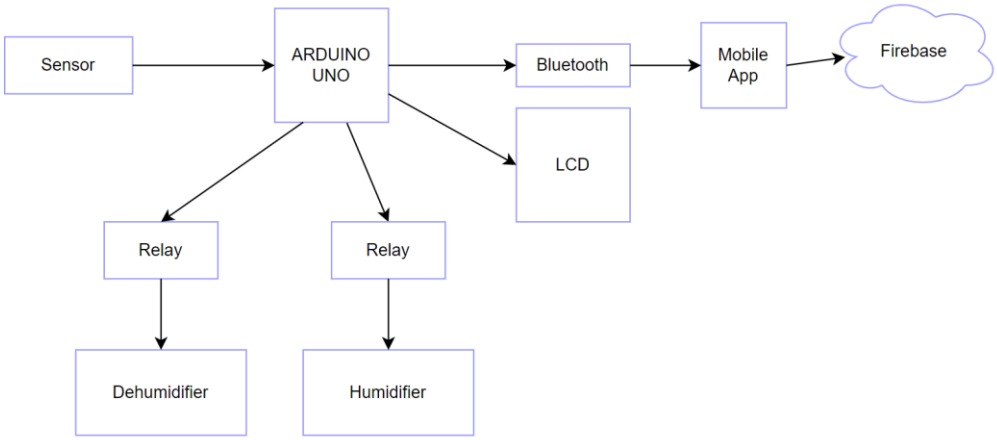

Figure 11: System Design

The actual gadget is made up of an Arduino UNO microcontroller, which serves as the primary processing unit, a programmable sensor Hc-05, a DhHT-11 bluetooth module, a spray module for controlling dry air, and an air-misting peltier with a heat sink and fan. Only one input is required for this system, which also includes a sensor, and many outputs as an LCD to display temperature and humidity, and humidifiers and dehumidifiers that manage the air to make breathing easier. The Arduino UNO microcontroller has an embedded Bluetooth module that is used to transmit data to a smartphone.

Additionally, this system has an Android-based application that is utilised to keep track of the humidity and temperature sensor. The programmed has two primary pages: the home page, which displays the Bluetooth connection, and the main page, which displays the environment's temperature and humidity. The remaining pages require user authorization.

These flow charts explain shows how the user will interact with the hardware system using software. First the user has to open mobile application then register themselves via e-mail address after completion registration process, now the user can easily login with same e-mail’s username and password [18] [20]. The user will now see the humidity and temperature of the area or room. They will have to turn on Bluetooth to connect with device if Bluetooth is not connected it will not show the temperature and humidity, then if humidity is lowit will automaticall turn on the humidifier from the application and when humidity is low then temperature will automatically normal and cools down of the area or a room.

The Android application's flowchart is seen in Figure 12.

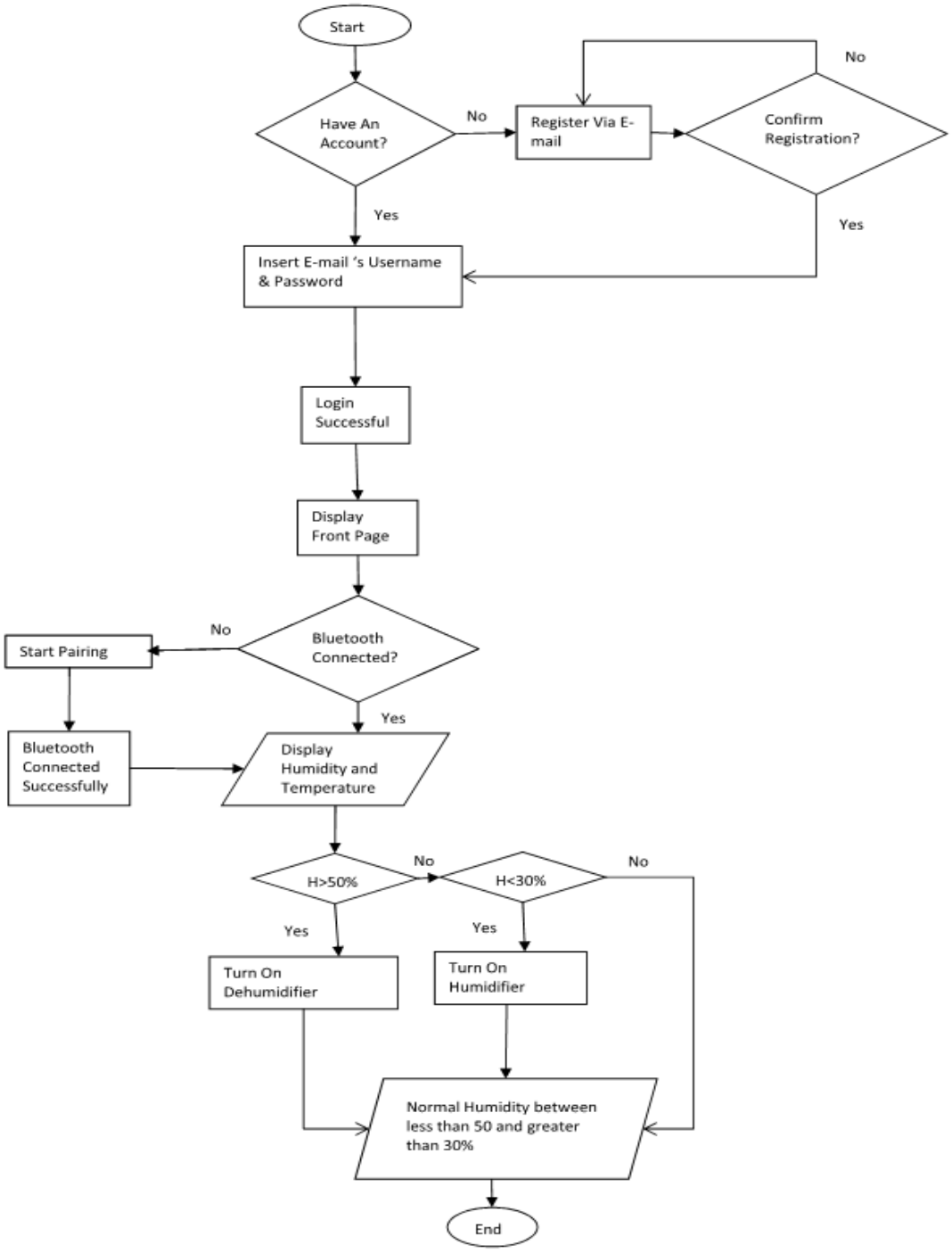

Figure 12: Flow Charts

The material was connected as follow in figure 12. . The UNO is one of the more popular boards in the Arduino family and the major components the Arduino UNO board are type B USB connector to upload program, and in Power port give 9v 1 amp power supply, Microcontroller Atmega328, 6 Analog Pins to Connect input (Sensors), so we give A0 pin to DHT-11 data pin to send data to Arduino , 14 Digital pins (LED, LCD, Relay etc), Reset switch in which 9,8 pin given to Hc-05 Bluetooth module and from 7 to 4

given to LCD pins D4 to D7 and 3-2 pins connected to Rs and E pin and Arduino GND pin connected with Bluetooth GND pin , 16 MHz quartz Crystal oscillator, USB interface chips, TX RX LEDS. LCD V0 pin is connected with DHT-11 VCC and GND pin using 4.7k and 1k resistor respectively. DHT-11 GND pin is also connected with LCD VSS and RW and K pins and VCC pin is connected with LCD VDD pin and using 100R pin connected with LCD A pin and then when we give power supply to Arduino it shows the reading on LCD screen for automatically running Humidifier and dehumidifier for setting the humidity we will be using spray module as humidifier nad for dehumidifier we will be making a device using peltier , heat sink, fan and steel sheet and it also need power supply of 12 v and 6. Amp. These humidifier and dehumidifier will connect to the Arduino 10-11 pin using relay module. Now it will automatically start and stop when it needed. We use Arduino ide software for Arduino coding in which we set the limits of humidity for humidifier and dehumidifier as it when humidity lows humidifier will automatically on and when it increase dehumidifier will on.

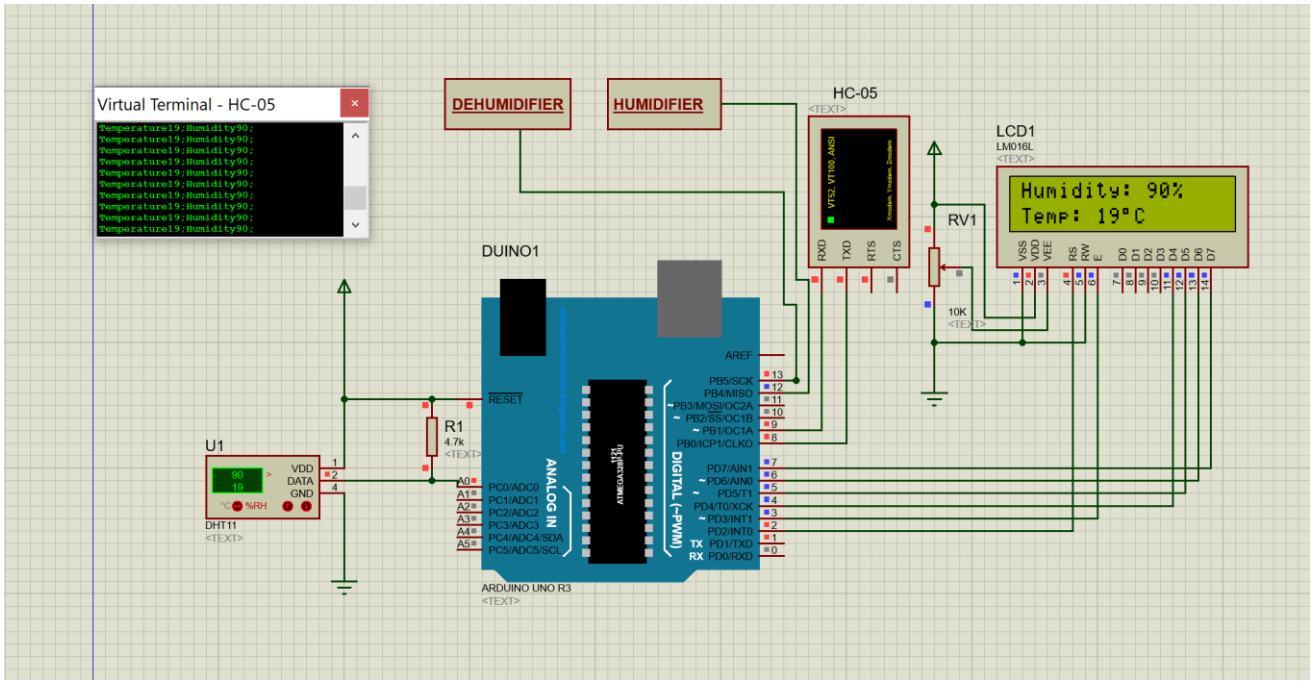

Figure 13 Circuitt Design

8 IMPLEMENTATION

The overall layout of our system for monitoring the environment is shown in Figure 13. Figure 14, Figure 15, Figure 16 depicts the actual implemented design as it was put into practice and includes a functioning integration of all hardware parts. The Arduino UNO has connections for the DHT11 and Hc-05. The Arduino IDE is utilised to connect DHT11 and LCD. The data sensed is shown by the Android application after it connects to Bluetooth. Figure17 -33 shows the actual implementation of mobile application and the emails and in Figure 34-35 shows the database.

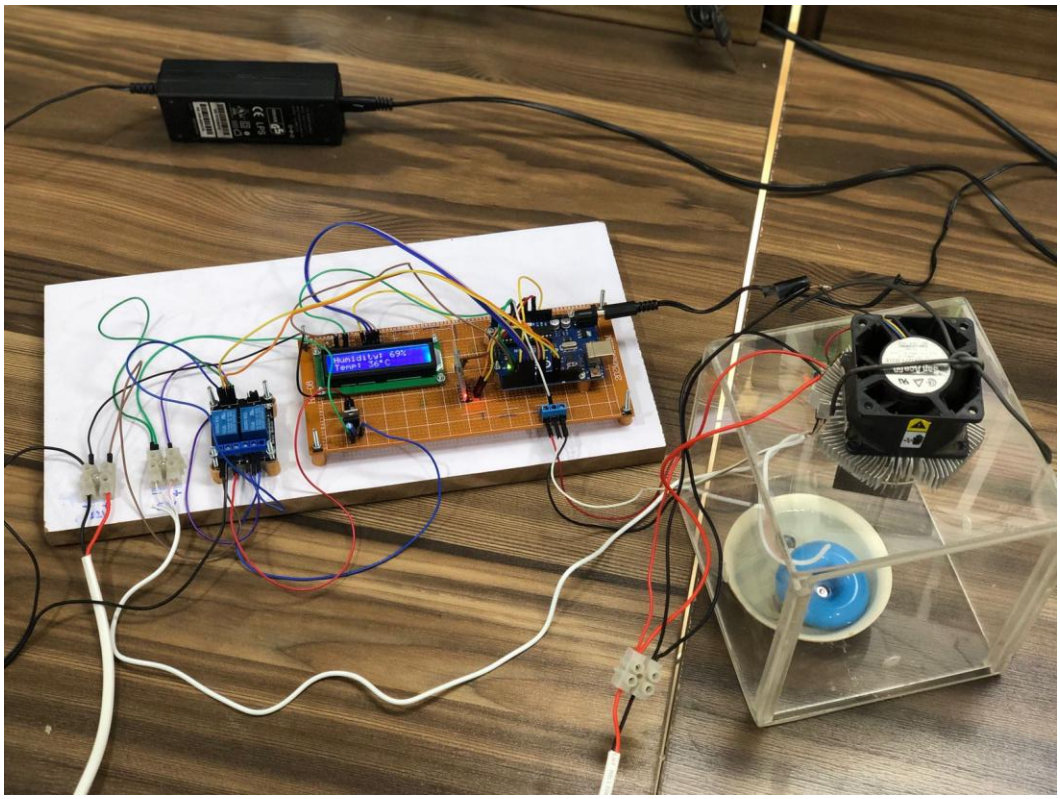

Figure 14; Actual Diagram1

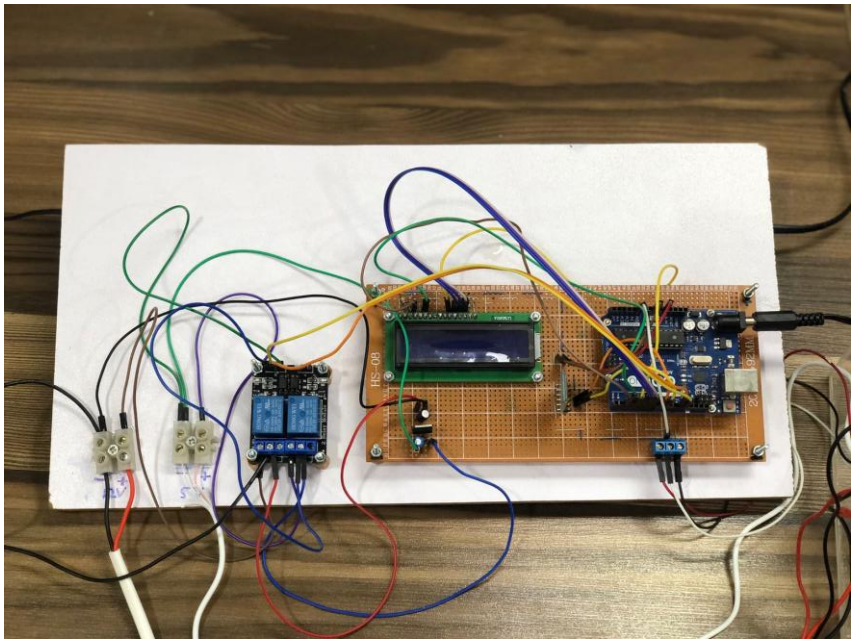

Figure 15: Actual Diagram2

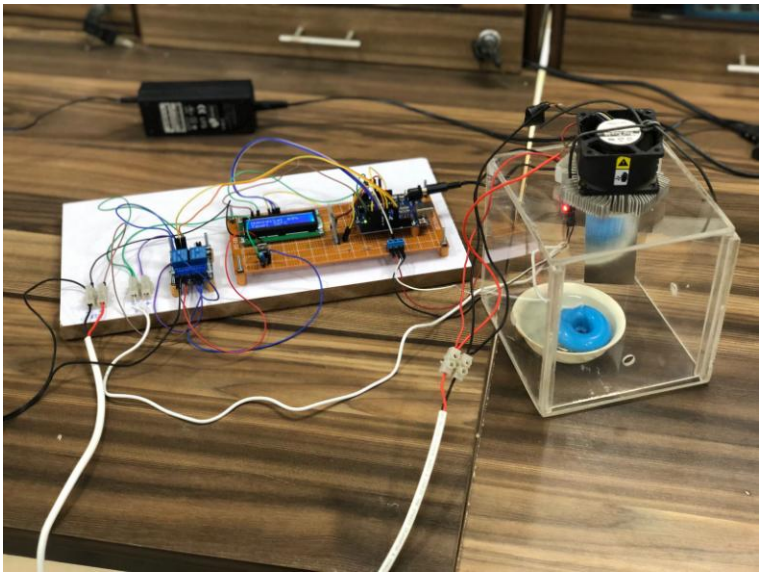

Figure 16: Actual Diagram3

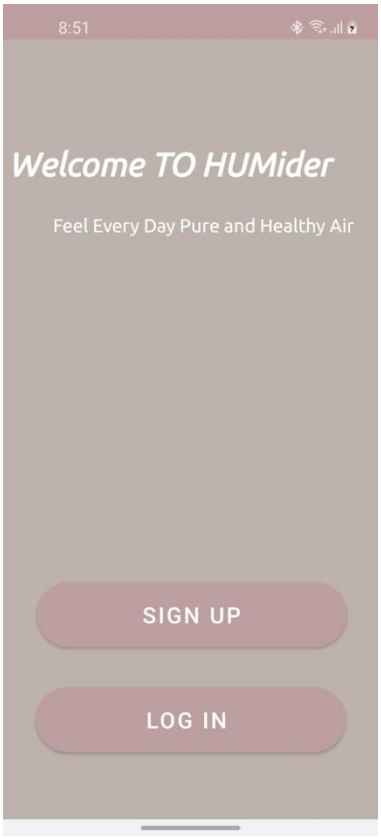

Figure 17Welcome Page

Figure 18 Signup Page

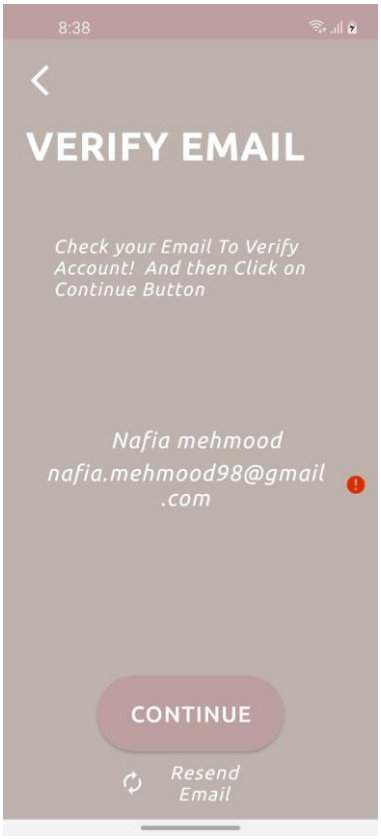

Figure 19 Verify Email

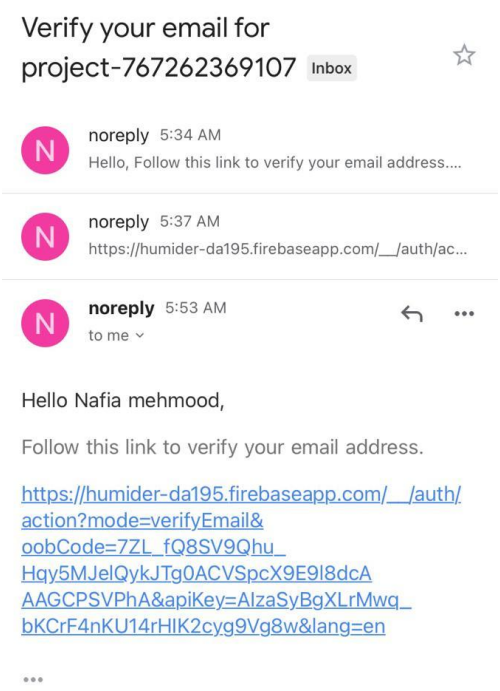

Figure 20 Verify Email

Figure 21 Verify Email

Figure 22 LOG in Page

Figure 23 Forgot Password

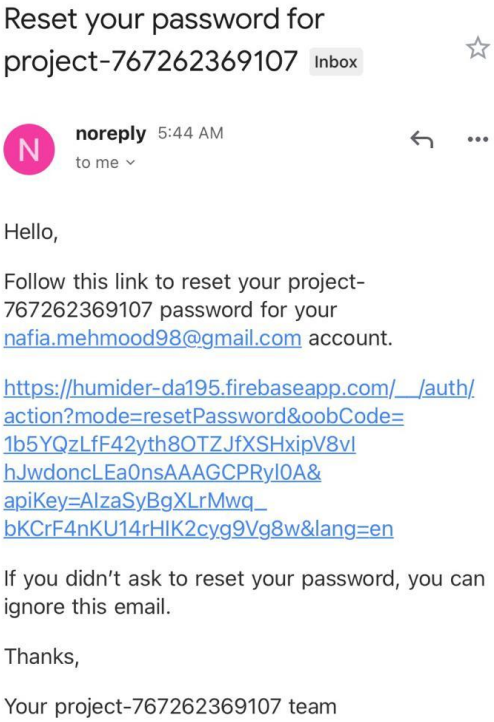

Figure 24 Reset Email

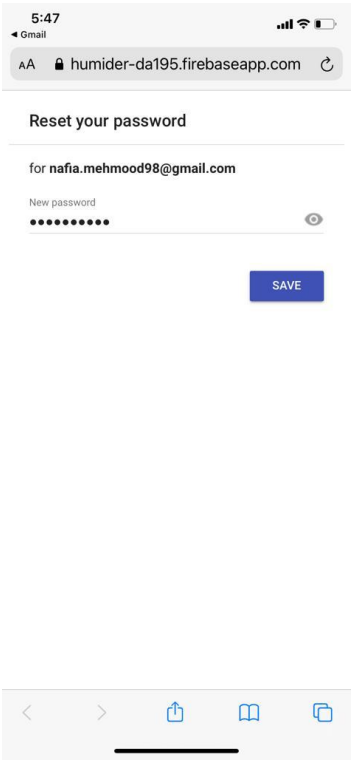

Figure 25 Reset Email

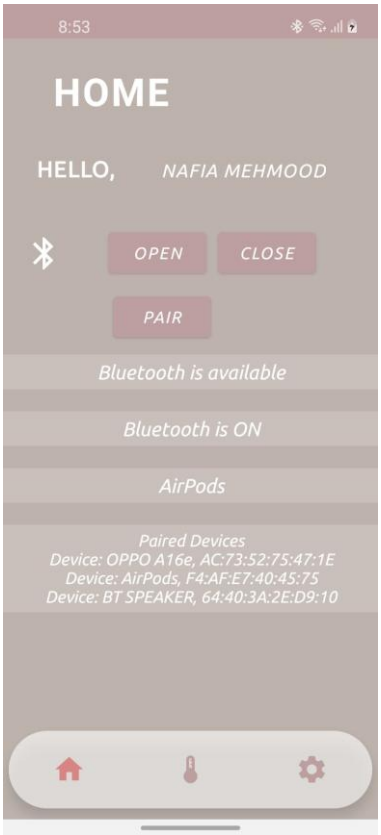

Figure 26 Home Page

Figure 27 Thermostat Page

Figure 28 Setting Page

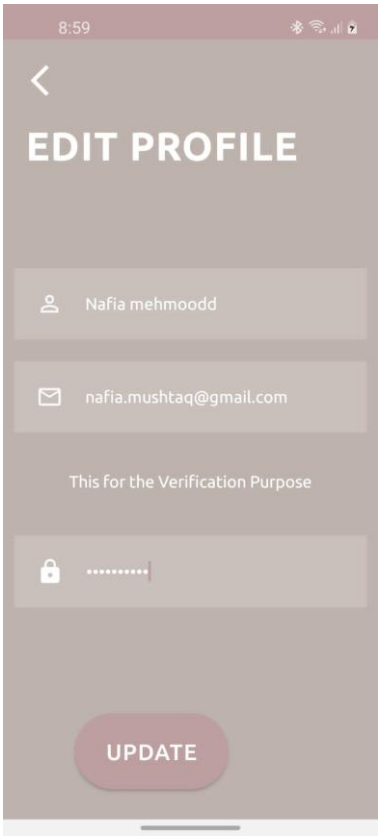

Figure 29Edit Profile Page

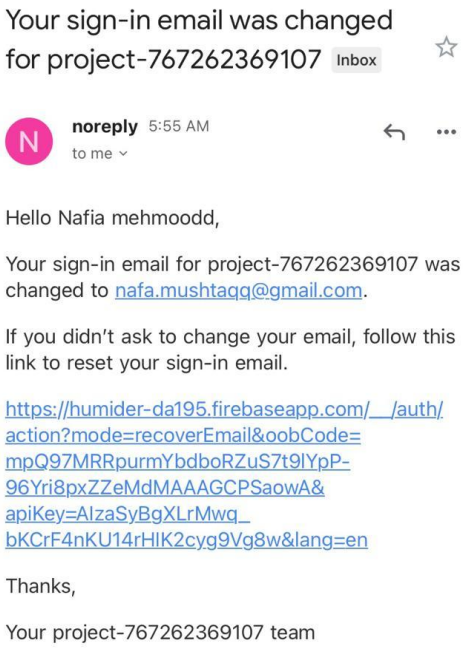

Figure 30 Edit Email

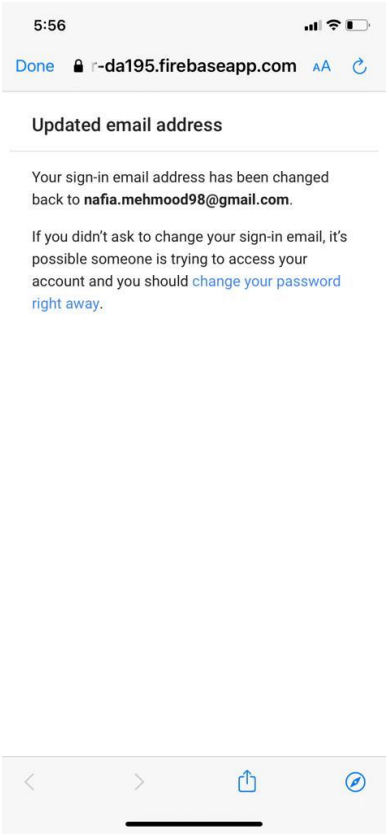

Figure 31 Edit Email

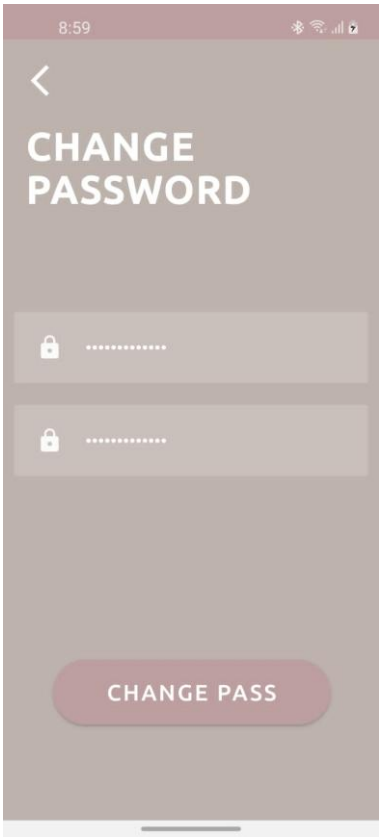

Figure 32 Change Password

Figure 33 Info Page

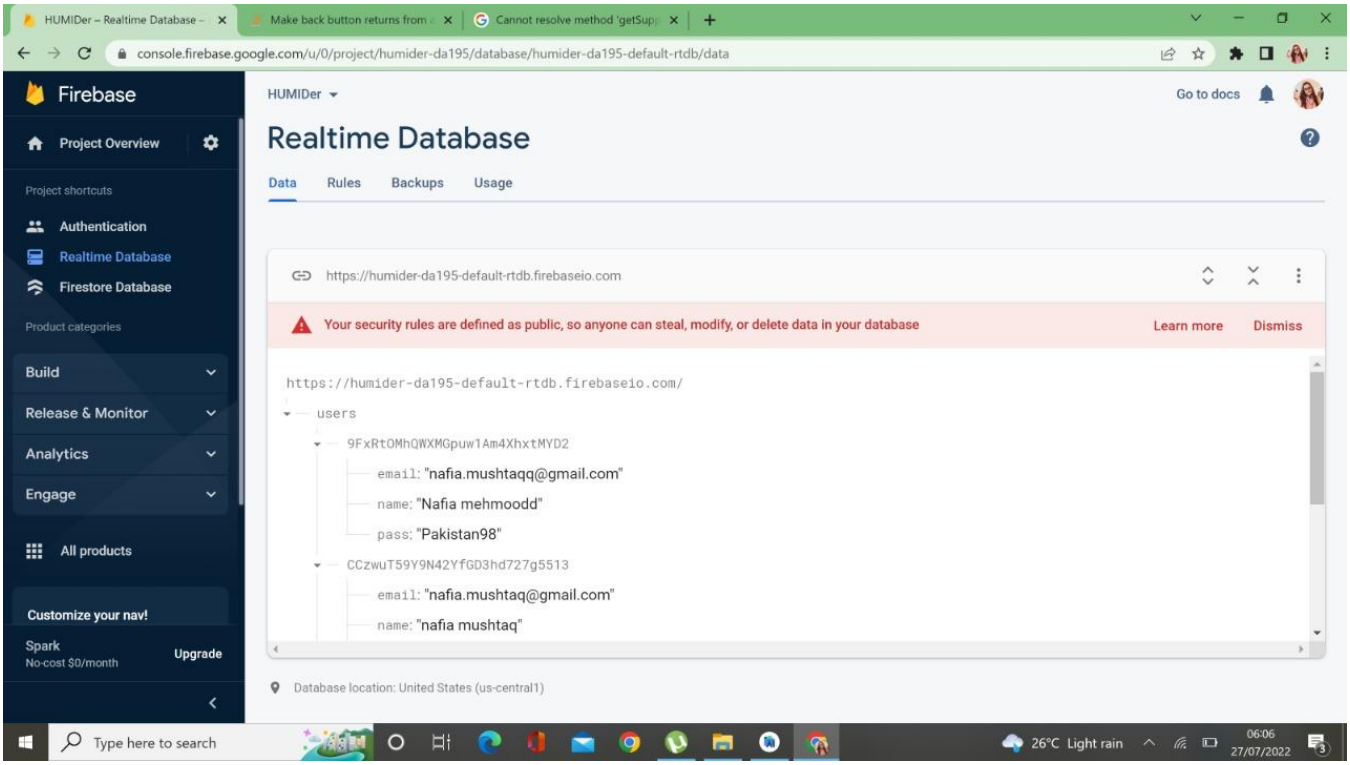

Figure 34 Realtime Database

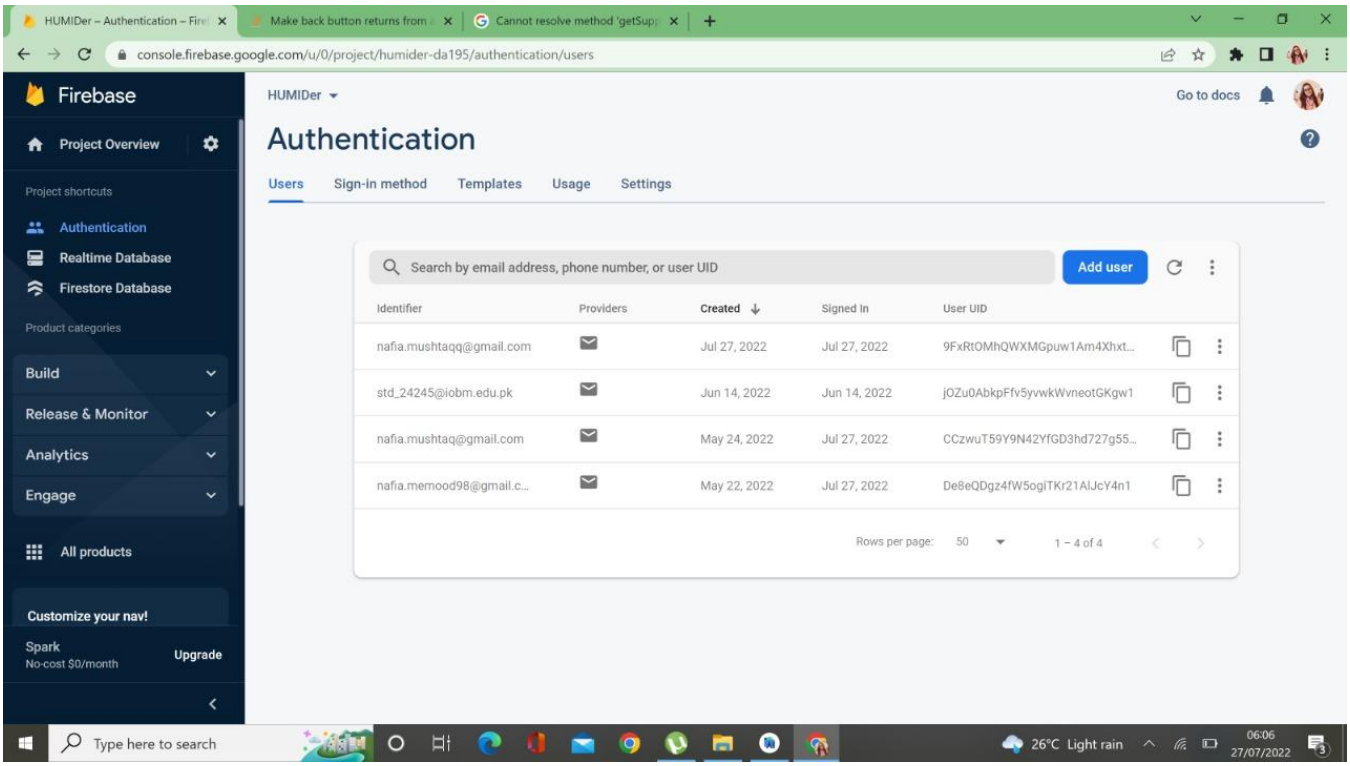

Figure 35 Authntication Page

9 TESTING

9.1 Test plan

Both functional and structural testing will be carried out from the user's and developer's perspectives. We'll simply look at how the application works from the user's perspective. The only things that matter are input and output. We'll see whether we're the last one to utilize the application.

From a developer's standpoint, we'll just look at how the system works and test all algorithm pathways in the software. Everything is significant.

9.2 Test-design specification

To test each part of the software and hardware, we will use various types of testing, such as unit testing to verify each and every individual program or object, system testing to verify that each and every program or object works with each other properly, integration testing to verify that a system is functioning with other applications, and performance testing to verify that a system is functioning properly with actual data.

9.3 Test-case specification

Test cases are run to evaluate a variety of features of the code. The failure of the outcome is predicted due to the actions that will be taken to test it, however these failures may be updated or altered. We'll work on functionality test, case database test case, user interface test case, performance test case, usability test case, integration test case.

10 CONCLUSION

This research successfully constructed a device that automatically controls the humidity of a room utilising humidity sensors DHT and an Arduino Uno, with data shown on an LCD.

This proposed system could provide a simple and effective approach for real-time temperature and humidity monitoring. When compared to the prices of devices used to measure environmental parameters, this system is compact and cost effective to some extent. Apart from this, humidifiers and dehumidifiers have health benefits as well as they can prevent dry skin, nose bleeds and asthma attacks.

From the above mentioned findings, it is ensured that by replacing the nested wired systems by the wireless sensor networks we can receive an accurate data and avoid many hazardous situations.

In the future, this Arduino System can be used in the agricultural sector. It can be made as an agriculture automation system to keep in track the value of plant's growth, using the mobile application. This weather monitoring system will deliver precise information to farmers, pharmacists, event planners, and others, allowing them to take proper measures.

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12 APPENDICES

12.1 Project Schedule <Gantt Chart>

PROJECT	Start	End	Duration
FYP			
Planning of the project	Sep-21	Sep-21	10
Literature Review	Sep-21	Oct-21	30
Gather Requirements	Oct-21	Nov-21	35
Design Project	Nov-21	Dec-21	50
Coding	Jan-22	Feb-22	40
Implementation	Feb-22	Oct-22	38
Testing	Feb-22	Mar-22	20
Finalize the project	Mar-22	Mar-22	26