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Automatic Room Humidifier and Dehumidifier Controller using Arduino Uno

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ABSTRACT

Humidity is blamed for harmful things of all kinds. I this study it aims at creating an automatic controller for humidifier and dehumidifier. It helps to regulate and monitor the level of humidity to minimize the room humidity and to make the user comfortable. The study uses a humidity sensor to measure the room's humidity and provide the device with two choices to automatically humidify or dehumidify the air. This helps minimize odors that can surround mold and mildew to rid your house of the "musty" or "rotting" smell, it also decrease dust and the risk of forming molds on your clothing, furniture and other linens, and eventually reduces inflammation of your skin and respiratory system, making it easier to breathe and feel comfortable at home. Controller used in this study is Arduino Uno. An input supply to the Arduino Uno is then connected to its pin by a humidity sensor, and the LCD will display the humidity value. A relay that was used to power humidifier and dehumidifier operations. The study was done after the testing procedure shows the result of different longer-term data when the dehumidifier and humidifier turns on and turn off if it's become normal, depending on the size of room and weather temperature.

Key words: Arduino Uno, Dehumidifier, Humidifier, Humidity sensor.

1. INTRODUCTION

Heterogeneity of the rooms in temperature and humidity i s a significant factor that must be regulated in an industrial operation [1].Healthy air has three main components to it. It has to be fresh, clean and have the right moisture content. Human beings are prone to humidity, because the human body uses evaporative cooking as the primary mechanism for getting rid
of waste heat, activated by transpiration. Depending on the temperature, humans can be relaxed within a wide range of humidity – from 30% to 70%, but preferably between 50% and 60%. In some individuals, very low humidity can cause pain, breathing problems and aggravate allergies. Relative humidity should be kept at or above 30 percent in the winter. Extremely low relative humidity (below 20 percent) can also cause eye irritation. Humidify your home, particularly your dormitories.
A common cause of the nosebleeds is low humidity. The right levels of humidity make your home feel cool in the summer and warn in winter.Humidification, or the addition of moisture, is necessary in winter, or in areas that appears to be cold for much of the year. Humidity is the concentration of atmospheric water vapor. In reality, water vapor, the gaseous state of water, is invisible to the human eye. Humidity suggests the possibility of a presence of snow, dew or fog. As the temperature increases, the amount of water vapor required to attain saturation increases.

The project senses temperature and humidity from your room or environment and either checks whether or not it is within comfortable range. The DHT-11 Sensor senses closed room temperature and humidity and sends the data to the microcontroller [2]. Considering the importance of parameters such as temperature and humidity in many projects, it is very important to correctly pick sensors that are capable of measuring temperature and humidity. The DHT family are the most prominent and common. Within the world of Arduino projects, imagination and need will find infinite possibilities.
The Arduino.cc Uno is also known as a microcontroller device, an open source system. It is based on the device of the microcontroller [3].

The project is about automatic humidity controller, the prototype can help to control the level of humidity to lower a room's humidity or to balance the temperature. After detecting the room's humidity, the device has two choices-humidifying or dehumidifying the room.

2. RELATED LITERATURE

The studies concerned set out in this section present the definition that relates to the Arduino powered Automatic Room Humidifier and Dehumidifier.

A research in Soil Moisture, Temperature and Humidity Calculation Using Arduino said that this project was built to designed smart farming methods for Indian farmers to track critical crop growth factors accurately. The system tests three of the most important and significant plant production parameters, namely soil moisture, temperature, and humidity. The Arduino Uno microcontroller. The FC28 hygrometer and DHT11 sensors are used, respectively, to measure soil humidity and temperature. In other words, soil humidity and relative humidity. The microcontroller of Arduino Uno. The FC28 hygrometer and the DHT11 sensors are being used to calculate soil moisture and temperature respectively. The data is read by the sensor and then sent to the microcontroller board. The board then processes, maps and displays data by code on the LCD panel [1]. L.Barik., The computer employs Arduino Uno with Raspberry Pi, sensor package HTU 211D, and Wi-Fi module ESP8266. The experimental data show the ambient live environment temperature and humidity of any plant using Raspberry Pi with Arduino Uno, and the soil moisture. This research incorporates the environmental observance results, such as humidity and temperature measurements using sensors. The information collected could be used to generate habits such as distantly dominant cooling devices, heating devices or long-term statics that will help track the same [2]. Another study by Bhadani P., used the Arduino controller system to calculate the devices temperature and humidity, pressure, and size. The system involves the height measurement tool and a measurement or control instrument. For this work they suggested an Arduino Uno with Raspberry Pi data processing unit [3]. Late people are increasingly relying on embedded systems to control and monitor ecosystem-influencing factors for rising human effort and participation. Temperature and humidity are important to natural observation and understanding. IoT takes form here by dramatically enhancing the mechanism's efficiency and systematically reducing human participation, and therefore overall spending [4]. The proposed prototype consists of a temperature and humidity detection DHT11 module, an Arduino microcontroller, a mist generator and a ventilator for cooling. DHT11 sensor was extensively used in temperature and humidity control system design [5]. The comfortable room was built by monitoring room condition temperature (on a scale of 18 – 34 0C) and humidity (on a scale of 40 percent -70 percent). Room temperature and humidity were regulated using four variables such lamp, water vapor supply pump, air circulation fan and exhaust air cleaner. Hardware (moisture sensor, microcontroller, pump, lamp and fan) and (software IDE) were used to build the system [6]. Arduino refers to an electronic board which is open source and is programmed using the software. It makes the electronic design more available for anyone interested in creating it with suitable environments [7]. Thanks to the continuous running of the cooler pump, humidity rises so that humidity is regulated, they created a system that helps to provide space for human comfort. Help maximize moisture. Microcontroller used on the computer. Sensor to temperature and humidity (DHT – 11), relay circuit [8]. In practical operations, the state of a room with humidity and temperature is really useful to know the room condition with regard to humidity and temperature, , a prototype of humidity and temperature can be using certain materials such as DHT 11 sensor, Arduino Uno R3, 2X16 LCD, l2C LCD, etc. The designed prototype offer access to the internet of things in such a way that information on humidity and temperature can be easily transmitted to Android user's themselves. This design can be used well every second with precise performance, and ever second data could be sent through an internet connection [9].

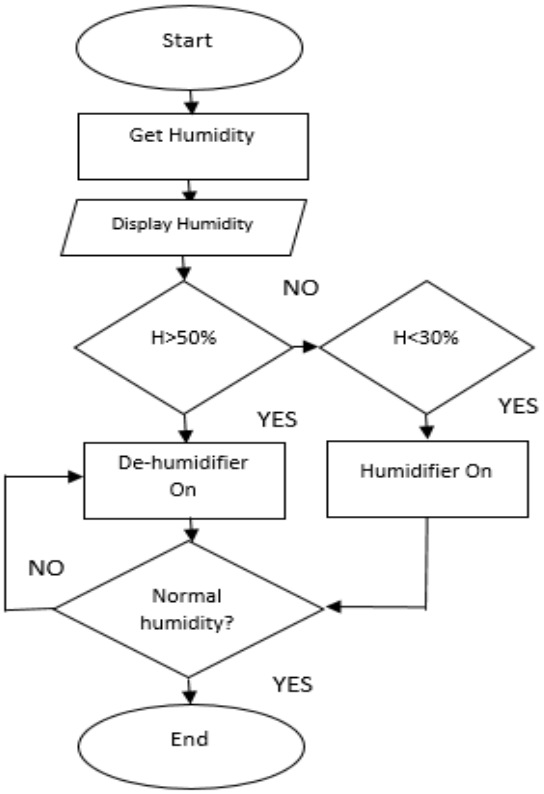
Dehumidifier reduces the humidity air by direct interaction between liquid desiccant and process air, and then provides the supply room with cool and dry air. The driving force behind mass transmission during dehumidification process lies in the variations in the surface water vapor pressure between the liquid desiccant solution and the ambient air. Power efficiency and occupant convenience have been two big issues in the air conditioning industries in recent decades. A liquid Desiccant Dehumidification System is capable of achieving low humidity with relatively low energy consumption and has the ability to use renewable energy. Those benefits in recent years make this system more appealing [10].

3. METHODOLOGY

The actual design of the prototype is shown in Figure 1. It's the DIY dehumidifier on the left side, the study used silica gel and fans and used an acrylic to enclose it. It is the prototype's main design in the middle part of the picture, which is designed to show the humidity value and program for sensing room humidity. It is the humidifier on the right.

Figure 1: Actual Prototype

Figure 2 shows the sensor of humidity, and the value of a room's humidity is displayed in the LCD. When the humidity value reaches 50%, the dehumidifier will be on but if the humidity is less than 30% the humidifier will be on and the humidifier will be off if the humidity is natural



Figures 2: System Flowchart

Figure 3 illustrates the Automatic humidifier and dehumidifier controlled using Arduino Uno system architecture. It shows the components used, and how the components are connected. An input supply to the Arduino Uno is then connected to its pin by a humidity sensor. The humidity value shall be reflected in the LCD. A relay used to monitor moisturizer and dehumidifier service.

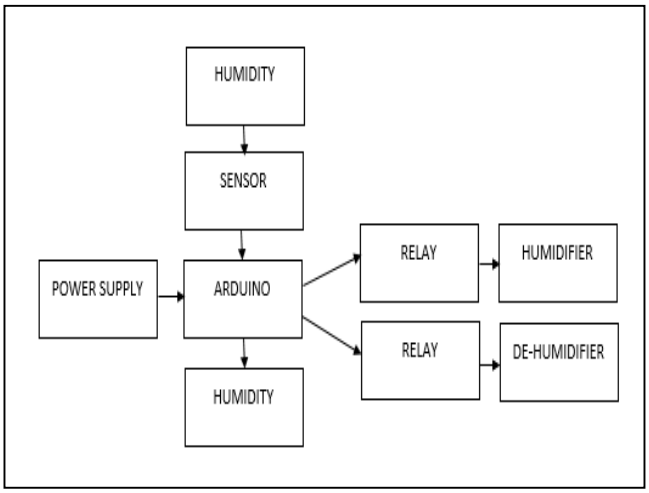


Figure 3: System Architecture

Figure 4 shows a power supply circuit design, the output voltage is about 7 volts and 12 volts. The developer designed a power supply so that the system as a whole operates.

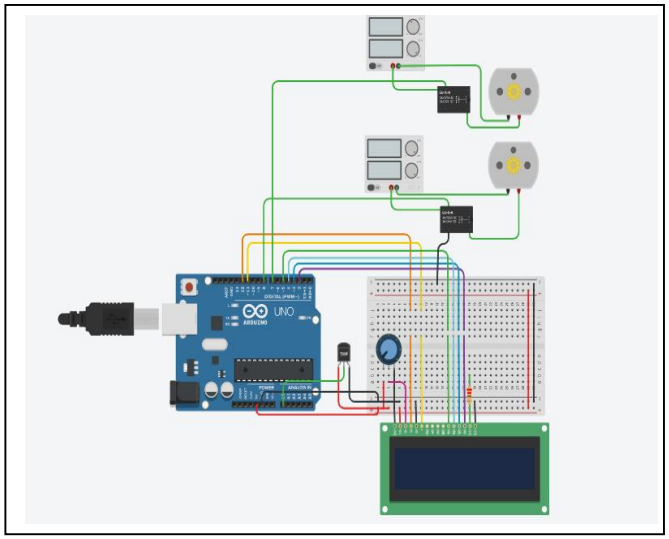


Figure 4: Power supply Circuit Design

Figure 5 shows that the two engines act as the dehumidifier and humidifier, the developer designed a 5v and 12v power supply for the Arduino, and the dehumidifier fans. While the humidifier requires supply, it's linked to the 220v.

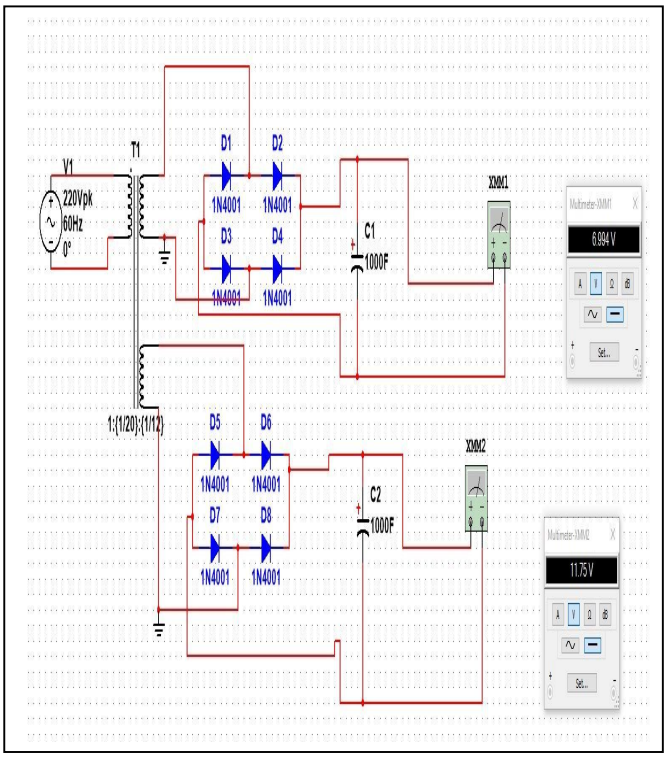


Figure 5: Main Circuit Design

4. RESULT AND DISCUSSIONS

A. Testing Result

Table 1 shows when the dehumidifier turns on, how long will it take to normalize the humidity of a 4.75 sq meters room. It takes about six hours before the humidity transition into its normal state.

Table 1: 1st Set of Data (Humidity 1)

SIZE OF THE ROOM: 4.75 sq. meters	
TIME	**HUMIDITY**
12:00PM	63%
1:00PM	60%
2:00PM	58%
3:00PM	55%
4:00PM	52%
5:00PM	50%

When the dehumidifier turns on, table 2 shows how long it will take for a 12 sq to normalize space to meters. When the humidity turns into its normal state it takes about 11 hours.

The weather in the Philippines is too humid, so when the humidity is below 30%, the developers did not get data. As the developer experimented with the project, the developers attempted to set the humidity below 30% by putting a hot soldering iron in front of the sensor when the desired value is reached, the humidifier turns on and it only takes ten minutes or less to normalize the humidity of an open room.

Table 2: 2nd Set of Data (Humidity 2)

SIZE OF THE ROOM: 12 sq. meters	
TIME	**HUMIDITY**
12:00PM	68%
1:00PM	67%
2:00PM	65%
3:00PM	64%
4:00PM	62%
5:00PM	60%
6:00PM	57%
7:00PM	55%
8:00PM	53%
9:00PM	50%
10:00PM	48%

B. Graph

Figure 6 shows the relationship between air humidity and room size, how long it takes to normalize a moisture. In Humidity 1, the size of the atmosphere in Humidity 2 is smaller than the size of the atmosphere, so the time taken to normalize a moisture is much quicker from 63% to 50% in just six hours, while in Humidity 2, it takes ten hours to normalize a 68% moisture to 50%.

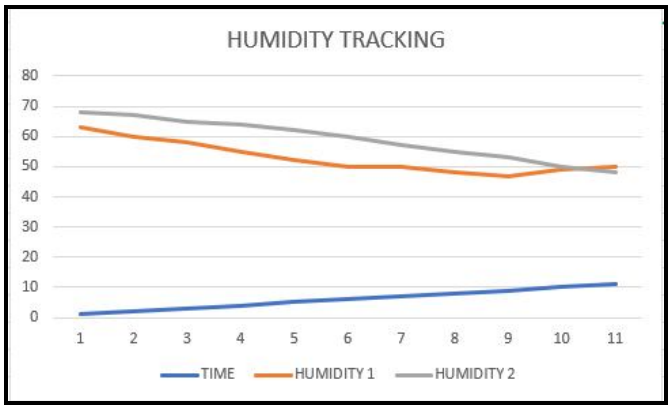


Figure 6 : Humidity Tracking

5.CONCLUSION

In general implementation, this study successfully created a devices to control humidity of the room using humidity sensors DHT and Arduino Uno automatically with data display on the LCD. The developer programmed a system that will control the humidity of a room to normalize it by turning on the devices like dehumidifier and humidifier. As the system tested, there are some difficulties like in making the supply as one.

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