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DEVELOPMENT OF ELECTRONIC LABORATORY TEMPERATURE AND HUMIDITY DETECTION USING FUZZY LOGIC AND MYSQL DATABASE METHODS

Bahrun Niam, Much Sobri Sungkar, Dany Sucipto

Abstract. The electronics laboratory is a place for practicum for electronics students. In this laboratory there are electronic components that must be protected from temperature and humidity. If the temperature is too cold and the humidity is too high, it can cause corrosion of electronic components, which can cause damage. Arduino is an open source electronic kit specially designed to make it easier for everyone to develop electronic devices that can interact with various sensors and controllers. Laboratory room temperature detection system using software and hardware. The software used is Ardiono and the MySql database, while the hardware is power supply, D1 Mini microcontroller, DHT11 sensor and LCD. The temperature data obtained from the DHT11 sensor will be displayed on the LCD. In data processing using fuzzy method.

1. Introduction

Based on the Decree of the Minister of Health of the Republic of Indonesia No. 1405/Menkes/SK/XI/2002 concerning Health Requirements for Office and Industrial Work Environments, the requirements for temperature or room air that are properly regulated are in the range of 18° C - 28° C with humidity temperature or room air ranging from 40% - 60%. If the room air temperature increases by about 28o C, then the room where you work must be installed with AC (Air Conditioner) (Menkes, 2002) [1].

Agus Sumarjono (2018) in research on monitoring or monitoring room temperature through LabView software and can be controlled automatically using an Arduino microcontroller, can be precise and accurate, when the minimum temperature (27°C) and maximum temperature (32°C) is reached through the Arduino type UNO microcontroller. , So that the value of the air temperature in the work room will be easily monitored and controlled automatically, in accordance with the standard rules of Occupational Safety and Health (K-3) regulations regarding good or normal air or room temperature requirements [2].

This study aims to obtain temperature data using fuzzy logic that has been embedded into a microcontroller chip module. So that the electronic components are not damaged. Because if the temperature is too cold and the humidity is too high, it can cause corrosion of electronic components.

2. Iterature Review

In a study conducted by Arifin Bustanul and Agus Adhi Nugroho entitled Indoor Temperature Control Based on Fuzzy Logic Using the National Instrument Myrio 1900, it was found that the temperature can be controlled properly and the motor and speed can be controlled properly. The data obtained can be displayed using the LabView MyRio application, the data displayed is in the form of graphs and data information needed in research. [3]

Research conducted by Prayitno Edy, Noni Juliasari, and Pipin Farida Ariyani entitled Monitoring and Controlling the Temperature and Humidity of Web-Based Food Storage With the Fuzzy Logic Control Method, the system can run well, namely the temperature and humidity data obtained will be sent via Bot Telegram, and if there are abnormal conditions, there will be phone calls or notifications sent via SMS. The temperature detection used is the DHT22 sensor and the humidity detection used is the DS18B20. While the microcontroller used is the Arduino Uno type. [4]

The research conducted by Aristiono Defri, and Asti Riani Putri with the research title Development of a Temperature Control and Monitoring System in an Incubator Room for Lovebird Cultivation Based on Fuzzy Logic resulted in a very high accuracy of 99.6%. because the temperature produced is in accordance with what is needed, namely 34.10 C - 35 C, so love bird cultivation can develop optimally. This temperature monitoring and control system uses a DHT22 temperature sensor and uses an incandescent lamp as a component that will generate heat. And also using a fan whose rotation is regulated using PWM so that the fan rotation speed can be determined according to the detected temperature. [5]

Abdullah Rossy Rosdian and Agung Wibowo conducted a research entitled Monitoring Server Room Temperature Using Fuzzy Logic Sugeno Method Using Arduino and SMS. From the results of the study, it was found that the server room temperature data can be monitored via SMS. Changes in temperature that occur in the server room can be seen via SMS and if a problem occurs, there will be an automatic notification via SMS. The temperature sensor used is the LM35 temperature sensor. With the existence of this system, it is very beneficial for IT personnel, because they can work in parallel with other jobs. [6]

Research conducted by Ismawati Dini, Dahnial Syauqy and Barlian Henryranu Prasetio with the title Comparison of Membership Numbers and Fuzzy Models on Temperature Changes in Egg Incubator Incubators, from this study resulted that using the fuzzy method it was found that to reach the ideal temperature faster than the using Gaussian, Trapezoid and Triangle methods. When using the fuzzy method, the difference is 0.8 while the third is using the Gaussian, Trapezoid and Triangle methods, the difference is 12.9. so that with this system the ideal temperature in the incubator is maintained and the hatching of chicken eggs can be maximally successful. [7]

3. Hardware

The making of the tool will be done after the software creation is complete. The components will be assembled into one and will be packaged with acrylic so that it has an attractive appearance. This temperature detection consists of several components, namely,

3.1 D1 Mini Microcontroller

Microcontroller D1 Mini is a mini wifi board based on ESP266 that can connect microcontroller devices such as Arduino to the internet via wifi. The D1 Mini microcontroller will be programmed using the Arduino application and will control the process of temperature and humidity detection devices.

3.2 DHT11 . Temperature Sensor

The DHT11 sensor is a sensor that will detect temperature and humidity. The data obtained from the DHT11 sensor will be sent to the D1 Mini Microcontroller which will then display the results to the LCD.

3.3 LCD

LCD (Liquid Crystal Display) serves to display data obtained from the DHT11 sensor. The LCD used is an OLED LCD type

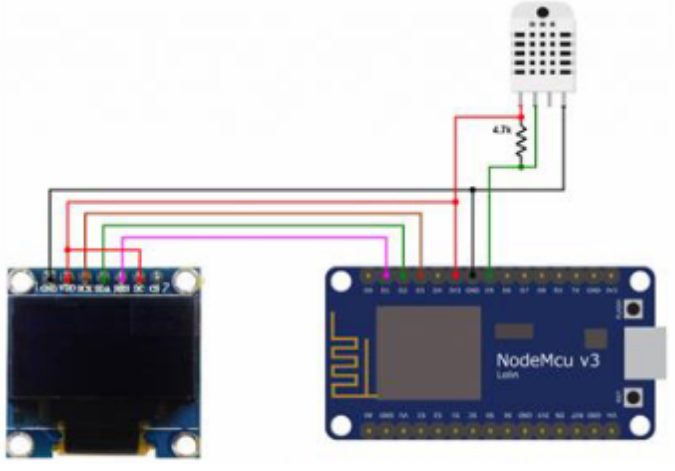

Figure 1. Hardware

4. Results and Discussion

Testing of this sensor is carried out by monitoring the temperature and humidity from 09:00 to 09:45 WIB with a time interval of 45 minutes. The choice of time in the morning because the temperature and humidity in the morning is relatively cold and the increase and humidity in the afternoon is very visible difference. The average temperature increase recorded by the DHT11 sensor is 0.438^{0}C. For the average humidity increase per 30 minutes 1.62% RH. The following table 1 is the result of testing the DHT11 sensor.

Table 1. Result DHT11sensor

No	Time	DHT11 Sensor	
		Temperature (^{0}C)	Humidity (%)
1.	09:00:00	27	50.8
2.	09:05:00	27.3	50.7
3.	09:10:00	27.3	50.5
4.	09:15:00	27.5	50.3
5.	09:20:00	27.9	50.4
6.	09:25:00	28.5	50.0
7.	09:30:00	29.0	49.0
8.	09:35:00	29.8	47.5
9.	09:40:00	30.4	47.2
10.	09:45:00	31.2	44.0

The membership functions formed, among others, can be seen in the curve of Figure 2 for temperature and the curve for humidity in Figure 3 below:

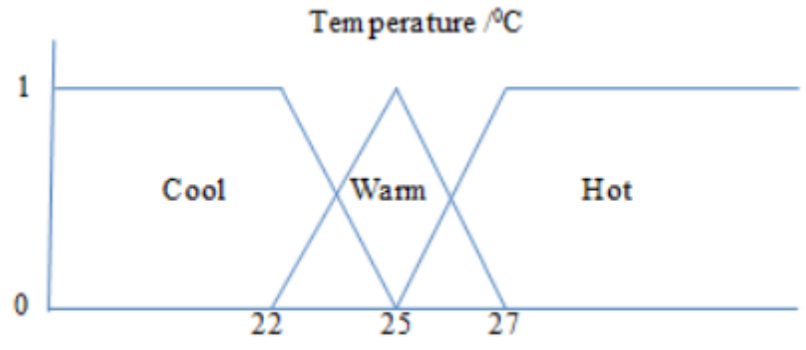

Figure 2. Temperature Graph

From Figure 2, we can conclude that the temperature variable has three sets, namely cold, warm and hot. For the humidity variable, there are also three sets, namely dry, medium and wet which we can see in Figure 3. These variables will be used as linguistic variables.

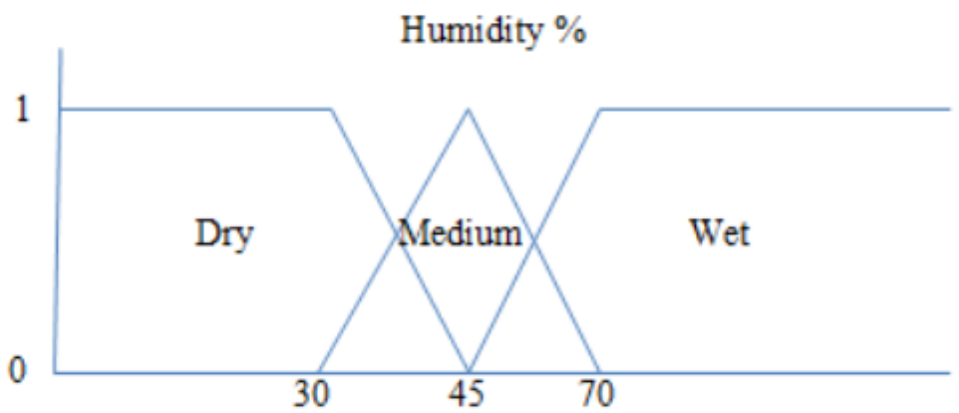

Figure 3. Humidity Graph

From the curves above, we can find the degree of membership of each variable which we will use as input data for the rule base by using the membership degree equation.

To make it easier to observe laboratory temperature and humidity, temperature and humidity data is displayed on the OLED LCD. Temperature and humidity data is displayed on the oled LCD, as shown in Figure 4

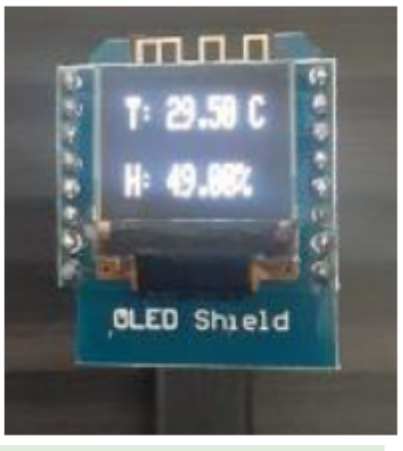

Figure 4. Temperature and humidity data display

5. Conclusion

The research that has been done can be concluded that the system can run as it should. The system is able to provide information when the temperature and humidity conditions are not normal. By using the fuzzy logic method, the controller system can display temperature and humidity data according to room conditions. temperature recorded at 09:00 - 09:45 is 27 C - 31.2 C and humidity is 50.8% - 44.0%

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