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TEMPERATURE AND HUMIDITY INSTRUMENTATION PRACTICUM REPORT USING ARDUINO WITH DHT 11 SENSOR

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Abstract

The extreme temperatures that occur in Indonesia mean that we must always maintain room temperature which has an effect on body temperature. A room temperature that is too high will cause the body to release a lot of fluids which can result in dehydration, while a body temperature that is too low can make it difficult for the body to move and make the body stiff. Therefore, in this study the aim is to create an automatic room temperature accompanied by humidity. The room is equipped with an Arduino which functions like a thermometer. In this practicum, it is about temperature and humidity instrumentation using the DH11 sensor. The components used are the DHT11 sensor, Arduino Uno, jumper cables and others. Data taken during the practicum this is 3 pieces of data. This test also produces output, namely DHT 11 and a laptop to display the output results via the Arduino module. Sensor output is displayed in real time. To display the temperature in this Arduino sketch, you can open it in the Arduino IDE application.

Keywords: *room temperature meter, Arduino, DHT 11.*

[1] Korespondensi Penulis

INTRODUCTION

Unpredictable weather like today is certainly worrying, changes in weather from extreme heat to rainy weather mean that the body must be able to stay healthy in the face of weather changes. Although extreme weather does not directly cause disease, it can trigger our bodies to become sick. This means we have to control the room temperature to make our bodies comfortable so that it doesn't interfere with our activities. A room temperature that is too hot will also inhibit activity and can result in dehydration due to the release of a lot of dry fluid. Vice versa, if the body temperature is too cold it can make the body move less because the temperature is too low so oxygen levels can also decrease.

Therefore, in this study the aim is to create an automatic room temperature accompanied by room humidity with an Arduino which functions like a thermometer. So that each user can check the room temperature and humidity conditions in the room. Which can be accessed via smartphone or laptop. The research carried out includes applied research with experimental research methods (Kothari, 2009).

Picture 1. Research Stages

Research Purposes

1. Understand the characteristics of humidity and room temperature using the DHT 11 sensor.
2. Learn how to assemble a room temperature and humidity device using a DHT 11 sensor.

STUDI LITERATURE

Temperature

Temperature is used as a medium to express how hot or cold something is. The temperature of a system is a property that determines the balance of a system with other systems. When two or more systems are in thermal equilibrium, the systems are said to have the same temperature. The temperature of all systems that are in a state of thermal equilibrium can be expressed by numbers. Setting a temperature scale means determining the value of temperature with a parameter called a temperature unit. The condition for thermal equilibrium between two systems occurs when both systems have the same temperature. On the other hand, if the temperatures are different then the two systems are not in thermal equilibrium. (Mahmud, H. 2015).

The tool for measuring temperature is called a thermometer. The term thermometer comes from the Latin thermo, which means heat, and meter, which means to measure. Thermometers utilize the thermometric properties of a substance, namely changes in the properties of a substance due to changes in the temperature of the substance. The thermometer was discovered by Galileo-Galilei (1564 – 1642). The thermometer that is currently widely used is a mercury thermometer because this

thermometer contains mercury. Mercury functions to show temperature. If the thermometer touches an object that is warmer than mercury, the mercury will expand. (Aruan A. 2019).

Humidity

Air humidity is the amount of water vapor in the air (atmosphere). Humidity is the concentration of water vapor in the air. This concentration figure can be expressed in absolute humidity, specific humidity or relative humidity. (Handoko, 1994). Air humidity is the level of wetness of the air because in air, water is always contained in the form of water vapor. The water vapor content in warm air is greater than the water vapor content in cold air. If the air containing a lot of water vapor is cooled, the temperature drops and the air can no longer hold that much water vapor. Water vapor turns into water droplets.

Air that contains as much water vapor as it can contain is called saturated air. Humidity is the concentration of water vapor in the air. This concentration figure can be expressed in absolute humidity, specific humidity or relative humidity. Even though the amount is small, air humidity has an important meaning because the amount of water vapor in the air is an indicator that rain will occur. This water vapor also absorbs earth's radiation, so air humidity also plays a role in regulating temperature. The greater the amount of water vapor in the air, the greater the potential energy available in the atmosphere and can be a source of wind rain, thus determining whether the air is permanent or impermanent. (Aruan A. 2019).

Air humidity in a closed space can be regulated according to wishes. This air humidity regulation is based on the principle of equal water potential between air and a solution or certain solid materials. (Putri M, et al. 2017). The high and low humidity of the air in a place really depends on several factors as follows (Soewarno, 1991): Temperature, Air pressure, Wind movement, Quantity and quality of radiation, Vegetation etc, Availability of water in a place (water, land, waters).

Arduino Uno

Arduino is an open source physical computing platform with a combination of hardware, programming language, and an Integrated Development Environment (IDE) software that functions to write programs, compile programs, and upload programs into microcontroller memory.

Arduino means a single-board microcontroller designed to facilitate electronic use and has an open-source nature ((Hurisantri, 2013). Arduino is not only a development tool, but it is a combination tool of hardware, programming language, and also A very sophisticated Integrated Development Environment (inspiration) (Djuandi, 2011).

Arduino can provide convenience because it is an open source tool for both hardware and software, and we don't have to bother with a minimum set of systems and programmers because this is all built in on one board, making it easier for us to focus on sharing systems. Arduino also has several board options, for example: Nano Series, Uno, Mega, Yun Micro, Pro Mini, and others. This type of Arduino is generally differentiated according to the storage memory, the number of inputs/outputs, or the services that will be embedded in the Arduino, all you have to do is change it according to the project you are working on.

Sensor DHT 11

DHT11 is a sensor that can measure two environmental parameters at once, namely temperature and humidity. In this sensor there is an NTC (Negative Temperature Coefficient) type

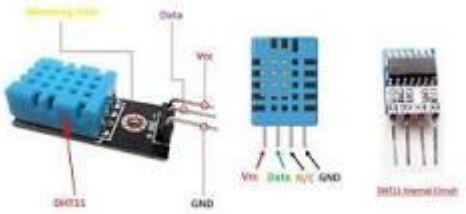
thermistor to measure temperature, a resistive type humidity sensor and an 8-bit microcontroller which processes the two sensors and sends the results to the output pin in single-wire bi-directional format (single cable). two-way) (Ajie. 2016).

Each DHT 11 sensor features highly accurate calibration of the humidity of the calibration chamber. Calibration coefficients are stored in the OTP program memory, internal sensors detect signals in the process, we should call them calibration coefficients. Single-cable serial interface system integrated to be fast and easy. Small size, low power, signal transmission distance up to 20 meters, resulting in a wide range of applications and even the most demanding applications. . Before we work with the DHT 11 sensor, it's a good idea to first know the specifications so that we don't misprocess the measurement results. On the market there are two types of DHT 11 which generally come in the form of modules, namely DHT 11 with 3 pins and DHT 11 with 4 pins. Both are the same, because in the DHT 11 module which has 4 legs (pin) there is one pin module that is not used, namely on leg 3. The following is the function/configuration of these pins (Aruan A. 2019.): Pin 1: Vcc 3 -5.5 V DC Pin 2: Data/serial data (single bus) Pin 3: NC (not used) Pin 4: Ground (GND).

TOOLS AND MATERIALS

1. Arduino Uno

2. Sensor DHT11

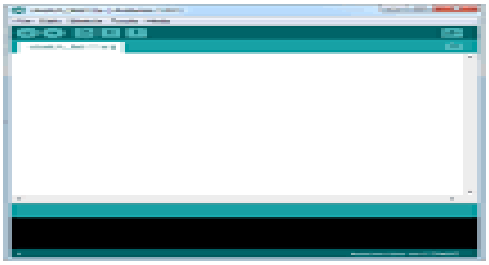


3. Jumper Cables

4. USB Uploader

5. Laptop / PC

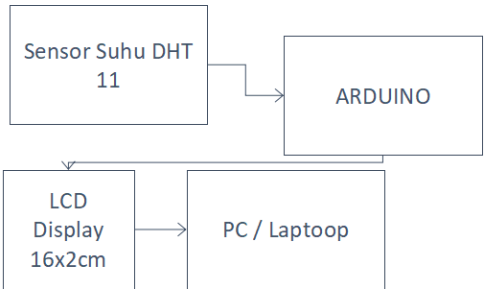
6. Aplication of Arduino IDE



7. LCD Screen

EXPERIMENT PROCEDURE

At this stage, a design is carried out in the form of a layout based on the supporting components of the system to be built. This design consists of a temperature sensor, Arduino module, LCD and PC or laptop. The process of designing a temperature measuring device can be seen in Figure 2.



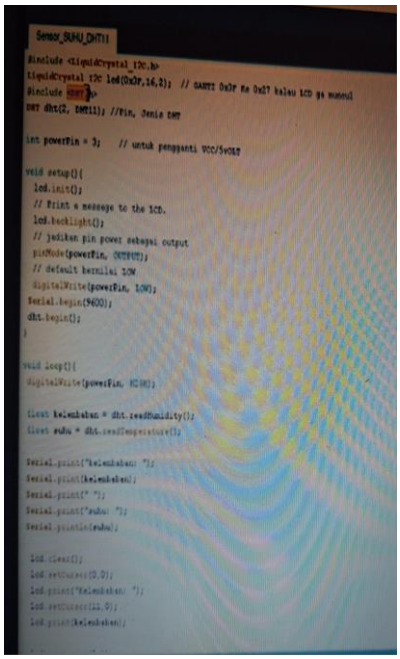
Picture 2. Blok Diagram Alat Ukur Suhu Ruangan

Image description and steps:

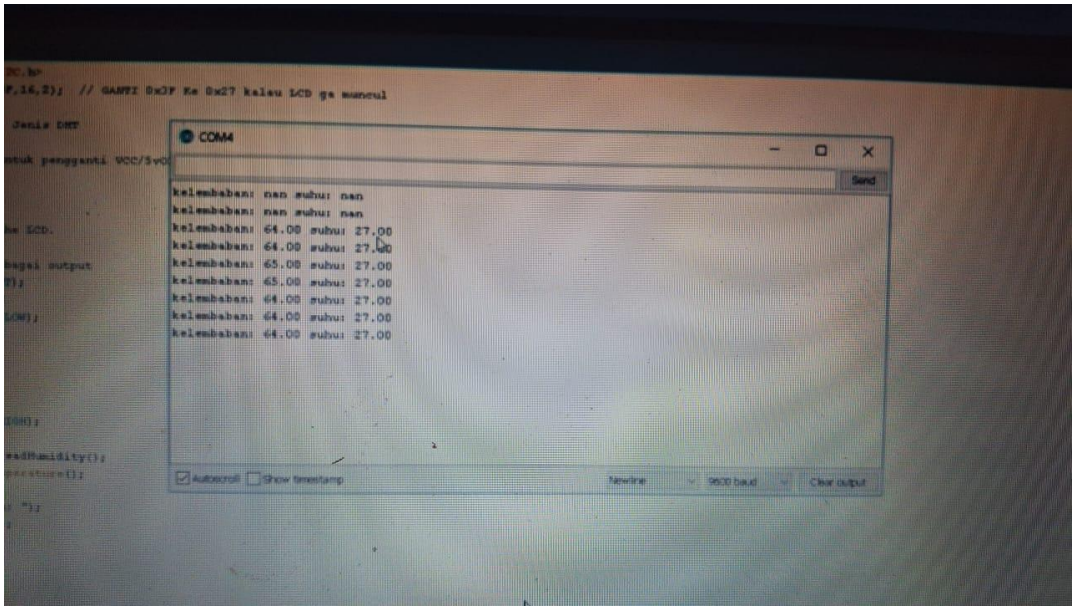
1. Make a circuit like the picture.
2. Start connecting the jumper cables to the Arduino by:
    a. GND LCD to Arduino
    b. VCC LCD to Arduino
    c. SDA LCD to Pin A4 Arduino
    d. SCL LCD to Pin A5 Arduino
3. Next connect:
    a. VCC Sensor to PIN 3 Arduino
    b. DATA Sensor to PIN 2 Arduino
    c. GND Sensor to GND Arduino
4. Make sure everything is installed properly and download the Arduino IDE application
5. Connect the Arduino to the laptop and start the Arduino program.
6. Enter the following program on Arduino

```
#include <DHT.h>
DHT dht(2, DHT11); //Pin, Jenis DHT

void setup()
{
Serial.begin (9600) ;
dht.begin();
}  void loop(){
float kelembaban = dht.readHumidity();
float suhu = dht.readTemperature ();
Serial.print("kelembaban: ");
Serial.print (kelembaban) ;
Serial.print(" "); Serial.print("suhu: ");
Serial.println(suhu); delay(1000); }
```



7. Open the serial monitor in the Arduino IDE.
8. Record the temperature and humidity that appear on the monitor as well as the output voltage.



9. Sensors on room conditions
10. Light a match for 3 seconds at a distance of 5 cm from the sensor.
11. Record the temperature and humidity that appears on the monitor as well as the sensor output voltage.
12. Repeat the experiment with matchstick distances of 10 cm and 15 cm.

OBSERVATION DATA

Temperature and Humidity Data is in Normal Condition

Humidity (Rh)	Temperatur (C)
80	29,30

80	29,30
80	29,30

Temperature and Humidity Data with a Match at a Distance of 5 cm

Humidity (Rh)	Temperatur (C)
78	31,30
78	31,30
78	31,30

Temperature and Humidity Data with a Match at a Distance of 5 cm

Humidity (Rh)	Temperatur (C)
75	32,20
75	32,20
75	32,20

RESULTS AND DISCUSSION

Conclusion

In this practicum, it is about instrumentation of room temperature and humidity with Arduino using a DHT 11 sensor. Based on function tests on the tool and can be monitored via LCD and Laptop/PC. The components used are the DHT11 sensor, Arduino Uno, jumper cables and others. The data taken in this practicum was 3 data. This test also produces output, namely DHT 11 and a laptop to display the output results via the Arduino module. Sensor output is displayed in real time. To display the temperature in this Arduino sketch, you can open it in the Arduino IDE application.

Suggestion

In future research, it is recommended to carry out stability tests and pairing tests with Bluetooth to make it easier to check room temperature and room humidity. Making the series easier to use with packaging that is more economical and looks attractive.

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