

Design And Design Of A Temperature And Humidity Monitoring System For Broiler Chicken Cages Based Internet Of Things (IOT)

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ABSTRACT

In this research, we designed a tool that is used to help chicken farmers to continue their daily activities in raising livestock. Problems often experienced by chicken farmers are frequent theft, and having to check the temperature manually in the coop. So a Security and Temperature Monitoring and Light Control System for Broiler Chicken Cages Based on Internet of Things (IoT) was created using NodeMcu Esp32 as the controller of the entire system. The tools used in this system are, Buzzer, DHT22, LCD 16x2, ESP32, Breadboard, Relay, and Incandescent Lamp. The tool making method uses engineering design methods in making the automation system. The test results show that the system that has been made is able to maintain the temperature in the chicken coop in accordance with the ideal conditions for Broiler chickens.

INTRODUCTION

Livestock farming is a business that is growing very rapidly and has quite high demand, especially for raising poultry such as broiler chickens. Poultry farming includes all processes of raising poultry for food purposes, namely broiler chickens. Chicken production around the world has witnessed massive growth over the last 50 years to meet the current demand of consumers around the world. In fact, poultry has come to dominate meat consumption in the United States, the EU, and some other large countries. And chicken has become the most popular animal food consumed by society today (Hadyanto, Try, and Muhammad Faishol Amrullah. (2022). The cultivation of purebred chickens, especially broiler chickens as broiler chickens, experiences ups and downs, especially in partnership businesses. This is caused by several things, including erratic price fluctuations. The superiority of animal protein means that the livestock industry or business has great potential to develop, because Indonesian people's low meat consumption can still be increased.

The role of broiler (broiler) chickens is very important in fulfilling the community's need for meat as a nutritious food ingredient, this is because the population of these chickens is quite large and they are kept in almost all corners of the country Ningrum, N. K., Kusuma, T. W., Mulyono, I. U. W., Susanto, A., & Kusumawati, Y. (2023).

The farmer's business is a side business. This is because breeders generally only keep livestock in relatively small numbers. This condition will affect the farmer's income level. Income is the profit from farming in one year's business which is for the owner, wages, management and own capital used for the business ARTIYASA, Marina, et al (2016).

LITERATURE REVIEW

Based on several journals that have been read and used as references in making this report, in this final project we will design how to see the temperature and humidity conditions in the chick coop without having to monitor it directly, so that we can understand how to connect and function of each device in the chicken coop. inside. designing the installation.

Based on this research, the author wants to create and develop a Final Project based on the Internet of Things which can be used as a medium for making tools that include several components that will be used later. Therefore, the title of this final assignment is "Design of a Temperature and Humidity Monitoring System in Broiler Chicken Cages Based on Internet of Things", it is hoped that this final assignment can be used. as a learning medium for other students and can fulfill the competencies of Padang State Polytechnic Telecommunication Engineering students related to the field of Tool Making.

METHOD

The process stages that will be carried out in this research can be depicted in the following diagram :



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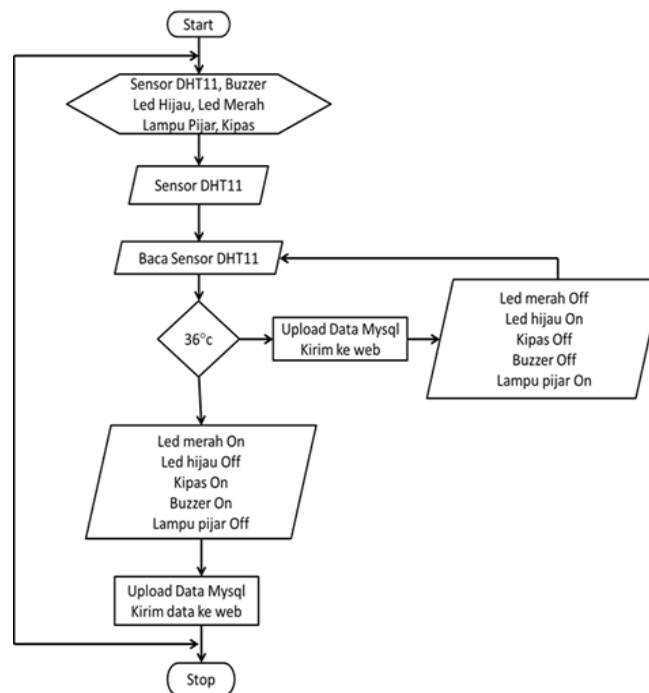


Figure 1. Design Flow

Before making the Final Project, the first step is to prepare several components that will be used later, such as the dht11 sensor, buzzer, green LED, red LED, incandescent lamp and fan. At this stage, a search is carried out on journals, theses or Final Assignments related to the title that will be appointed. Next, after several components have been prepared, the data is read using the DHT11 sensor. and after that start reading the dht11 sensor. Then, after the data is read by the dht11 sensor, several components turn on and off. then after several components are interconnected, the data will be uploaded via the web so that it can be monitored. After that, the data that appears on the web will provide information if the temperature is above 36 degrees Celsius then the buzzer will sound, indicating that the temperature is changing or increasing. , then the fan will turn on and the incandescent lamp will turn off and the red LED will turn on and the green LED will turn off. After testing the design that has been carried out, we have reached the final stage. and the data is ready to be monitored.

RESULT

In the design of the tool making that has been carried out, several data are obtained which will later contain various information according to the components that have been used previously.

Temperature test results on the dht11 sensor

It can be seen in table 1, namely the results of temperature testing on the Dht11 sensor :

Table 1. Temperature test results on the dht11 sensor

Thermometer Temperature (°C)	DHT11 Temperature (°C)	DHT11 output (mV)	Error	Percentage Error (%)
30.2	30.0	300	2	0.66
32.0	32.0	320	0	0
34.4	34.0	340	4	1.16
36.3	36.0	360	3	0.82
38.4	38.0	380	4	1.04
40.5	40.0	400	5	1.23
41.4	41.8	418	4	0.94
44.3	44.3	443	3	0.67
Average error				0.79

Humidity test results on the Dht11 sensor

It can be seen in table 2, namely the results of humidity testing on the Dht11 sensor:



Table 2. Humidity test results on the Dht11 sensor

Humidity Thermometer (°C)	DHT11 Humidity (°C)	DHT11 output (mV)	Error	Percentage Error (%)
30.2	30.0	300	2	0.66
31.0	31.0	310	0	0
33.4	33.0	330	4	0.12
34.3	34.0	340	3	0.88
35.4	35.0	350	4	1.11
39.5	39.0	390	5	1.23
40.4	40.8	408	4	0.12
42.3	42.3	423	3	0.70
Average error				4.82

Test results on the relay sensor

It can be seen in table 3, namely the test results on the Relay sensor:

Table 3. Test results on the relay sensor

Relay Condition	TP 1 (Volts)	TP 2 (Volts)	TP 31 (Volts)	Driver Transistor Condition	Load Condition
Close	3,3	0,7	0	Saturation	ON
Open	0	0	5	Cut-off	OFF

Test results on the buzzer sensor

It can be seen in table 4, namely the test results on the Buzzer:

Table 4. Test results on the buzzer sensor

Buzzer Condition	Read Voltage (Volt)	Logic
OFF	0	0
ON	3,3	1

Test results on the Led sensor

Can be seen in table 5, namely the test results on the LED:

Table 5. Test results on the Led sensor

LED	Read Voltage (Volt)	Logic
Red	3,3	1
Green	3,3	1

DISCUSSION

Discussion of Temperature and Humidity

Testing on the DHT11 sensor module uses temperature and humidity detection methods. The readings from the DHT11 sensor are temperature and humidity in degrees Celsius. The values produced from sensor readings are in the form of increases and decreases in temperature conditions in the chicken coop. The test is carried out by providing a voltage of 5 Volts from the microcontroller used. From this test it will be known whether the module used is correct or not. From the DHT11 sensor test in table 4.1, there is an error which is defined as the difference in the comparison of the DHT11 sensor output voltage reading with the voltage that should be obtained using the formula. Based on the DHT11 sensor datasheet, in the information above there is a linear calibrated sensor output which is worth 10 mV/ °C, the temperature at table above with a value of 30 multiplied by 10 mV produces an output voltage of $30 \times 10\text{mV} = 300\text{ mV}$, the result From the thermometer information, it is 30.2 mV, so we get a difference of 0.2 mV so that number 2 in the table column above is a description of the error in the component I tested. In the table above, there is a description of the errors in the program that we observed and the value obtained is 0.66, namely the percentage of errors in the program. The test results on the output voltage value of the DHT11 temperature sensor in the circuit still have differences with the voltage value which corresponds to the characteristics in the datasheet, the difference in output voltage is 2 mV to 8 mV. The difference in temperature readings between the thermometer and DHT11 can be caused by the accuracy of the reading on the measuring instrument.

Discussion on Sensor Relay

In the relay driver circuit above, it can be seen that TP1 is connected directly to the driver circuit. When the

Arduino provides logic high, the measured voltage on TP1 is 3.3 VDC. Meanwhile, when the logic is low, the measured voltage is 0V. TP2 is the base of the transistor. When the Arduino provides logic high, the measured voltage on TP2 is 0.7 V. Meanwhile, when the Arduino provides logic low, the measured voltage is 0 V. TP2 is the VBE of the transistor, where at saturation the VBE voltage is 0.7 V.

TP3 is the collector leg of the transistor. When the Arduino's VCC provides a logic high, the measured voltage on TP3 is 3.3 V. This condition is a saturation condition where current flows from the collector to the emitter. When the Arduino provides logic low, the measured voltage is 0 VDC, this condition is a cut-off condition where current does not flow from the collector to the emitter.

Discussion on Sensor Buzzer

In the buzzer circuit above, the results of the buzzer circuit measurement points can be seen so that from the measurement results above the buzzer will be active when given high logic (1), and the voltage on the buzzer when active is 5 V.

Discussion on Sensor Led

In the LED circuit above, the results of the LED circuit measurement points can be seen so that from the measurement results above, the LED will be active when given high logic (1), and the voltage on the LED when it is active is 3.3 V.

CONCLUSION

This final assignment is about making a tool which can be used as an illustration for telecommunications engineering students who can learn about the various uses and functions of using several electronic components related to system programming, so that the following conclusions are obtained:

1. In this design, we designed an efficient and accurate Temperature and Humidity Monitoring System for broiler chicken cages. This can be done by including several components used, such as the use of temperature and humidity sensors and the use of other components, namely Esp32, which functions to send data to a web server and allows the use of smartphone applications for monitoring. As an example of the results of component or sensor testing that I tried, namely: in the previous description, the linear calibrated sensor output has a value of 10 mV/ °C, the temperature in the table above with a value of 30 which is multiplied by 10 mV produces an output voltage of $30 \times 10\text{mV} = 300 \text{ mV}$, the results thermometer information is 30.2 mV so that a difference of 0.2 mV is obtained. So number 2 in the table column above is a description of the error in the component I tested.
2. This time the design was focused more on monitoring the temperature and humidity in the broiler chick cage. which uses temperature and humidity sensors and Internet of Things (IOT) technology to transmit data, so that the data obtained is more accurate and also more detailed. In this design, the Internet of Things (IOT) system is related to a component. Namely the Raspberry Pi which can be used as a web server to access website hosting, whether based on HTML, PHP or MySQL.

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