Design an Automatic Condenser in Swallow Bird House

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Abstract

This design is a system development carried out by swallow breeders in stabilizing the temperature and humidity of swallow houses. This design uses the principles *of the Internet of Things* (IoT), which will monitor temperature and humidity through internet media. This design aims to make a temperature and humidity control system in the swallow house automatically and find out the level of accuracy of temperature and humidity readings in the design made. This design uses a Wemos D1 Mini Board microcontroller that controls components such as DHT22 sensors, DS18B20 sensors and relays. The result of this design can control the condenser automatically, when the temperature and humidity are above the standard temperature, it will turn on the condenser automatically.

***Keywords: Internet of Things,* Wemos D1 Mini Board, Sensor DHT22, Sensor DS18B20, Relay**

I. INTRODUCTION

Swallows *(Collocalia Vestita)* are birds that live in humid tropical climates whose habitat is in caves or in rooms that are quite humid and dark. Swallows produce nests, where the swallow's nest comes from the bird's saliva, and the nest is of high selling value because it is beneficial for health and cosmetic ingredients. Because of the high selling value, this swallow's nest business has developed into a source of livelihood and export value. To cultivate swallows, rooms are made in buildings or houses that are conditioned to resemble the characteristics of caves that are usually inhabited or become habitats by swallows.

Every swallow breeder must know correctly the ins and outs of swallows and make buildings strive according to the needs of swallows so that failure factors in cultivation can be avoided. Controlling the swallow house is very important to increase breeding productivity. To make swallows happy to live in buildings, it is necessary to strive for temperature and humidity regulation similar to natural caves. Generally, the temperature of the cave that is the residence or habitat of swallows ranges from 26ºC-29ºC with humidity of 80-90%. The temperature and humidity should be stable at all times in *that* range.

A swallow house that has ideal temperature and humidity conditions will produce a perfect nest shape and will certainly have high economic value. However if the temperature is not optimal (≥29 °C) or humidity is outside *Range* 80-90% will cause the shape of the nest to be imperfect because swallow saliva dries quickly so that the nest is easily broken.[1]

II. LITERATURE REVIEW

A. Wemos D1 Mini Board

The Wemos D1 module was created as a solution to the high cost of a microcontroller-based wireless module. With this Wemos microcontroller, the costs incurred to create a project-based *IoT (Internet Of Things)* So less, what's more, this Wemos can run the bait code system without using Arduino as its microcontroller. The advantage of using the Wemos module is that it can be programmed using the Arduino IDE with a library program syntax that is widely available on the internet and pin outs that are compatible with Arduino Uno so that it is easy to connect with other Arduino shields and has a very large memory of 4MB. Wemos is also compatible with several other programming languages such as Pyhton and Lua, making it easier to upload programs into Wemos if a programmer is not too familiar with how to program using the Arduino IDE. The small shape of the board and the economical price make it easier for many developers to implement a device or project *IoT* into Wemos which will be controlled or monitored using a smartphone or PC online and realtime. In terms of performance and specifications, the Wemos D1 mini is better when compared to Arduino because the speed of the controller is newer and higher plus it has been integrated with Wifi connection so that it can update Software via On the Air. [2]

B. StepDown LM 2596 DC-DC

StepDown LM2596 DC-DC is a voltage lowering converter that converts DC input voltage into DC voltage.[3]

C. Sensor Suhu DS18B20

Understanding sensors in general is a tool used to detect and measure the magnitude of something. Sensor can be defined as a type of transducer used to convert mechanical, magnetic, heat, light and chemical variations into voltage and electric current. Sensors can be divided into 2 types, namely:

a. Sensor Physics
   Physical sensors detect a quantity based on the laws of physics. Examples of physics sensors are light sensors, sound sensors, speed sensors, and temperature sensors.
b. Sensor Kimia
   Chemical sensors detect the amount of a chemical substance by converting chemical quantities into electrical quantities. It usually involves some chemical reaction. Examples of chemical sensors are pH sensors and gas sensors. The temperature sensor DS18B20 serves to convert the amount of heat captured into the amount of voltage. The type of temperature sensor used in this system is IC DS18B20, this sensor has high precision. This sensor is very simple by having only 3 feet of fruit. The first leg of the IC DS18B20 connected to a power source, the second leg as output and the leg when connected to the graund.[4]

D. Sensor DHT22

The DHT22 or AM2302 sensor module is a temperature and humidity sensor that has an output in the form of a digital signal with conversion and calculation performed by an integrated 8-bit MCU. This sensor is almost the same as the DHT11 also has four legs. The legs of DHT22 can be seen in the following figure.

Figure 1. Sensor DHT22

In Figure 1, shows the four legs of the DHT22 sensor namely Vs, Data, NC and *Ground*. The source voltage is connected to the Vs leg where the source voltage used is generally 5V because it follows the working voltage of the microcontroller, which is 5V as well. Then the data foot is connected to a microcontroller which is used to take temperature and humidity data that has been measured.[5]

a. Mod Relay

A relay is an electrically operated switch and consists of two main parts, namely electromagnetic (coil) and mechanical (a set of switches). Relays use the electromagnetic principle to drive the contact switch so that with a small electric current (low power) it can conduct higher voltage power. For example, with a relay that uses 5V and 50 mA electromagnetics, it is able to drive the armature relay to conduct 220V and 2A electricity.[6]

III. RESEARCH METHODS

The first step taken is to make a block diagram that aims to be a reference in making tools. Figures 2 and 3 show a block diagram of an automatic condenser device. In figures 2 and 3 is a block diagram created as a reference for making devices. In designing this tool, the author designs a system in blocks as an illustration to make it easier for the author to assemble it into a circuit that will later function as it should.

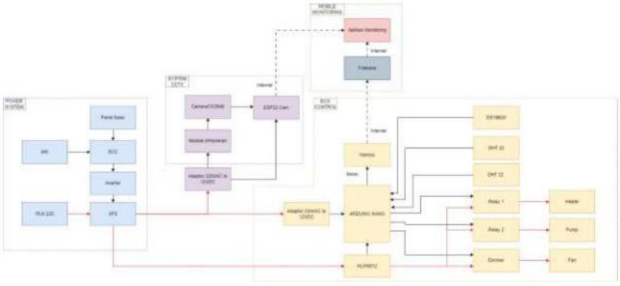


Figure 2. Hardware Block Diagram

In figure 2, it is noted that after getting a voltage source of 5V all components will start to turn on and an initialization process will occur, namely preparation for the operation of each component. The DHT22 sensor will read the temperature and humidity values which will then control the ON/OFF automatically on the condenser and will display the temperature and humidity readings of air and water in the Blynk application.

IV. RESULTS AND DISCUSSION

Automatic condensing device testing in this swallow house aims to maintain temperature values in the *range of* 27°C-29°C and humidity 80-90%. Where this automatic condensation tool is tested for 1x24 hours with a room area of 7x14 meters, which is in Sengkang City.

Based on the results of data testing for 1 day with a time of 3.5 hours, starting at 10.00-13.30 WITA. This test was conducted using 200 WP solar panels. The measurement results are shown in the description of table 1

Table 1. Measurement results dated September 12, 2023

No	Time	*Output Panel Surya*			Battery Charging			Light Intensity (LUX)	Information
		Voltage DC (V)	Current DC (A)	Power DC (W)	Voltage DC (V)	Curren DC (A)	Power DC (W)		
1	10.00	12,54	3,22	40,37	12,32	3,82	47,06	3243	Bright
2	10.30	12,55	5,65	70,90	12,34	3,89	48,00	3918	Bright
3	11.00	12,67	4,85	58,02	12,44	4,83	60,08	4702	Bright
4	11.30	12,72	4,99	63,47	12,49	4,81	60,07	5142	Bright
5	12.00	12,77	4,38	55,93	12,54	4,40	55,17	4497	Bright
6	12.30	12,85	4,60	59,11	12,63	5,94	75,02	1595	Bright
7	13.00	12,91	6,76	87,27	12,68	3,73	47,29	6308	Bright
8	13.30	13,04	6,07	79,15	12,67	5,04	63,85	5567	Bright

Table 2.Application Test Results

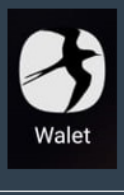
Testing Activities	Test Result	Conclusion	Documentation
Splash screen	Displaying the title of the thesis cover page in the Android application functions as shown expected	[x] Succeed [ ] Fail	
Login	You can log in by pressing the enter button	[x] Succeed [ ] Fail	
Main Screen	Can display monitoring results.	[x] Succeed [ ] Fail	

Table 3. DHT22 Sensor Test Results

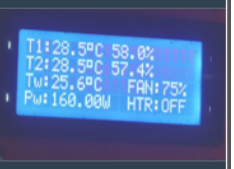
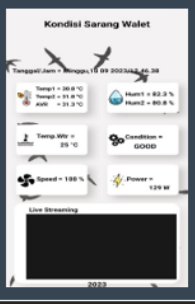
Testing Activities	Test Result	Conclusion	Documentation
Reading water temperature data	The DS18B20 sensor can read temperature varibles as desired	[x] Succeed [ ] Fail	
Sending data to the application	Data from sensors DS18B20 can sent to the application as expected	[x] Succeed [ ] Fail	

Table 4. HLW 8012 Sensor Test Results

Testing Activities	Test Result	Conclusion	Documentation
Power data reading	The HLW8012 sensor can read power varibles	[x] Succeed [ ] Fail	
Sending data to the application	Data from can sent to the application as expected	[x] Succeed [ ] Fail	

V.CONCLUSION

Based on the results of the design that has been made, it can be concluded that:

1. Automatic condenser made to maintain the temperature and humidity of the swallow house to match the temperature and humidity of natural caves ranging from 27ºC-29ºC which can be monitored remotely using the application.
2. Android apps can monitor temperature, humidity and condensation in real-time. Making it easier for swallow cultivators to find out the condition of swallows and can see the condition of the swallow house with CCTV.
3. The automatic condenser uses 2 power sources, namely from PLN and also from PLTS. The PLN source is the main source of this tool which is backed up by PLTS when there is a disturbance and the ATS system functions as an automatic switch that will move the source from PLN to PLTS automatically.

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