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# Design of Monitoring of Egg Incubator Machine Based on Internet of Things with ESP8266 and Web Server

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***Abstract* — In general, egg incubator technology still uses simple equipment made of wooden boxes filled with chaff and sand, then the eggs to be hatched are placed in it using a manually controlled electric or oil lamp.**

**This research will design an egg incubator that can be controlled by a web server. The tool built is a temperature and humidity detector on the egg incubator that utilizes the Internet Of Things technology.**

**The final result of the egg incubator monitoring system that utilizes the DHT-22 temperature sensor and the NodeMcu ESP8266 microcontroller has been successfully built at 370C-380C and Humidity 40% -53%. This egg hatching monitoring system can be controlled by a Web Server that is connected to the internet network on Web Server Ubidots using remote smartphones in real-time.**

***Index Terms* — incubator, internet of things Microcontroller ESP8266, DHT22, Webserver Ubidots.**

## I. INTRODUCTION

The development of internet technology now causes jobs that used to be human or manually automated with modern equipment that automatically uses the Internet of Things to provide services to the community, for example in agriculture such as temperature and humidity control systems in agriculture [1]–[3], in the field of using RFID [4]–[6], in the field of health [7], and in the field of chicken farming one of them is the egg incubator temperature control system [8].

In general, the egg incubator is still using simple equipment and a manual control system, this problem can be overcome by using the control of the development of internet technology in the development of the Internet of Things.

The Internet of things is a global infrastructure for the information society, enabling sophisticated services, by connecting things both physically and virtually based on the current information exchange technology and its development and temperature communication technology automatically on egg hatchers. This egg hatching system is based on IoT (Internet of Things) with the NodeMcu ESP8266 microcontroller.

Internet of Things series can control temperature and humidity with the DHT-22 sensor module, using a microcontroller. used type ESP8266. The microcontroller serves to regulate temperature and humidity on the DHT-22 sensor which will be displayed on a Web server so that it can monitor with the Internet of Things. which means it can be controlled or monitored remotely through existing networks and can be accessed through the Ubidots Web server.

## II. DESIGN SYSTEM

The system used in this egg hatching is as follows:

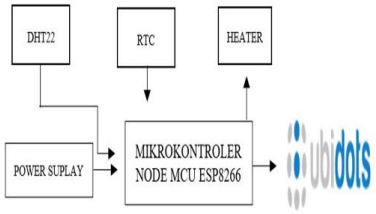


Figure 1. Block diagram system

circuit with block diagram in Figure 1 Where changes in temperature and humidity values in the egg incubator incubator machine will be detected by the DHT-22 sensor, the value will be an input signal on the NodeMcu ESP8266 Microcontroller as the main controller. The signal that will be generated from changing conditions that will read the temperature and humidity if it is to be delivered via wifi to the internet is then released in the form of data displayed on Udibots web server. If it has arrived, the Microcontroller will directly regulate the life of the Heater, Set the Temperature and humidity in the room of this egg hatching incubator machine that is directly connected to electricity.

Overall the temperature and humidity monitoring system on the egg incubator machine with a Web server are:

1. Input Section
   The input section consists of a DHT-22 sensor that reads the changes in temperature and humidity in the hatched egg incubator machine and the value to be read will be sent to the Ubidots Web Server.
2. Process Section
   In this section, the temperature and humidity that has been read by the DHT-22 sensor, the value is processed by the NodeMcu ESP8266 Microcontroller to partially input data. This NodeMcu ESP8266 microcontroller functions as a heater controller, Exsaust fan heater and cooling fan to stabilize temperature and humidity, and the RTC command sends data to command the servo motor to move the egg rack and display time. Temperature,

humidity and time in real time processed by NodeMcu ESP8266 Microcontroller to be delivered via wifi to the internet are then released in the form of data displayed on Udibots web server.

3. Output section
   The output part of the Monitoring system is the temperature (0C) and humidity (%) generated by the DHT-22 sensor which is delivered via wifi to the internet and then released in the form of data displayed on Udibots web server.

## III. HARDWARE DESIGN

The design of this hardware is assembled like other egg incubators which are in the shape of a box and the side is a component tool.

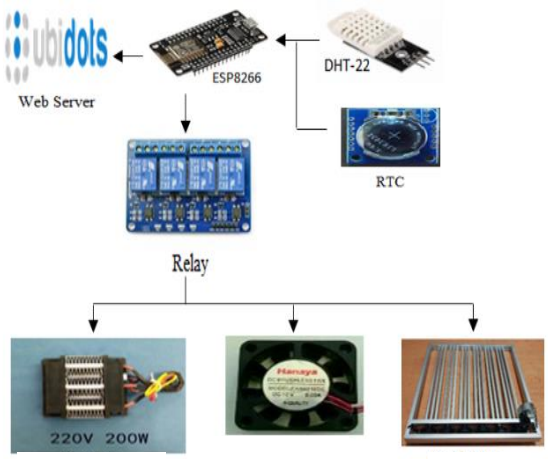


Figure 2. Design an egg stage incubator machine system


Figure 3. Incubator Machine

In Figure 3 is a hatching egg incubator machine in which the incubator is made of aluminum measuring 75x50cm and where in the incubator machine consists of the following:

1. Heater (Heater)
2. DHT-22 sensor
3. Egg Shelves
4. Heating Fan
5. Input Cooling Fan
6. Output Cooling Fan
7. door.

## III. DESIGN SOFTWARE

Arduino Integrate Development Environtment (IDE) used for tool pemogramming NodeMCU ESP82666 and Ubidots is platform for IoT for information data send from NodeMCU ESP8266.


Figure 4. Temperature and humidity analysis on a Web server

Table 1 Temperature and Humidity Analysis on the incubator machine

| Day Date and Time | temperature | Humidity |
|---|---|---|
| Monday, May 21, 2018. 22.30 - 23.15 | $32^0$C-$38^0$C | 44%-58% |
| Tuesday, May 22, 2018. 06.00 - 18.00 | $30^0$C-$38^0$C | 41%-68% |
| Friday, May 25, 2018 21.00 - 00:00 | $37^0$C-$38^0$C | 43%-48% |
| Saturday, May 26, 2018 08.00 - 14.00 | $37^0$C-$38^0$C | 44%-50% |

Table 1 inform time and temperature data. the temperature on May 21,22 2018 the temperature is still not stable. On May 25 2018 until the temperature is stable at $37^0$C-$38^0$C.

## IV. EXPERIMENT TEST

Based on the research conducted on May 15, 2018 until May 30, 2018. try to incubate as many as 6 chicken eggs Chicken eggs that will be hatched on the incubator machine.

Figure 5. Eggs in the Incubator machine

Table 2. Egg Hatching Test Results

| Incubator Machine | | information |
|---|---|---|
| Egg Hatch | Egg failed Hatch | Hatching eggs within 16 days |
| 2 | 4 | |

## V. CONCLUSION

Based on the results of the research that has been done, some conclusions are obtained, namely:

1. Node Mcu Microcontroller ESP8266 plays a role as a microcontroller as well as a wifi module to transmit sensor data and the status of ongoing components in realtime through Udibots Web Server.
2. This system can measure the temperature and humidity in the incubator with a temperature that can be maintained is $37^0$C -$38^0$C and humidity addresses 40% -53%.
3. To run Monitoring on the Web server Ubidots must first have an email and be able to log in. In order to be able to enter the Udibots Web server.

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