

IMPLEMENTATION OF LIGHT CONTROL SYSTEM IN CHICKEN EGG INCUBATOR USING DHT 11 SENSOR AND ARDUINO UNO R3

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Abstract— This research develops a prototype of a lamp setting system in a chicken incubator using DHT11 and Arduino UnoR3 sensors. The purpose of this system is to control the temperature and humidity inside the incubator automatically to create optimal conditions for hatching chicken eggs. The DHT11 sensor serves to measure temperature and humidity, while the Arduino Uno R3 is used as a microcontroller that processes data and regulates the heating lamp. This system works by comparing the sensor measurement results with a set point value. If the temperature or humidity is outside the desired limits, the Arduino will turn the heating light on or off to return the ambient conditions to the optimal range. Tests show that this system is effective in maintaining the appropriate temperature and humidity, thus increasing the success rate of hatching chicken eggs. The results of this study show that the prototype developed can be a practical and efficient solution for the process of hatching chicken eggs

Keywords: Chicken egg incubator, DHT 11 sensor, Arduino Uno R3

I. INTRODUCTION

One application of technology in the field of livestock farming is the use of egg incubators, commonly known as egg hatchers. Incubation is a method used to process the development of an embryo inside a fertilized egg until it hatches, which is traditionally done by the mother hen. The growing demand for meat and eggs could pose a problem if farmers are unable to meet market demands. In natural conditions, a hen can only incubate around 10 to 12 eggs at a time. Therefore, egg incubators are utilized to help farmers increase productivity and hatchability rates, making the hatching process more efficient and higher in volume. With the use of these devices, the time that the hen would normally

spend incubating eggs can be redirected toward preparing to lay more eggs. Egg incubators are available in various prices and capacities. The mechanism of these incubators is to warm the eggs in a way that mimics the natural incubation process, ensuring successful hatching. To

automatically maintain the desired temperature within the incubator, a thermostat is typically used.

This research aims to develop an automated incubator that controls internal environmental parameters and processes for maturity detection to produce high-quality eggs for the balut and penoy production markets.

II. METHODS

The research begins with a literature review, which involves searching for, collecting, and reading materials from various research sources related to the problem at hand. This initial stage makes the research process easier by providing references for the design of the Chicken Egg Incubator using temperature, humidity, and motion sensors.

After reviewing the literature, the next step is to build the device. The necessary components include a microcontroller, temperature and humidity sensors, motion sensors, an LCD screen, navigation buttons, relays, and heating lamps. A Printed Circuit Board (PCB) and jumper wires are used to connect these components. Once the device is assembled, it undergoes testing to assess its functionality. If the device does not perform as expected, adjustments will be made. If successful, the research proceeds to the next stage.

In the final stage, the test results are analyzed to determine whether the device functions correctly. Conclusions are then drawn, and suggestions are provided for future improvements or developments. This tool is expected to help poultry farmers monitor the incubator's conditions remotely. System design is needed to facilitate the manufacture of this tool. The system contains component parts that have their respective roles. For more details, see Figure 3.2 below.

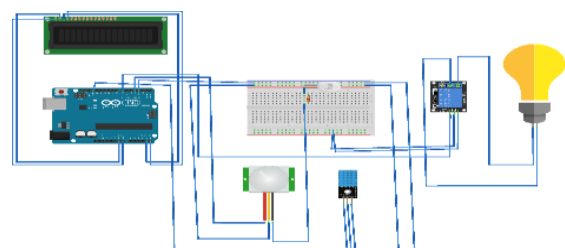


Figure 1 Component Product Design

PIR sensor is used to detect the movement of hatching eggs. Readings from both sensors From the microcontroller, the temperature and humidity values will be forwarded to the i2c LCD to be displayed. In order to be connected to the temperature, humidity and motion sensors. In addition to temperature, humidity and motion, through notifications regarding information on the detection of movement of hatched eggs and warnings of humidity conditions that are too high or too low from the setpoint so that we can add water in the incubator as a humidity maintainer so that it remains ideal. Meanwhile, to maintain the ideal temperature, the incubator will turn on the heater in the form of a light bulb when the temperature in the incubator is less than or equal to the lower temperature setpoint.



Figure 2 Egg Incubator Design

III. RESULTS & DISCUSSION

The researcher will discuss the results of the data on the Design of a Chicken Egg Incubator Using Temperature, Humidity and Motion Sensors with the Assistance of a Camera made by the researcher. There are sub-chapter that will be discussed by the researcher in this chapter, namely: Results and product evaluation, presentation, data, and discussion.

The results and product evaluation aim to determine whether the product can be used or whether there are still improvements that need to be made so that the presentation of data and results in this tool can be carried out optimally. Component used :



Figure 3 inside of incubator

- Arduino Uno R3
- Breadboard
- DHT 11 sensor
- Pir hc-sr501 sensor
- Led
- Relay
- 1k resistor
- Jumper cable
- Lcd i2c 1602
- Light bulb

Testing of heat and humidity temperature, basically this test is carried out to find out the results of the heat and humidity temperature in the incubator.

| No | Suhu panas | Suhu kelembaban |
|------------|------------|-----------------|
| Hari ke 1 | 36.1 | 33.9% |
| Hari ke 2 | 35.6 | 44.4% |
| Hari ke 3 | 30.7 | 49.3% |
| Hari ke 4 | 36.5 | 33.5% |
| Hari ke 5 | 39.3 | 30.7% |
| Hari ke 6 | 34.5 | 45.5% |
| Hari ke 7 | 33.0 | 37.0% |
| Hari ke 8 | 32.9 | 37.1% |
| Hari ke 9 | 35.2 | 44.8% |
| Hari ke 10 | 33.5 | 36.5% |
| Hari ke 11 | 38.1 | 41.4% |
| Hari ke 12 | 36.7 | 33.3% |
| Hari ke 13 | 38.6 | 31.4% |
| Hari ke 14 | 31.5 | 38.5% |
| Hari ke 15 | 32.9 | 47.1% |
| Hari ke 16 | 36.8 | 33.2% |
| Hari ke 17 | 30.9 | 39.1% |
| Hari ke 18 | 34.8 | 35.2% |
| Hari ke 19 | 36.3 | 33.7% |
| Hari Ke 20 | 39.9 | 30.1% |
| Hari ke 21 | 36.0 | 34.0% |

Tabel 1 Temperature Humidity Data Testing

Based on research using a chicken egg incubator design using temperature, humidity and movement sensors, the following results were obtained:

- Temperature Sensor: Data obtained from prototype testing is displayed in the table Measuring and recording the incubator temperature every few minutes. Ideally, the temperature should be around 37.5°C to 38°C. In the prototype I made, the temperature still had a threshold for a few days.
- Humidity Sensor: Measuring and recording relative humidity every few minutes. Humidity should usually be between 50% and 55% for the first 18 days, and increased to 65% to 70% in the last 3 days. In the prototype I made, there was still a weakness, namely that in the first 18 days it had not reached 50% humidity.
- Motion Sensor: To ensure the hatching of chicks in the incubator.

PIR motion sensor (HC-SR501), has proven to be an effective and cost-efficient approach to egg incubation. This design aligns with similar research, which has demonstrated that microcontroller-based systems can reliably simulate the natural incubation conditions provided by a hen. The use of widely available and affordable components further enhances the practicality and accessibility of this solution for small to medium-scale poultry farmers.

Enhanced Automation and Control This system effectively automates the monitoring and regulation of crucial environmental factors, such as temperature and humidity, which are vital for successful egg incubation. By integrating motion detection, the system ensures that eggs are rotated regularly, replicating the natural behavior of hens to prevent the embryo from sticking to the shell and to promote even heat distribution. Previous studies have shown that regular egg rotation is critical to improving hatch rates, and the incorporation of this feature in the automated system significantly boosts the likelihood of successful hatching. Additionally, the ability to control these parameters remotely allows for more consistent and precise management of the incubation process, further reducing the risk of human error and increasing overall efficiency.

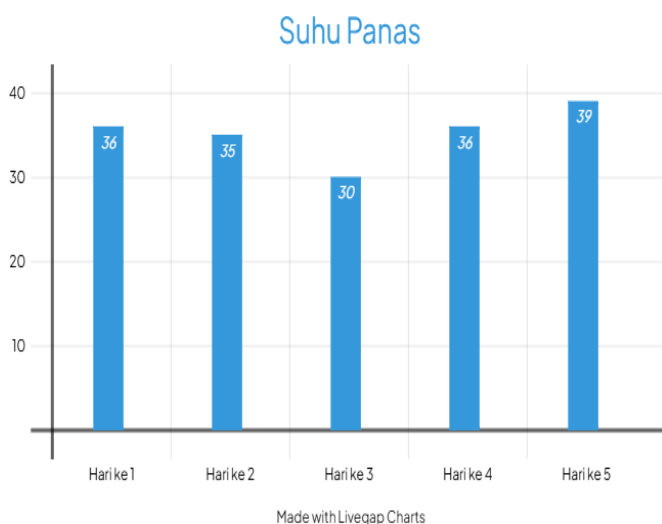


Figure 5 Grafik of Hot Temperature

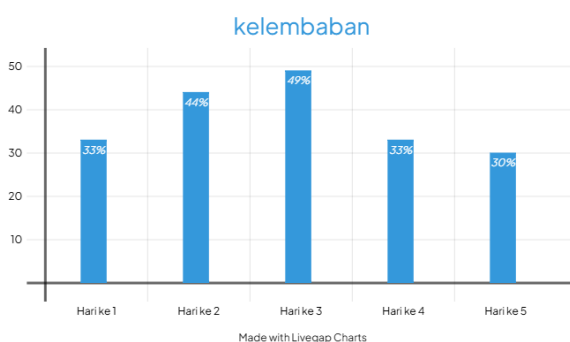


Figure 4 Grafik of Humidity

IV. CONCLUSION

Based on the testing and measurements conducted in this study, the following conclusions can be drawn Effective and Cost-Efficient Design The development of a chicken egg incubator utilizing the Arduino Uno R3, in conjunction with a temperature sensor (DHT11), humidity sensor (DHT11), and

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