BEST
Journal of Applied Electrical & Science Technology – University of PGRI Adi Buana Surabaya
p-ISSN 2715-2871
e-ISSN 2714-5247

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

Atmiasri
Electrical Engineering
University of PGRI Adi Buana
Surabaya, Indonesia
atmi.asri@yahoo.com

Wildan Surya Wijaya
Electrical Engineering
University of PGRI Adi Buana
Surabaya, Indonesia
wildansurya@unipasby.ac.id

Mochamad Choirul Fu,ad
Electrical Engineering
University of PGRI Adi Buana
Surabaya, Indonesia
mochamadchoirulfuad@gmail.com

***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 thetemperature 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 setpoint value. If the temperature or humidity is outside the desired limits, the Arduino will turn the heating light on or offto 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 studyshow that the prototype developed can be a practical and efficient solution for theprocess 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 couldpose a problem if farmers are unable to meet market demands. In natural conditions, a hen can only incubatearound 10 to 12 eggs at a time. Therefore, egg incubatorsare 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 incubatorthat 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 tobuild 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, adjustmentswill be made. If successful, the research proceeds to the next stage.

In the final stage, the test results are analyzedto 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 isneeded 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.

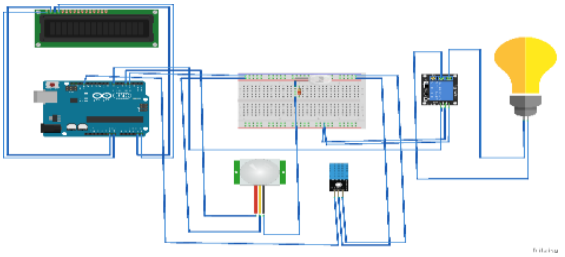

Figure 1 Component Product Design

p-ISSN 2715-2871
e-ISSN 2714-5247

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 informationon the detection of movement of hatched eggs and warningsof humidity conditions that are too high or toolow from the setpoint so that we can add water in the incubator asa 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.

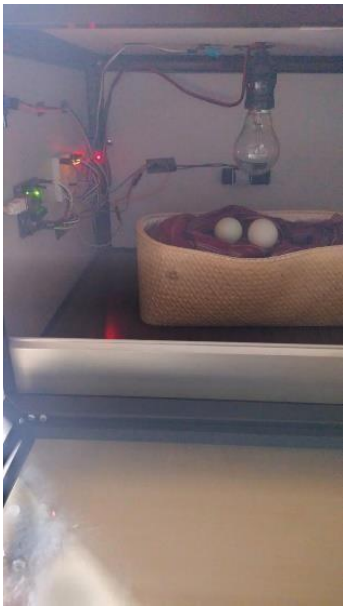

Figure 2 Egg Incubator Design

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 thatthe presentation of data and results in this tool can be carried out optimally. Component used :

Figure 3 inside of incubator

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

Testing of heat and humidity temperature, basicall this test is carried out to find out theresultsof 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:

p-ISSN 2715-2871
e-ISSN 2714-5247

- Temperature Sensor: Data obtained fromprototype 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 ithad not reached 50% humidity.
- Motion Sensor: To ensure the hatching of chicks in the incubator.

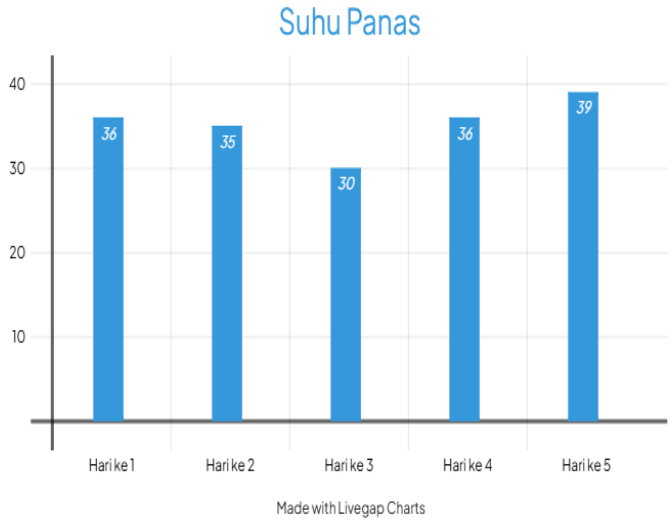

Figure 5 Grafic of Hot Temperature

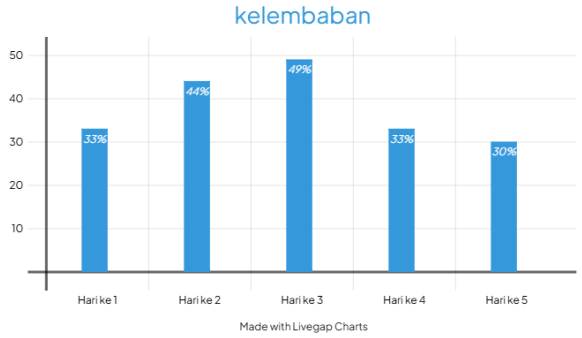

Figure 4 Grafic of Humidity

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 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 ofwidely available and affordablecomponents 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 vitalfor 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 theshell 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.

p-ISSN 2715-2871
e-ISSN 2714-5247

REFERENCES

1) Ardiansyah, F., Lawasi, M. F., & Hadi, C. F.(2019). Sistem Monitoring Inkubator Penetas Telur Berbasis Android. JOURNAL ZETROEM, 1(2), 8-16.

2) Atmiasri, A. (2024). Design of an Internetof Things (IoT) based Early Fire Prevention System Due to LPG Gas Leakage Using NodeMCU ESP8266 Module. BEST: Journal of AppliedElectrical, Science, & Technology, 6(1).

3) Ar, T. I., Hariyanto, N., & WALUYO, W. (2015). Perancangan DanRealisasi Alat Penatas Telur Dengan Catu Daya Pembangkit Listrik Tenaga Surya Berbasis Arduino Uno R3. RekaElkomika, 3(1).

4) Awal, J. (2022). Rancang Bangun Alat Penetas Telur Ayam Arab dengan Kendali Mikro (Doctoral Dissertation, ITN Malang)

5) Atmiasri, A., & Solikin, A. (2023). Voice Warning to Identify Distance to Obstacles on Smart Cane for Blind People. Journal of Electrical Engineering and Computer (JEECOM), 5(2), 244-249.

6) Dinata, A. S. (2021). Rancang Bangun Alat Penetas Telur Otomatis Berbasis Arduino Uno. Jurnal Ilmiah Mahasiswa Kendali dan Listrik, 2(2), 66-74.

7) Hasan, T. A., & Indra, J. (2016). Prototipe Mesin Penetas Telor Otomatis Berbasis Mikrokontroler Atmega328 menggunakan Sensor DHT11. Techno Xplore: Jurnal Ilmu Komputer dan Teknologi Informasi, 1(1).

8) Karsid, K. (2024). Sistem Kontrol Suhu dan Kelembaban Udara pada Alat PenetasTelur Menggunakan Arduino Uno. Elektriese: Jurnal Sains dan Teknologi Elektro, 14(01), 25-32.

9) LM, S. S. I. (2019). Perancangan PurwarupaPengatur Suhu Otomatis pada Inkubator Penetasan Telur Ayam Menggunakan Arduino Uno. JAST, 3(1), 60-72.

10) Mentari, P. D. (2022). Implementasi fuzzy logic mamdani pada sistem notifikasi penetas telur ayam kampung dengan teknologi iot (Bachelor's thesis, Fakultas Sains dan Teknologi UIN Syarif Hidayatullah Jakarta).

11) Mukhlis, S., Puspasari, R., & Kom, M. (2023). Perancangan Alat Penetasan Telur Otomatis MenggunakanBluetooth Berbasis Arduino Uno. JurnalRekayasa Sistem (JUREKSI), 1(3), 1202-1213.

12) Nurul Ummi, F. (2023). PROTOTYPE MONITORING SUHU DAN KELEMBAPAN PENETASAN TELUR BEBBASIS INTERNET OF THINGS (Doctoral dissertation, UniversitasSiliwangi).

13) Putra, E. K., & Darmansyah, H. (2021). Perancangan Prototipe Mesin Tetas Telur Berbasis Arduino Dengan Antarmuka Web. Jurnal Teknik Elektro,10(2), 141-149.

14) Permana, D. A. Y. (2024). Prototipe Inkubator Penetas Telur Otomatis Menggunakan Logika Fuzzy.(Prototype Automatic Egg Hatching Incubator Using Fuzzy Logic) (Doctoral dissertation, Universitas 17 Agustus 1945 Surabaya).

15) Putra, Y. D. A., & Sari, C. (2022) Pengaplikasian Sensor DHT22 Berbasis Arduino Sebagai Penetas Telur Ayam Kampung. ELECTRA: Electrical Engineering Articles, 2(2), 42-48

16) Saktiawan, R. A., & Atmiasri, A. (2017). Pemanfaatan Tanaman Toga Bagi Kesehatan Keluarga Dan Masyarakat. Jurnal Abadimas Adi Buana, 1(2), 57- 64

17) Sujiwa, A., Atmiasri, A., & Purwanto, E. (2019). Sistem Kontrol Efisiensi Daya Otomatis Pada Perangkat Prototipe Desalinasi Dual Output Bertenaga Sel Surya. WAKTU: Jurnal Teknik UNIPA,17(1), 26-31.

18) Setyaningsih, N. Y. D., & Mustofa, A. N. (2019). Optimalisasi Posisi Heater Dan Cooler Terhadap Perubahan KondisiSuhu Pada Inkubator Tetas PenetasTelur. Simetris: Jurnal Teknik Mesin,Elektro dan Ilmu Komputer, 10(1), 281-286

19) Setiawan, R. (2017). PERANCANGAN WEB DAN SISTEM MONITORING SUHU PENETASAN TELUR MENGGUNAKAN RASPBERRY PI BERBASIS WHATSAPP SEBAGAI NOTIFIKASI (Doctoral dissertation, Institut Teknologi Nasional Malang).

20) Wahyudi, M. R., & Nugraha, A. R 2024). ALAT INKUBATOR KANDANGANAK AYAM MENGGUNAKAN SENSOR SUHU DHT11 DENGAN MIKROKONTROLER ARDUINO. JURNAL TEKNIKINFORMATIKA (JUTEKIN)