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Smart Wi-Fi based country egg hatching incubator using Arduino

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Abstract:

The most subject of this extend is to plan and create an egg hatchery with savvy highlights This specific shrewd egg incubator works on the fundamental standards of thermodynamics and employments Arduino as its centre innovation. In this extend we are giving reasonable temperature to the eggs interior alongside satisfactory levels of stickiness. The wellbeing of the eggs is most important factor that's considered and took optimal care with the outlined model. By utilizing water and cooling fans ready to diminish the mugginess. Here in this project we will screen the temperature and mugginess values at any instant using login accreditations in Blynk app, this specific work is conceivable through Wi-Fi module called NodeMCU. We are able also control the number of revolutions that roller would make or sum of temperature that's have to be be provided to the eggs within the hatchery. We are settling a LCD screen modified by Arduino which is utilized to show the current values of temperature and humidity.We can roll the eggs for every 4 to 5 hours to make the heat supplied substantially.

Key words: Node MCU, LCD , Arduino, Blynk app

1. Introduction:

Egg incubation may be a technique utilized by the farmers generally to supply chicken from eggs without the presence of mother hen hatching them. An automatic incubator major idea is to regulate and monitor the subsequent parameters:

- Temparature
- Humidity
- Movement of the egg tray
- Required ventilation

Incubator generally means a circumscribed device to conserve a living organism. Electrically controlled incubator is employed for scientific incubation process within which the environment factors are monitored and controlled at any instant of your time. Egg incubator is one among the inventions that provide opportunity especially for who want to be excellent farmer. there's one in every of easy and fastest way that may make a product. This invention will upgrade the egg incubator that has already within the market today. The systems will automatically control the temperature and humidity of the incubator for various forms of egg. The function of the incubator is to require over an animal job to incubate an egg until hatching. The modern manager's hatchery objective is to provide large number of uniform and robust eggs. The Robustness can be a health criterion, originating with embryonic life stage of chicken correlating directly with performance and resistance of individual chicks under different farm conditions.

Incubating conditions:

Eggs need to be fertilized to reduce hatching. Before incubation, fertilized eggs should be stored in a cold and dry place. It is usually up to 60 degrees Fahrenheit and should not be stored in the refrigerator. Fertilized eggs can be placed in a warm incubator and harvested in 21 days under optimal conditions and settings. The components that need to be controlled by the incubator are temperature, humidity. The temperature depends on the type of egg. Incubator must be able to maintain a constant temperature in order to hatch a significant proportion of fertilized eggs. Be sure to maintain humidity during the breeding season.

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2. Literature survey:

Several researcher had ventured into finding solutions improve on the existing incubator. The function of the egg incubator according to [5] is to undertake the animal's job of hatching eggs until they hatch. In his study, the incubator was designed and tested to verify its performance. The incubator consisted of a solar collector with a built-in heat storage and an incubation chamber that could hold 100 eggs. As a result, the average collector outlet temperature on the day with the least amount of solar radiation was 72.4 ° C, and the average collector outlet temperature on the day with the least amount of solar radiation was 51.8 ° C. The incubation chamber was maintained in a temperature range of 37 ° C to 39.5 ° C and a relative humidity of 58% to 71.5% throughout the incubation period. Egg fertility and hatching rates were 85% and 78.5%, respectively. Although these values may be inconsistent during the rainy season [6], studies have been conducted on passive solar heating for the gloomy of Nigerian poultry chicks. Studies have speculated that the application of solar energy is the most attractive option for long-term energy supply in poultry production during the dry season.

Pallavi Bhosale1, Jagriti Tripathi2, "Development of Smart Egg Incubator System Using Arduino". The purpose of their paper is to design and develop the system of an egg incubator that is able to incubate various types of egg, named as Development of Smart Egg Incubator System using Arduino (SEIS). [15], Ogunwande, G. A., Akinola, "Development of a Biogas-Powered Poultry Egg Incubator". This study advances the utilization of biogas energy for chick production.

In addition, a system that integrates temperature, humidity, and light to monitor the hospital environment is proposed in [11]. An intelligent, integrated heat, light, and humidity control system that uses conventional exposed technology, marketable ducts, and household items that dynamically display ecological conditions. The main goal of this system is to design and implement the system in the most cost-effective way possible. This scheme allows operators to enter the desired situation of exactly acceptable temperature, humidity, and light propagation. Looking at this research, we can see the temperature. This is very useful for designing temperature control systems for egg incubators [12]. Next, we developed a microcontroller-based baby incubator with a sensor. The PLC is programmed to monitor heat shock via a liquid crystal display. In his work, he succeeded in designing and building a PIC control system. Through a series of studies, it has been found that the development of an automatic temperature system is not a smooth task.

3.Proposed methodology

Block diagram:

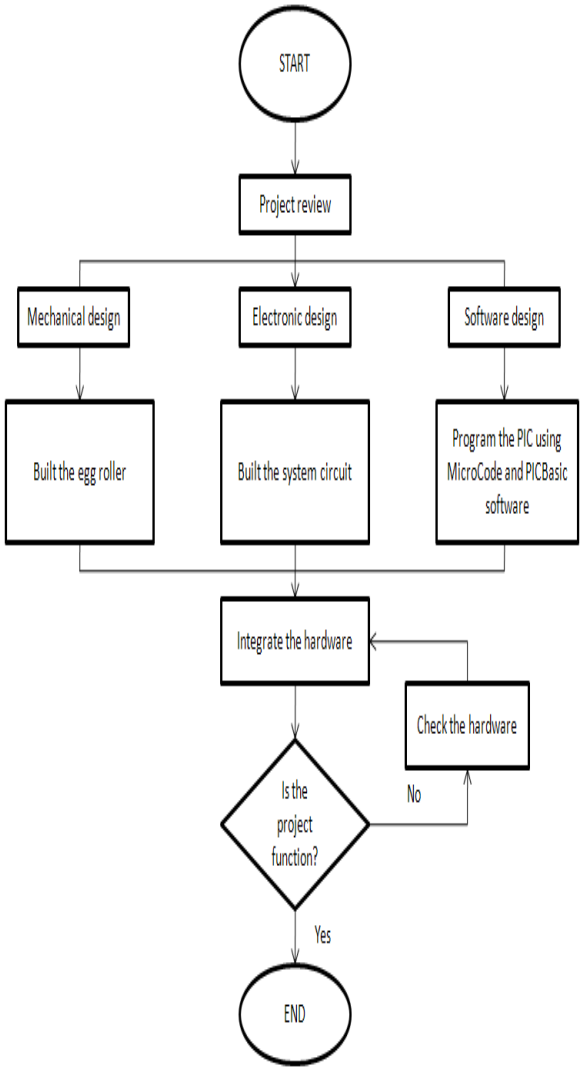

Fig 1: Block Diagram

3.1 Working Principle:

Mechanical Structure:

This research and development is divided into three main sections. Mechanical design, electronic design, software design. Combine these parts to run an

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automatic egg incubator system for different types of eggs. The incubator is consistent with a temperature and humidity sensor that can measure the incubator's condition and automatically switch to the condition suitable for the egg.

• Incubator and hatcher unit locations are located indoors to protect against major weather changes. It is important that the room has a good ventilation system in order to provide enough fresh air to the system. Placing the unit indoors makes it easier to keep temperature and humidity levels constant. This is the other two factors that need to change as the tray moves. In this study, light was used to give the eggs the proper temperature. By controlling the fan and water in the incubator to maintain good humidity and

Mechanical Structure focuses on the structure of SEIS. Two light bulbs were placed around the wall inside the smart egg incubator. The lamp consumes 40 watts and supplies heat to the eggs. The smart egg incubator has two layers, called the first layer and the second layer. The main body is equipped with an egg tray, a light bulb, and a fan. Control temperature, fan, light bulb, humidity.

Software design:

The maximum temperature of the smart egg incubator is 37 ° C and the minimum temperature is 35 ° C. At 37 ° C, the lamp is off and the fan is on until the temperature drops to 35 ° C. At 35 ° C, the fan turns off and the lamp turns on until the temperature rises to 37 ° C. Therefore, the temperature range of the SmartEgg Incubator is kept between 35 ° C and 37 ° C. The lamps and fans turn on and off to maintain the temperature inside the system.

1. When the incubation is turned on, the heater will be turned on automatically and heated automatically when needed.

2. Here you can use your credentials to monitor the current temperature and humidity parameters of your smartphone and control the heaters and rollers in the incubator from anywhere.

3.2 Observations:

Days 7-10: Candling eggs:

Towards the middle of the incubation period at 7 to 10 days, eggs can be candled to determine if the embryos are growing properly.

If you notice broken or leaking eggs, remove them from the incubator as they are not likely to be viable and may contaminate the incubator. After candling, return eggs to the incubator and return to the day 1-24 turning schedule.

Day 1-18: Turning the eggs:

After setting the eggs, the incubation process begins. An important part of this process is turning, or rotating, the eggs.

Days 18-21: Pre-hatching:

By day 18, the embryo has developed into a chick and will take up most of the space in the egg. The chick is preparing to hatch. You can do a few things to best help the baby chick prepare:

Stop egg-turning at day 18 with the larger end of the egg facing up. At this point, the chick will position itself for hatching inside the egg.

Maintain a temperature of 38 degrees Celsius but increase humidity to 70 percent.

Day 21: Baby chicks start hatching:

Chicks will typically hatch at day 21. If the fertilized eggs were cooled prior to incubation, the process might take a little longer. If you are at day 21 with no hatch, give the eggs a few more days.

Fig.2 Egg incubator

Arduino connections:

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Arduino, Sensor and Servo connection

- Arduino Pin 9 connected to the servo control.
- Arduino Pin 8 is connected to Data pin of DHT11

Relay connections are arranged:
Relay-1 to control Bulb 100 Watt (heat source)
Relay-2 to control Humidifier
Relay-3 to control In-fan
Relay-4 to control Ex-fan
Power supply

- Arduino UNO (5 Volt via USB)
- Relay Board (5V)
- Bulb 100 watt (240 VAC supply)

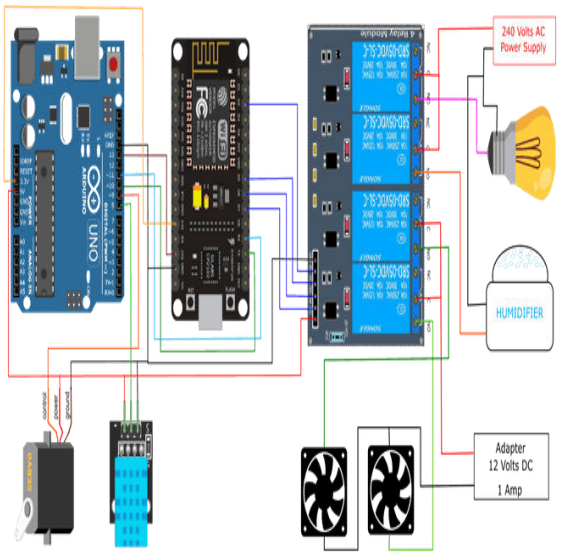

Fig 2Circuit diagram

3.3 Working description:

- As we turn ON Incubated the heaters will be automatically turned ON and after reaching the required temperature then automatically heat.

- To maintain moderate temperature and distribute it evenly two fans are maintained in the incubator which will be turned ON alternatively (Such that no fan will be turned ON continuously so that no failure of fans will occur).

- Here we can monitor the current temperature and humidity parameters on any Smartphone using login credentials andalso we can control heater and roller which is inside Incubator from anywhere.

- The current status of temperature and humidity is also displayed on LCD screen which is fixed on Incubator.

- Also we use motor to roll the eggs for every 5 hours that heat will applied equally to the each and every part of the egg.

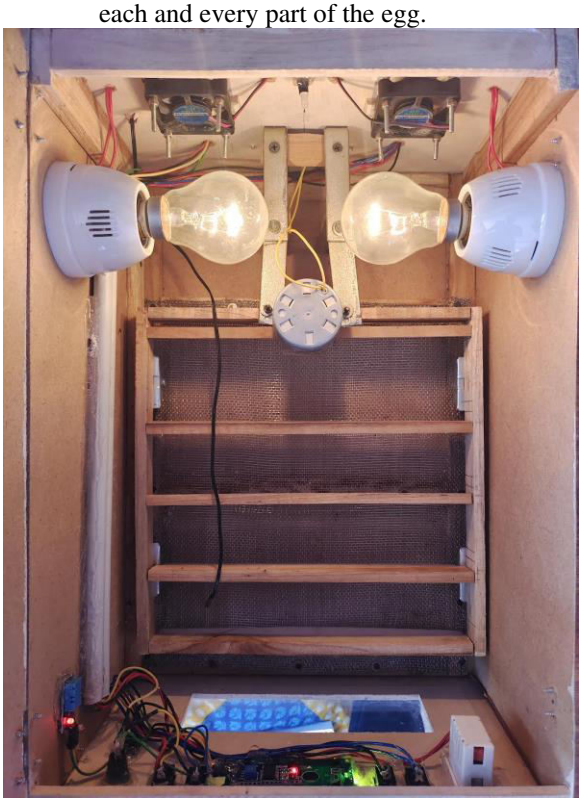

Fig .3: Figure showing the bulbs glowing and how the tray is placed

4. Results and Discussions:

- The proposed design has undergone multiple tests to determine the effective usability of the prototype. Testing of existing related projects was used as a reference for the actual evaluation performed on the prototype. Several tests have been run using the device. These include duty cycle tests, motor accuracy tests, dielectric strength tests, and 2-hour combustion or durability test LCD screens.
- This allows you to measure the rate of heat rise from the initial temperature of the

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incubator to the steady state temperature of 37.5 ° C.

- The correlation between ambient temperature and humidity and that of the incubator also needs to be determined.
- The initial temperature was 30 ° C, but gradually increase the temperature to 37.1 ° C for optimal heating of the egg in the first 2 hours.
- The ambient temperature fluctuated between a minimum of 24 ° C and a maximum of 34 ° C over 24 hours, but the internal temperature of the incubator was relatively constant, between 37.1 ° C and 38.1 ° C after the first two times. It fluctuated in. Time ° C This indicates that heat loss due to conduction through the walls of the incubator is minimal.
- Next, the ambient humidity during the test period ranged from 40% to 73%, while the internal humidity of the incubator ranged from 53% to 70%. It is a prerequisite for successful hatching that the designed incubator maintains an average relative humidity.
- Also, during the observed period, the duty cycle of both fans was 0.25 (25%). In other words, it was confirmed that the fan was on only 25% of the observation period, the heat capacity of the incubator was good, and the energy efficiency was high.

Table 4.1: Results and discussion

No.of Testing	Condition	Observation
Test 1	Date : 20/03/2022 to 10/03/2022 No .of eggs: 20 Temparature : 39.1 to 40°c	• Temperature range recommended by farmers • Humidity stay the same • Result: Unsuccessful incubation chicken egg • Percentage of egg hatched: 0%
Test 2	Date : 15/03/2022 to 5/05/2022 No .of eggs: 20 Temparature : 38°c to 39°c	• Egg turning 180 degree using stepper for 13 days and use DC geared motor for 5 days • 8 eggs unsuccessful incubation • Humidity stay the same • Result: 12 chicks hatched • Percentage of egg hatched: 60%
Test 3	Date : 6/05/2022 to 26/05/2022 No. of eggs : 20 Temperature : 37 to 37.5°c	Wire net corrode and collapse • Egg turning rotate 180 degree for 18 days • 3 eggs creak before 21 day • Humidity stay the same • Result: 17 chicks hatched • Percentage of hatched: 85%

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Fig 4: Figure showing temperature and humidity values

4.2 Description:

- The various temperature ranges are based on the recommendations of local farmers who are experts in egg farming to incubate between 39 ° C and 40 ° C.
- This is inconsistent with the ideal incubation temperature of 37 ° C to 38 ° C from theory. All three areas of the incubation test were performed to determine the ideal temperature for incubation.
- Test 1 incubation failed because it is not suitable for egg incubation due to the high temperature (39oC – 40oC). The egg seems to have died in the middle of incubation due to the presence of foetus.
- The incubation temperature for the second test is as low as 38oC to 39oC. Test 2 allows 12 eggs to hatch until they hatch.
- The amount of chicken egg incubates fixed to 20 eggs by reason of the dc motor was unable to push the all 25 eggs with the egg turning tray smoothly.
- Other than that, by decreasing the number of incubation eggs , will able to give equal number of incubation from both egg suppliers.
- The number of performances for each experiment had been made can be conclude in a graph form to distinguish the improvement of the incubator performance .
- The percentage performance of Egg incubator can be seen increased from 0% to 85%.

Fig 5: Figure showing the dispensing of water when master card is placed and any of the button is pressed.

- The incubator can be controlled and monitored with an appcalled Blynk. We should have a authentic log-in credentials and we can monitor the temperature and humidity along with the roller motion.

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- We can increase the heat of the bulb with a notch at the top of the incubator prototype.

5. Conclusion:

1. A significant portion of GDP goes to the poultry industry for eggs, meat and feathers. This trade is highly dependent on the quality of its production and its annual production.

2. Proper incubation is required for high quality development and production. Therefore, obtaining the right culture method can enhance the success of high quality products. In our project, 20 eggs were hatched 28 days before hatching.

3. Eggs were fed by a lamp that produces 37 degrees against the temperature requirements of the eggs. X-rays were taken of the eggs on the 10th day of incubation. Five eggs were considered underdeveloped.

4. On the 18th day of incubation, the fluoroscopic process reoccurred. One egg was considered underdeveloped. And finally, on the 21st day, two eggs were underdeveloped. Therefore, after 21 days, 8 eggs were underdeveloped and 12 eggs were expected to hatch. 5. From the collected results, it can be said that the incubation of eggs is reliable in temperature and humidity. The temperature should be stable at 37 degrees and evenly distributed in all phases of the egg.

6. Recommended for home use, self-sufficient poultry farmers to increase the production of poultry products. Another recommendation is solar energy. A power outage has occurred to improve system efficiency and should be used as a backup power source.

References:

1. Sani, R.M., Tachir and Kushwaha, Economics of poultry production in Bauchi State: A case study of Bauchi LGA, NigeriaJournal of Animal Production, 27(1):109-113, 2000.
2. Abu M. B. Mohd .A (2008) Development of smart Egg Incubator System for Various types of eggs Bachelor of Electronics Engineering, Universiti Malaysia Pahang.
3. Resnick and Halliday(1992) incubator designs
4. Nur Hidayah Binti Mohd Amir, Automated Egg Incubator (AEI) Universiti Teknikal Malaysia Melaka, 2013.
5. Okonkwo W.I and Okunbuo C.O , Thermal analysis and evaluation of heat requirement of a passive solar energy poultry chick brooder, Nigeria Journal of renewable Energy, vol 9 number 1 and 2, pp 83- 87, 2001.
6. Reijrink I. A. M, D. Berghmans , R. Meijerhof , B. Kemp , and H. van den Brand, Influence of egg storage time and pre-incubation warming profile on embryonic development, hatchability, and chick quality, Poultry Science Association Inc, pp. 1225–1238, 2010.
7. Noor Azhar Amran & Fuead Ali, (2016) Development of an Egg Incubator Using Raspberry Pi for Precision Farming, Malaysian Institute of Information Technology Universiti Kuala Lumpur,
8. Hitu Mittal , Lini Mathew and Ashish Gupta, Design and development of an infant incubator for controlling multiple parameters International Journal of Emerging Trends in Electrical and Electronics (IJETEE) Vol.11, Issue. 5,pp 65-78, Sep-2015.
9. Azlina B.B, Smart Incubator, Faculty of Electronic and Computer Engineering, North Western McCormick School of Engineering, 2011.
10. Christina Tan, (2010) Integrated temperature, light and humidity monitoring system for hospital environment, Faculty of Electrical and Computer Engineering McMaster University, Hamilton, Ontario, Canada, 2010.1-9.
11. Suruthi.M, Suma.S, Microcontroller Based Baby Incubator Using Sensors, International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Issue 12, pp 12037-12044, December 2015.
12. and Implementation of a Fully Automated Egg Incubator, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, (An ISO 3297: 2007 Certified Organization), Vol. 3, Issue 2
13. Khan, M. J. A., Khan, S. H., (2014), The effect of storage time on egg quality and hatchability characteristics of Rhode VETERINARSKI ARHIV 84 (3), 291-303

14. Bhosale, P., Tripathi, J., Gillurkar, H., (2018) Development of Smart Egg Incubator System Using Arduino. Volume 8 Issue No.3
15. Ogunwande, G.A., Akinola, E. O. and Lana, A. R., (2015), Development of A Biogas-Powered Poultry Egg Incubator. Ile-Ife, Nigeria, Ife Journal of Science vol. 17, no. 1, 219.