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# Implementation of automatic lighting and heating system for poultry farm using Arduino

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**Abstract**
In the field of poultry science, automation technologies can be highly helpful. Using an automatic heating and lighting system for newborn chickens helps to sustain a temperature that is ideal for their development both during the day and during the cold winter nights. A self-regulating temperature device that uses a fixed point or value to regulate the temperature of a lab or room is known as an automatic heat control system. The research study aimed to manage and control heat and lighting system automatically using Arduino. The user will set the desired temperature, which is then compared to the temperature of the poultry house as determined by a temperature sensor, and the device responds by automatically turning on the heater/lamp based on the temperature differential. Time and temperature will be registered on the SD card. The heater will turn on if the temperature falls below the fixed limit. Dip Trace, a circuit modelling program used to create electronic systems and PCBs, was used to create the device. The ATmega328p microcontroller and Arduino software were used to code. To provide a controlled voltage to most of the active devices in the system design circuit, a 5v DC power supply was added. For data recording, an SD card and an RTC are attached to the circuit. This method maintains a warm environment for baby chicks while also providing light. This technology regulates the temperature of the surroundings without the need for human intervention. The android mobile app may be used to monitor and check the temperature status of poultry homes at any time via a Bluetooth connection.

**Keywords:** Arduino, heating, poultry, sensor, chicks, automatic

## Introduction
This automatic heating and lighting system was designed specifically for baby chickens. Poultry farms face a number of problems during the winter months. The fitness, body weight, and many other parameters of the newborn chicken's body are all influenced by cold stress. A colder climate is preferred by chickens. During cold days and winter nights, the optimum temperature for chicken is around 21º to 23º Celsius. Temperatures between 32º and 35º Celsius are ideal for newborn baby chicks. The amount of heat they need is reduced to 5 degrees Celsius a week. Since they have a completely feathered body by the tenth week of life, they can withstand a wide range of temperatures. For better brooding of newborn chicks, users must regulate or retain this temperature. Since adult chickens have a completely feathered body, they don't want this temperature to stay warm. They can survive the cold as long as they have adequate food and water. They are able to walk among the flock while maintaining their ideal body temperature. A heating system is needed for brooding chicks' users. Newborn chicks without a mother hen need a warm environment. At night, these newborn chicks need light. This temperature-based automatic heating and lighting system for poultry houses are used. A heating bulb/lamp/mercury lamp provides both a heated environment and adequate illumination for the newborn chicks at night. This system is Arduino-based. This Arduino is in charge of the whole operation. This machine can be operated with a handheld computer, mobile contact, or a Bluetooth android program. This machine is capable of maintaining the welfare of newborn chicks.

## Materials and Methods
This temperature-based automatic heating and light intensity control system is basically developed for newborn chicks. The environmental temperature or cold stress affects their metabolism energy of maintaining body temperature in cold. New-born chicks need a warm atmosphere at their early age. They also need light at night. For their proper brooding user should maintain the temperature and light of the poultry house.

For automatic controlling of temperature and light in poultry system, this system is implemented. This system contains Arduino. Arduino is a microcontroller kit that controls the working of this system. A temperature sensor is used to capture the temperature of the surrounding environment and send it to the microcontroller. In this system, we used a bulb as a heating source which provides heat as well as light in the newborn chick's house. If the temperature goes below the set point value then the temperature sensor captures the value and sends it to a microcontroller. The microcontroller activates the relay module. The relay module is used as a switch for heating and lighting source. When the temperature rises more than the set point value the relay is deactivated by the microcontroller. Fig. 1 is showing block diagram of this system. Fig. 2 & Fig. 2 showing working model of this system.

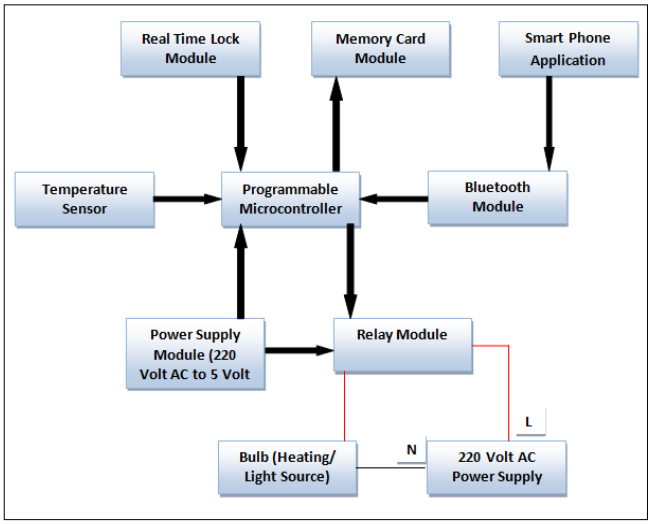


**Fig 1:** Functional Block Diagram of System

**Main Components of this system**

A. Arduino (Programmable Microcontroller)
B. Android Mobile Device
C. Bluetooth Module
D. Bulb (Heating and Light Source for Poultry House)
E. Power Supply Module (For Arduino and Relay Module) 5Volt Dc
F. Relay Module
G. Real Time Clock Module for capture real date time
H. SD card Module for Store data for future use
I. Temperature Sensor

**Fig 2:** Working Model of This System

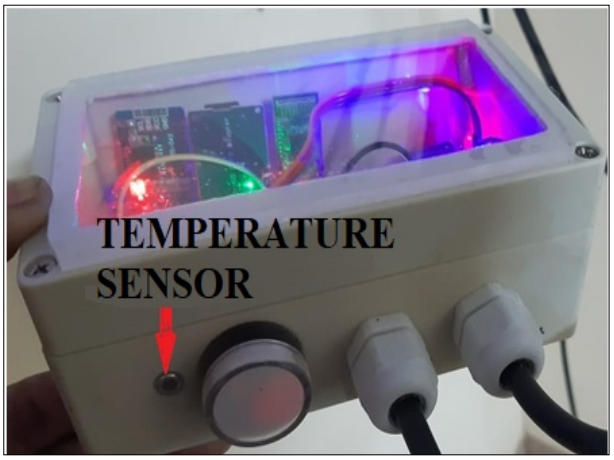


**Fig 3:** Working Model of This System

The user sets two threshold values of temperature one is for the high rate of temperature and another one is for the low rate of temperature. Here we set two values of temperature are 25º and 35º respectively (low and high).

In cold weather when the temperature goes below 25 ºC (set value), temperature senses this value and sends it to Arduino. Arduino activates the relay switch. Relay is worked as a power switch for Bulb (Heating and lighting source). Here we used bulbs as a heating and lighting source. There are four bulbs (every bulb of 100 Watt) in the one (2* 2-meter poultry) house. When the temperature goes below 25 ºC all bulbs go on and provide the desired lighting in this poultry house. Here we used a tungsten bulb which provides heat with light. Chicks' need for warm temperature is reduced 5º every week until their full feathered skin or 10 weeks of age. This fully feathered skin remains warm body in cold. Users can change the desired range of temperature every week according to the body of newborn chicks using a mobile device through Bluetooth. If the temperature goes high or equals 35º C, the relay switch turns off all bulbs. This system maintains and provides desired heat to the newborn chicks.

The following table is showing log data of the real-time clock stored in the SD (Memory) card. This table included the temperature captured by the temperature sensor and date and time according to the temperature.

**Algorithm for this system**

In the algorithm of automatic heating and lighting system

1. Process of Turns on Bulb
   T ()
   {If (Temp. <= 25º) {Turns Relay ON (Bulb ON)} Else {Relay (Remain Off)}}
2. Process of Turns off Bulb
   T ()
   {If (Temp. >= 35º) {Turns Relay OFF (Bulb OFF)} Else Relay (Remain ON)**}}**

**Result and Discussion**

We have observed almost one month. (Table 1) is showing Real Time Clock data of two days of this system. System is properly working according to real time temperature. We have discussed many previous researches on automatic lighting and heating system. A smart lighting control system for poultry houses is introduced (Junho Bang, *et al*. 2014). The energy efficiency of this machine can be improved. Users will watch the development of chickens from their first day to their fifth week of life. This LED smart lighting system

adjusts the LED strength based on the number of chickens present. Chickens need light at night before they have completely formed feathers. The effects of cold stress on broiler performance and sensitivity to ascites are discussed in this paper (A. Ipek, *et al*., 2006) [1]. This illustrates the impact of cold stress on chicken production from week one to week five. Cold stress causes chickens' body weight to drop. At a constant temperature, a chicken's brooder has a large bodyweight. A temperature and humidity management scheme for a poultry house is planned and implemented in this study (Olatayo M, *et al*. 2018). This machine is powered by a microcontroller. The temperature and humidity of the poultry farm are sensed using a DHT temperature and humidity sensor in this device. The control mechanism is engaged if the sensed temperature is lower than the target temperature. A fan, an automatic window, and a heat source were all part of this scheme. This research work is based on the heat and moisture production of broiler chickens during brooding (F.N. Reece, *et al*. 1982) [5]. This technique uses an environmental chamber to provide the necessary heat levels for broiler chicks in the early days.

**Table 1:** Real Time Clock (RTC) Log Table

| S. No. | Temperature in Degree Celsius | Date | Time |
|---|---|---|---|
| 1 | 24.37 | (2022/3/19) | 09:14:21 |
| 2 | 24.79 | (2022/3/19) | 09:24:21 |
| 3 | 25.13 | (2022/3/19) | 09:34:22 |
| 4 | 25.33 | (2022/3/19) | 09:44:23 |
| 5 | 25.55 | (2022/3/19) | 09:54:23 |
| 6 | 25.61 | (2022/3/19) | 10:04:24 |
| 7 | 25.69 | (2022/3/19) | 10:14:25 |
| 8 | 26.47 | (2022/3/19) | 16:24:50 |
| 9 | 26.71 | (2022/3/19) | 16:34:51 |
| 10 | 27.07 | (2022/3/19) | 18:34:59 |
| 11 | 26.95 | (2022/3/19) | 18:51:28 |
| 12 | 26.03 | (2022/3/20) | 08:32:23 |
| 13 | 25.95 | (2022/3/20) | 08:42:24 |
| 14 | 25.30 | (2022/3/20) | 08:52:25 |

This work implemented the design of an automatic room heater control system (Adamu Murtala Zungeru, *et al*. 2018). In this type of automatic system, user can control the desired temperature. The desired temperature is then compared to the environmental temperature. The environmental temperature is sensor by temperature sensor. This system is controlled by a microcontroller. In this system cooling and heating source depends on temperature. The fan is on when the room temperature goes high than the set point. Fan triggered off when the room temperature goes down to the set point. The heating source is triggered when room temperature below the set point. This system is simulated using Proteus 8, circuit building software. An automatic thermal camera is designed for monitoring broiler body temperature (Boch, V, *et al*. 2019). The body temperature of the broiler is measured automatically without any human interference. This system can be installed on a commercial broiler farm. This is a reliable and low-cost system. The researcher analyzed the effect of cold stress on turkey hens, the effect of cold stress on their physiology, and meat quality (Z.A. Henrikson, *et al*. 2018) [15]. The embedded poultry farm is implemented (Longinus S. Ezema, *et al*. 2019) [10]. This system measure and automatically controls the climate condition. This system also controls the water and power supply of the poultry house. This system is designed according to the climate condition need for the newborn chickens to 4 weeks old. In this system, the real-time values of temperature, humidity, and water level are displayed on LCD Display. The microcontroller controls the whole system. Researcher evaluated a heating system for poultry houses using computational fluid dynamics (Flavio Alves Damasceno, *et al*. 2014) This system can measure the airspeed and temperature in the poultry house. This system can also be used to improve the efficiency of the distribution of heat in the poultry house using different airspeeds and dimensions. Researchers developed an automatic monitoring and controlling system for broiler houses (Rohan D. Ramdurg, *et al*. 2016) [13]. This system can monitor and control water level management, heating source control, curtain open/close controlling, and environment monitoring. Users can access this system remotely. Users can monitor and control this system using a mobile device. Infrared thermo graphic images were used to evaluate of effect of cold stress on layers (Alves FMS, *et al*. 2012) [3]. This research verified that layers under cold stress can't maintain their body temperature. Cold stress affects egg production, and it affects economic growth. The researcher performs various methods to check the effect of cold stress on broiler chicken and check performance after cold stress (Saim Qureshi, *et al*. 2108). They conclude that the environmental temperature affects the metabolism and production of broiler. Feed supplement Vitamin E 250 mg/kg and Chromium 0.2 g/kg can reduce the effect of cold stress in the broiler.

## Conclusion

The health of newborn chicks is affected by environmental temperature. Cold stress lowers the energy required to maintain the body temperature of newborn chicks. Users should keep the surrounding temperature constant until their skin has fully feathered. Because of their feathered skin, adult chickens can maintain their body temperature. This mechanism is critical for the successful brooding of young chicks. This method maintains a warm environment for baby chicks while also providing light. This technology regulates the temperature of the surroundings without the need for human intervention. The android mobile app may be used to monitor and check the temperature status of poultry homes at any time via a Bluetooth connection. This technology is simple to use and robust. The microcontroller is connected to the real clock module, which displays the current date and time based on temperature. The android mobile application allows users to define low and high temperature settings.

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## Reference

1. Ipek A, Sahan U. Effects of Cold Stress on Broiler Performance and Ascites Susceptibility. Asian-Australas J Anim Sci. 2006;19(5):734-8. doi: 10.5713/ajas.2006.734.
2. Zungeru AM, Mangwala M, Chuma J, Gaebolae B, Basutli B. Design and simulation of an automatic room heater control system. Heliyon. 2018;4:e00655, doi:10.1016/j.heliyon.2018.e00655.
3. Alves F, Felix GA, Paz IA, Nääs ID, Souza G, Caldara FR, Garcia RG. Impact of exposure to cold on layer production. Brazilian Journal of Poultry Science. 2012;14:223-226.
4. Bloch V, *et al*. Automatic broiler temperature measuring

by thermal camera, Bio systems engineering. 2019. https:// doi.org/10.1016/j.biosystemseng.2019.08.011
5. Reece FN, Lott BD. Heat and Moisture Production of Broiler Chickens During Brooding, Poultry Science. 1982;61(4):661-666.
6. Damasceno FA, Saraz JA, Mendes LB, Martin S, Martins MA. Evaluation of a Heating System in Poultry Houses Using a CFD Model. Rev. Fac. Nal. Agr. Medellín. 2014;67(2):7355-736.
7. Moorthy GK, Yasshuwanth C, Venkatesh K. A Wireless Remote Monitoring of Agriculture Using Zigbee, International J of Sci. Research. 2014;2(8):2277-3754.
8. Xin H, Berry I, Tabler T, Costello TA. Heat and moisture production of poultry and their housing systems: broilers. Trans Am Soc Agric Eng. 2001;44:1851-7. doi: 10.13031/2013.7023
9. Bang J, Lee I, Noh M, Lim J, Oh H. Design and Implementation of a Smart Control System for Poultry Breeding's Optimal LED Environment. International Journal of Control and Automation. 2014;7:99-108.
10. Ezema LS, Nnabuko MC, Opara CB. Design and Implementation of an Embedded Poultry Farm, IEEE I$^{st}$ International Conference on Mechatronics, Automatic and Cyber-Physical Computer System (MAC-2019). 2019.
11. Mihaliov N, Lyubeniliev, D.T., 2014. Investigation of an Efficient Poultry Lighting Solution, IEEE conference, 978(1):4799-5817.
12. Olaniyan OM, Adegboye AM, Isife OF, Bolaji O. Design and Implementation of a Temperature and Humidity Control System for a Poultry House Prototype, ATBU, J. of Sci., Technology & Education (JOSTE). 2018;6(1):106-114.
13. Ramdurg RD, Patil MS. Automatic Monitoring and Controlling System for Broiler House, International J. of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering, 2016, 4(7).
14. Qureshi S, Khan HM, Mir MS, Raja TA, Khan AA, Ali H, *et al*. Effect of cold stress and various suitable remedies on performance of broiler chicken. J. World Poult, Res. 2018;8(3):66-73.
15. Henrikson ZA, Vermette C, Schwean-Lardner KV, Crowe TG. Effects of cold exposure on physiology, meat quality, and behavior of turkey hens and toms crated at transport density. Poultry Science. 2018;97:347-357.