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SMART EGG INCUBATOR

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Abstract: For the chicken farmers, hatching the eggs in a big number is a problem to producing the chicks which incubate by hens manually. In this paper we develop the system of eggs smart incubator. The incubator system based on Arduino Uno can control the temperature, humidity, and rotate the eggs automatically. In addition, Internet of Things (IoT) system can help farmers to monitor the smart incubator from anywhere in the world. The eggs smart incubator be applied to hatching the eggs at Farm show the best result to hatching the quail eggs. The quail eggs successfully hatched 88.55%, 0.41% defective, 1.84% hatch but dead, and 9.20% not hatch by 490 eggs in 21th days of incubate period

Keywords: *Eggs smart incubator, Microcontroller, Hatching eggs, IoT, Automatic control*

I INTRODUCTION

In this paper, The eggs incubator is a device to keep the efficient temperature and humidity for hatching process. By using incubator, we does not need hen,to incubate the egg manually. For this reason, this device can help for farmers to hatch an eggs and produce the big numbers of chickens. Researchers have to build the incubator for various egg, such as for Chicken, quail, Turtle, Partridge, and other. For the incubating system, we developed the incubator to automate the adjustment system, such as the temperature, humidity, egg rotation, and other which based on the microcontroller, IoT, and other. In this project we the development of hen eggs smart incubator for eggs hatching system. The incubator can control the temperature, humidity, and rotate the eggs automatically based on microcontroller. In addition, the incubator based on Internet of Things (IoT) system using PC/smartphone can help the farmers to monitoring the smart incubator from a distance. Finally, the eggs smart incubator be applied to hatching the egg at Farm for 21 days incubate period.

II CIRCUIT DIAGRAM

In this system, we are using Arduino as our main controller. It has 2 sensors input and 2 setpoint inputs. All these inputs are Analog input. It has total 6 Analog inputs 14 Digital input/output pins. Out of these 6 inputs we are using 4 inputs only. we are using LM35 as our temperature sensor and HS220 has humidity sensors. The microcontroller compares sensor values with their respective set-points. If the temperature is less than its set-point then the heater is turned ON and if its above setpoint it will turn OFF the heater. The operation of humidity sensor is opposite. Humidity sensor is above setpoint then Fan will be ON and humidity sensor is below set point then Fan will OFF. There will be a dead band of 2% for humidity set points.

Turning ON/OFF heater and exhaust fan is controlled by relays. As the relay turns on/off the heater/fan gets on/off. Relays are controlled by the microcontroller. There is also a stepper motor which will rotate a tray in 45 degree. We need the stepper motor drive which rotate the stepper motor.

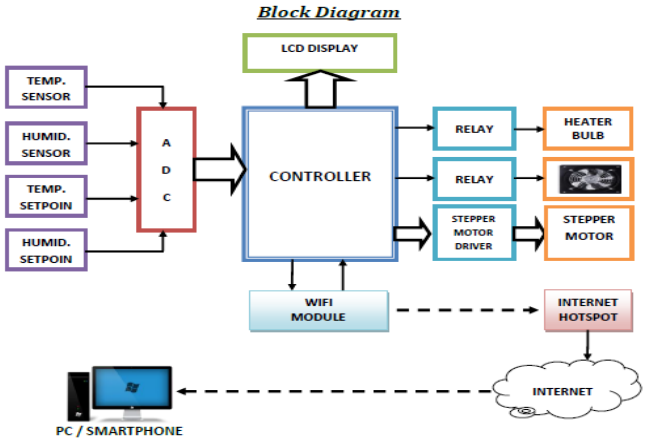

Fig.1.Block Diagram

III INCUBATOR DEVELOPMENT

In this Incubatorcontroller like as a Arduino, Temperature sensor, Humidity sensor, temp and humidity set-points, Stepper motor, Heater was used.

A) Arduino Board-

In the first development Arduino Uno was used. Ardunio uno is a microcontroller board. It has14 Digital input/output pins (of which 6 pins are used as a PWM). In this Arduino 6 Analog input pins are present. Its operating voltage is 5V and maximum power is 40mA. Its internal resistor is 20-50 Kohms..

Fig.2. Arduino Board

In this Arduino Uno 14 input/output pins (0-13) present. Out of these 14 pins have specific function is below:

i. Serial pin 0(RX) and 1(TX)- RX and TX pins are used to receive and transmitted data.

ii. 2nd and 3rd pin – To trigger and interrupt.

iii. PWM 3,5,6,9 and 11 – These pins provide 8-bit PWM output.

iv. Pin 10,11,12,13 – These pins are used for communication.

v. Inbuilt LED pin 13 – These pins connected with LED. Pin 13are HIGH the LED is ON and the pin 13 is LOW the LED is OFF.

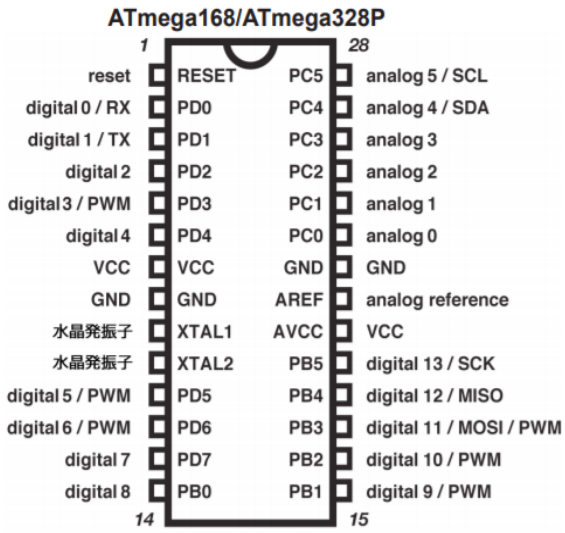

Fig.3. Pin diagram of Arduino board

(A0-A5)this are 6 analog pins. Sensors and set points are connected to analog pins. Temperature sensor (LM35) is connected to A0 pin. Humidity sensor (HS220) is connected to A1 pin. The two set-points adjustment pots are connected to A2 and A3 pins. The inbuilt ADC which can give output from 0 to 1023.it converts the analog output of sensor and pots into their digital equivalent. This digital value stored in Arduino memory (RAM).

A) Stepper Motor:

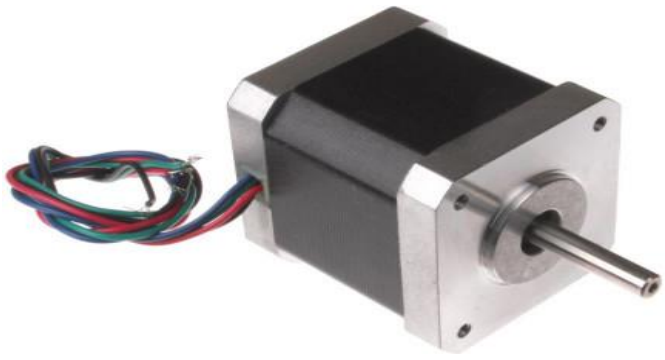

Fig.4. Stepper Motor

In fig 4 shows the Stepper Motor. Stepper motor are used in this incubator. Stepper motor are used for rotating the tray. This tray is rotated at 45º angle each 5 min.

The high-resolution type has half the step angle of standard stepper motor. The high resolution from 200 steps/revolution to 400steps/revolution.

Specification of Stepper motor:

i. Motor type is 2 phase.

ii. It is double shafted motor.

iii. It is high resolution type.

IV RESULT ANALYSIS

Fig.5.Egg Incubator

First day we have 20 eggs are placed in incubator shoe in fig.5. In the first day temperature of the incubator is 99º F. And Humidity is 86. The temperature of the incubator is vary from 98ºF – 102ºF. The Humidity of incubator is vary from 85-89%. The eggs tray is rotated at 45º angle at each 5 min.

After 7 day we egg are candled to determine the condition of eggs. In the candling process we find out which eggs are fertile and which eggs are not fertile. Upto 7 days temperature and humidity are same.

In fig 6. Show the candling process. The light is entered in the egg the red cells are show. Then this egg is fertile. The light is focused in the egg the red cells are not present then these eggs are not fertile.

After 18 days stop the rotating tray, temperature is decreased and humidity are increased. The eggs are placed in

plain tray. These are stored in 3 days in the incubator. And the last day means 21-day chicks are entered it is show in fig 6.

Fig.6. Candling process

Fig.7. Chicks

The result of egg incubator which revealed the following average result:

- 20 fertile eggs and we got 13 chicks and total Hatchability is 93%.

V CONCLUSION

The project has successfully run and we achieved the project objective.

It can be concluded that the prototype of egg incubator using Arduino is successfully developed and function perfectly. The average of the egg hatching recorded 93% success rate.The accuracy of measuring instrument is determined by using sensor and the error of temperature and humidity sensor was less than 5%, which means measure sensor used in the acceptable instrument. The motivation of this work was to promote the development of such applications. It should be noted that the little or no presence of egg incubators with Internet connection denotes the lack of development of the IoT in agriculture.

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