Indian Journal of Science and Technology, *Vol 8(19), DOI: 10.17485/ijst/2015/v8i19/76227, August 2015*
ISSN (Print) : 0974-6846
ISSN (Online) : 0974-5645

Internet based Smart Poultry Farm

K. Sravanth Goud* and Abraham Sudharson

School of Electronics Engineering (SENSE), VIT University (Chennai Campus), Chennai – 600 127, Tamil Nadu, India;
ksravanth2012@gmail.com, abrahamsudharson.ponraj@vit.ac.in

Abstract

Background/Objectives: In contemporary agriculture, automation plays a vital role. This paper focuses on the integration of wireless sensors and mobile system network to control and remotely monitor environmental parameters in a poultry farm. **Methods/Statistical Analysis:** This system will warn the person in-charge about the various environmental parameters like temperature, humidity, etc. by sending message to the registered mobile number. The person in-charge can initiate a required action by sending a message back and when the system doesn't receive a command in a particular time period it will initiate the action automatically. **Findings:** Water level is also monitored and controlled as they play an important role in cooling the poultry farm. Remote monitoring is achieved by acquiring all sensor values and passing the values to the web with the help of CC3200, which can be later viewed in Google spreadsheets. **Conclusion:** Thus the system design provides an efficient automated agriculture monitoring system.

Keywords: Agriculture, CC3200, IOT, Remote Monitoring

1. Introduction

From the past few decades, around the globe, there has been an increased level of awareness regarding the safety of foodstuffs and there has been a high demand for better quality food. This has forced many countries to adopt new protocols such as traceability and Biosecurity measures in order to avoid the cost of expensive disasters. One of the key roles involved in the development of human civilization is in the area of agriculture. With the continuing increase in the world's population, the demand for food supply is extremely raised. Thus, not just farmers nor agriculturists, but also researchers have put considerable effort into a number of techniques to increase food production with an efficient return-of-investment methodology.

The ability to monitor environmental conditions is crucial and it demands a good level of research in fields ranging from the change in climatic conditions in agriculture and zoology. This research focuses on the integration of wireless sensor and mobile network with a well know sensor integration platform using remote sensing. An Internet based Smart Sensing Platform is used to monitor the environmental Parameters is proposed, overview of the system was shown in Figure 1. This will probably make work much easier and efficient in poultry farm management. Here if the temperature crosses threshold value, the designed system will warn the person by sending message through GSM module and thereby control that particular parameter by turning ON the sprinkler using GSM module. If the design system doesn't receive any response from GSM module within a specified period of time, it will automatically turn ON. Similarly, if the water level is below the threshold value, then the GSM module will switch ON the water motor.Owner of the poultry farm can do remote monitoring and get information about each parameter like temperature, humidity, water level by the developed system with the help of the internet.

2. Literature Survey

Chakchai So-In, Sarayut Poolsanguan, Kanokmon Rujirakul[1] developed overall system architecture of the hybrid model for mobile and wireless sensor network management systems in the smart poultry farm. One of the insights is to differentiate the electronic and mechanical parts of the farm establishment for mobility and flexibility purposes. In general, considering EVAP systems, once

**Author for correspondence*

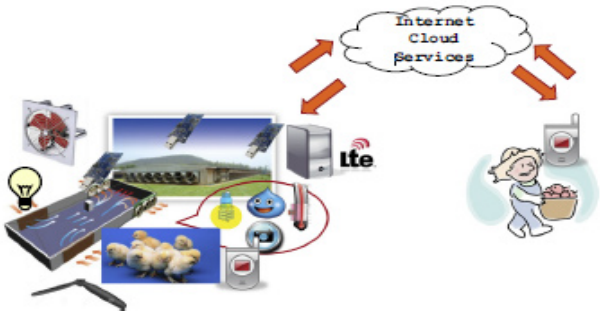


Figure 1. System overview.

managers and farmers have set up animal farms, aside from nutrition and animal heredity selections, other key factors such as temperature, humidity, light and population density are also required for the controller to properly adjust environmental conditions.

Hironao Okada, Koutarou Suzuki, Tsukamoto Kenji and Toshihiro Itoh[2] were explained a method to detect highly pathogenic avian influenza at the early stage in poultry farm using a wireless sensor node. Each chicken is attached by node and uses body temperature and 1–axis acceleration data to determine effected chickens. When the surveillance system detects unusual state of the chickens the system automatically alerts administrator through internet also this system reports a history of health conditions obtained from sensor such as fever and weakness.

Growth of chickens will reduce if presence excess dust and ammonia in the air. To void low growth rate humidity should be maintained below 50 percentif temperature is above 27 degrees.

E. L. Nichols[3] discusses the following important issues, for effective growth, humidity should be controlled. Humidity describes the amount of heat and amount of ammonia to which birds are subjected. Humidity is directly propositional to dust and ammonia present in the house. When the temperature is in between 15–17 degrees, humidity should be in-between 50–70.

H.Okada1, H. Nogami1, T. Kobayashi, T. Masuda and T. Itoh[4] were developed system with an ultra low power wireless sensor node with continuously monitoring of activity for animal health care. Intermittent operation of body temperature measurement is enough for health care and effective to reduce the power consumption. However, in activity measurement, the intermittent operation is not suitable because the change of activities is fast. In this report, it is shown that an ultra low power method for continuous activity measurement with a developed custom LSI which works at about 320 nW of calculated power consumption at standby state and a MEMS piezoelectric micro-cantilever. They also demonstrate the node which is applied to a chicken health monitoring system for avian influenza surveillance in poultry farms.

3. System Architecture

3.1 Block Diagram

The designed system is divided into control, alert module and monitoring module. Control and alert module comprises of analog temperature sensor (LM35), analog humidity sensor (HIH4030) and digital Water level sensor along with Arduino UNO. Here ultrasonic sensor (HC-SR04) is used to measure water level. Initially a threshold level is set for all sensor values. So depending on the inputs received from the sensors the UNO board will send a message via GSM module if the value received from the threshold value is more than the threshold level. For remote monitoring purpose CC3200 ARM cortex-M4 micro controller is used for taking the input values from the sensors and converting them into an organized format such as a Google spreadsheet so that the owner can view the data.

Temperature, Humidity, Water level in the tank is monitored using the respective sensors. The measured data is relayed to a cloud using the CC3200. The user can view the data from anywhere. The owner will alert if temperature and water level crosses threshold value and required action will be done through GSM module by switching of the relays. Designed system was shown in Figure 2.

4. System Implementation

4.1 Alerting and Controlling

The developed system will continuously monitor the environmental parameters like temperature, humidity,

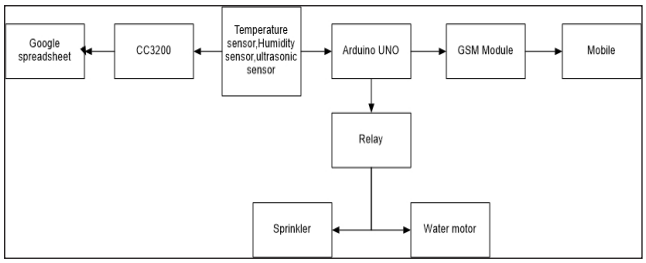


Figure 2. Block diagram of the designed system.

water level. For effective growth of chickens in poultry farm all the above parameters should be in desired level, if not it will be difficult for the survival of the chickens. To avoid this situation, in this research a system is being designed which will provide the status of each of the parameters and alert's the person in-charge if any critical situations arises which is shown in Figure 3.

Here temperature sensor, humidity sensor and ultrasonic sensors are given to the base unit along with a GSM module. This will alert the person in-charge if the temperature of the poultry farm crosses a threshold value. This is as shown in the Figure 4.

After receiving warning message, the person in-charge will get information about the temperature. Now he has to set the temperature to the required range, for this a system is designed so as to turn ON the sprinkler through the message. Prior to this, the poultry farm should be equipped with sprinklers. The experimental set up is as shown in Figure 5.

In the experimental set up a Fan is used instead of a sprinkler. Temperature will come into the required range

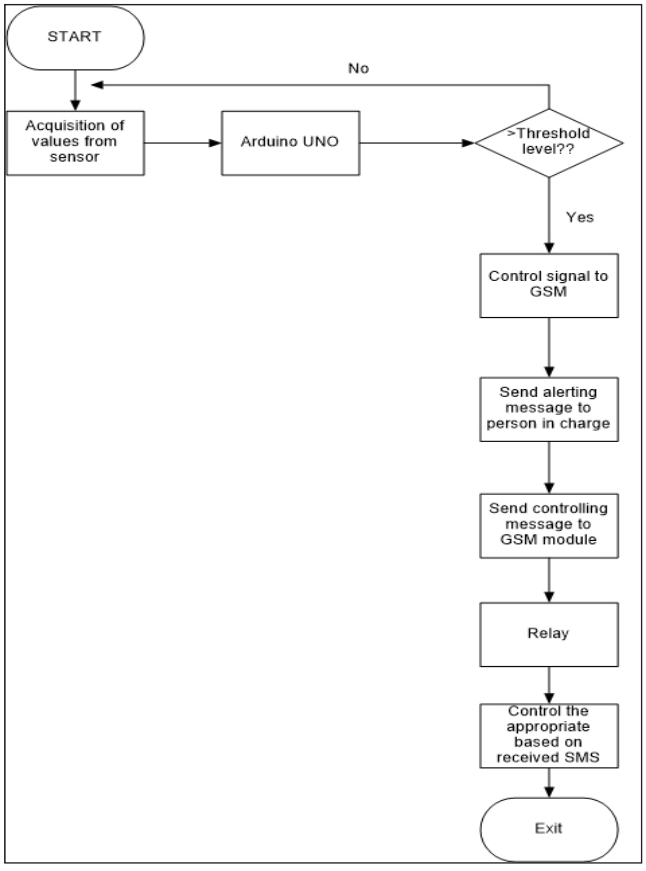


Figure 3. Flow of control, alerting module.

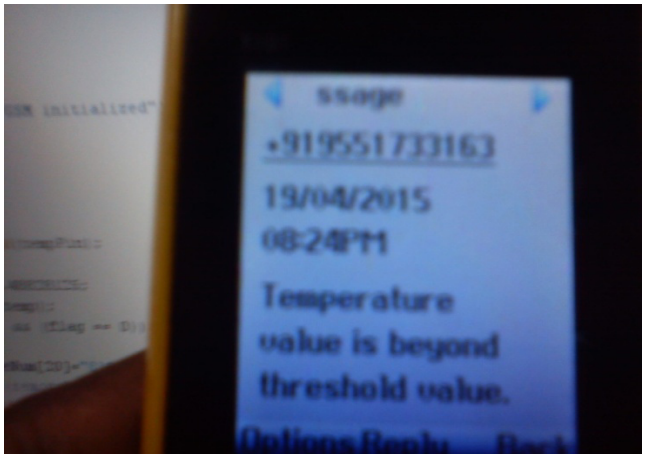


Figure 4. Warning message.

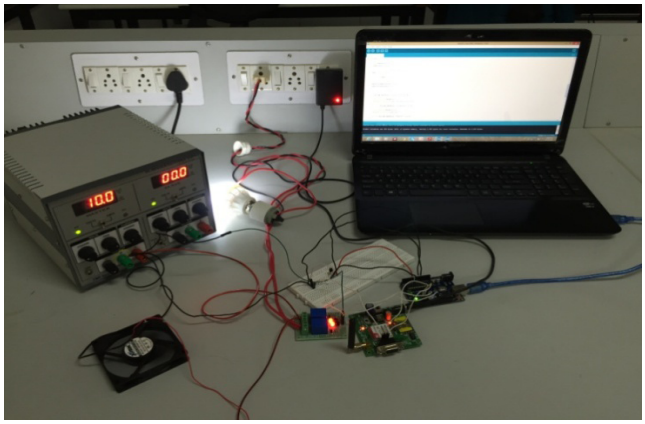


Figure 5. System set up to trip fan.

by sending messages which will trip the relay so that the fan will activate. Based on the threshold value if the water level is low in the tank, a warning message will be sent to the owner's mobile. From the same mobile owner can send a message back, to trip the relay so that water motor will turn ON. In the experimental setup instead of water motor a 220v bulb is used and it is shown in Figure 6.

4.2 Remote Monitoring

Remote monitoring will be achieved by using CC3200 launch pad. It is an ARM cortex- M4 based micro controller and consists of applications micro controller, Wi-Fi network processor, power management subsystem, 4 general purpose timers with PWM mode, upto 27 individually programmable and multiplexed GPIO pins, 4 channel 12 bit ADC's. For connecting the controller to the internet the mobile internet sharing is done. The experimental setup is shown in Figure 7.

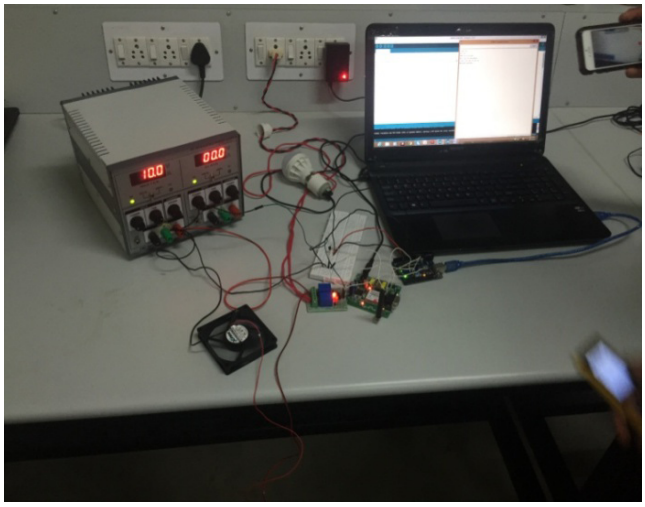


Figure 6. Controlling bulb by sending message.

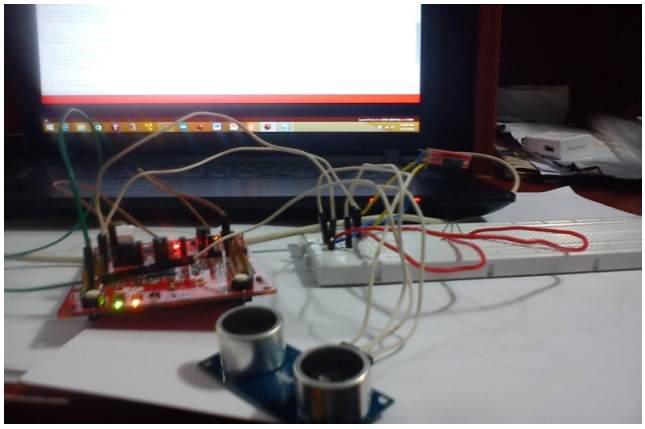


Figure 7. System setup for remote monitoring.

4.3 Algorithm

In this research remote monitoring is done by sending values to the Google spreadsheet.

Step 1: Make sure you have a Temboo account. If you don't have one, you have to register.

Step 2: Make sure that you've got the latest version of Energies.

Step 3: Since in this research remote monitoring is done through spread sheet, you'll also need Google account.

Step 4: Login to Google's Developer Console, and creates a new Project if you haven't done so already.

Step 5: Under APIs and auth > APIs, make sure you've enabled API Access to the Google Drive API.

Step 6: Under APIs and auth > Credentials, create a new Client ID and specify a Web application for the Application Type.

Step 7: When configuring the Consent Screen, make sure you fill the Email Address and Product Name fields.

Step 8: Save the Consent Screen details and specify this callback URL as the Authorized Redirect URI.

Step 9: Do authorization and specify the Client ID from the app you registered at Google and the following link, https://spreadsheets. google. com/feeds/ in, is entered in the scope scope field. Turn on IOT mode and make sure how your launch pad is connected to the internet.

Step 10: Accept the Url returned by the authorization process to grant the app, access to your Google account.

Step 11: Run final authorization process and it will generate refresh token that will be used in further steps.

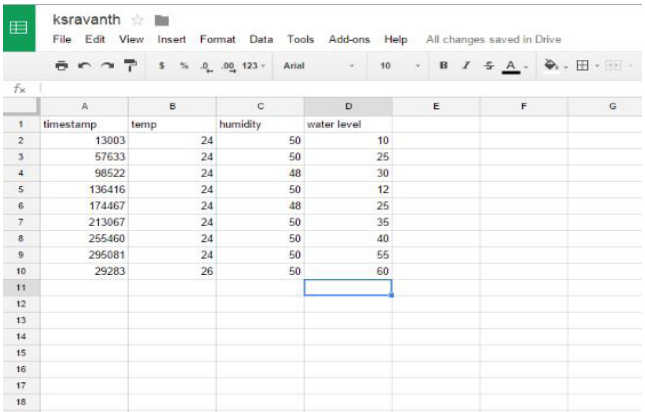
Step 12: Create a Google Spreadsheet. Give names to any columns you want to add data to. It doesn't matter what the column labels are, but there must be text in the first row.

Step 13: Append rows to send values dynamically.

After completion of all steps a code will be generated and do some modifications based on the basis of which sensor and how many sensors are used in the project and do the execution. After this process, you can see values from anywhere with the help of the created spread sheet. This is given in the Figure 8.

5. Results

In this paper, we have proposed a methodology to Alert, Control temperature, humidity, water level in a poultry farm. This work has been implemented is done with the help of Arduino UNO for controlling and alerting. CC3200 is used for organizing the data using a Google



	A	B	C	D	E	F	G
1	timestamp	temp	humidity	water level			
2	13003	24	50	10			
3	57633	24	50	25			
4	98522	24	48	30			
5	136416	24	50	12			
6	174467	24	48	25			
7	213067	24	50	35			
8	255460	24	50	40			
9	295081	24	50	55			
10	29283	26	50	60			
11							
12							
13							
14							
15							
16							
17							
18							

Figure 8. Remote monitoring of sensors.

spreadsheet. This method can be further applied in applications involving remote monitoring of various physical parameters.

6. Conclusion

Monitoring environmental parameters in a real time industry are crucial. In this paper, various environmental parameters for effective growth of chickens have been identified and defined. It also explains the method to switch on either sprinkler or water motor based on threshold values of temperature and water level. As well as remote monitoring is done and with the help of this facility, the person in-charge can observe the situation and can react quickly if anything wrong happens.

7. Future Scope

There have been various survey's that have been carried out in places like Saudi Arabia and Japan and it was inferred that most of the chickens were usually affected by the avian influenza virus. Poultry farms usually provide plenty of animal waste and by using that, goober gas can be developed and can be used for daily energy requirements. Hence, it's very important to maintain the proper environment for the chickens. The health of the chicken at an early age is something to be taken care of as there is chance of chicks competing with each other for survival. Air inflow to the poultry farm also is important so while constructing the farm itself proper care should be taken. Studies have shown that, the effective growth of the chickens depends on the amount of ammonia present in the surroundings. Hence this also provides a scope for future study.

8. References

1. So-In C, Poolsanguan S, Rujirakul K. A hybrid mobile environmental and population density management system for smart poultry farms. Computers and Electronics in Agriculture. 2014; 109:287–301.
2. Okada H, Suzuki K, Kenji T, Itoh T. Avian influenza surveillance system in poultry farms using wireless sensor network. EDA Publishing/DTIP; 2010.
3. Nichols EL, IV. An automatic psychrohgter sensor for poultry farming. IEEE Transaction on Health.1992 Jun.
4. Okada H, Nogami H, Kobayashi T, Masuda T, Itoh T. Development of ultra low power wireless sensor node with piezoelectric accelerometer for health monitoring. The 17th International Conference on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS & EUROSENSORS XXVII); IEEE; 2013 Jun.
5. Islam MS, Islam A, Islam MZ, Basher E. Stability analysis of standalone biogas power plants in poultry farms of Bangladesh. IEEE Transaction on Power System. 2011 Aug.
6. Corbanie EA, Remona JP, Reeth KV, Landman WJM, van Eck JHH, Vervaet C. Spray drying of an attenuated live New castle disease vaccine virus intended for respiratory mass vaccination of poultry. Vaccine. 2007 Oct; 25(49):8306-17.
7. Kelleher BP, Leahy JJ, Henihan AM, O'Dwyer TF, Sutton D, Leahy MJ. Advances in poultry litter disposal technology – A review. Bioresour Technol. 2002 May; 83(1):27–36.
8. Blanes-Vidal V, Guijarro E, Balasch S, Torres AG. Application of computational fluid dynamics to the prediction of airflow in a mechanically ventilated commercial poultry building. Biosystems Engineering. 2008 May; 100(1):105–16.
9. Sallabi F, Fadel M, Hussein A, Jaffar A, El Khatib A. Design and implementation of an electronic mobile poultry production documentation system. Computers and Electronics in Agriculture. 2011 Mar; 76(1):28–37.