

IOT BASED SMART POULTRY FARM MONITORING & CONTROLLING USING EMBEDDED SYSTEM

¹Miss. Supriya Kale, ²Mr. P. Balaramudu

Department of Electronic & Telecommunication Engg,
Sahyadri Valley College of Engineering & Technology, Rajuri, Pune, India.
Corresponding Author:kale.supriya12@gmail.com

ABSTRACT

IoT is a revolutionary technology that represents the future of communication & computing. Now days IoT is used in every field like smart homes, smart traffic control, smart cities etc. The area of implementation of IoT is vast and can be implemented in every field. This paper is about the implementation of IoT in Poultry Farming. IoT helps in better management, better resource management, cost efficient farming, improved quality and quantity, birds and animal monitoring and field monitoring etc. can be done. The sensors used in proposed model are air temperature sensor, air quality sensor, humidity sensor, etc. In this paper typical agriculture methods used by farmers these days and what are the problems they face are discusses, for more information about new technologies in farming. The proposed model is a simple architecture of IoT, in which sensors collect information and send it to arduino. Then this data values send to raspberry pi and compared this data values with threshold value to control the environmental condition inside poultry farm. A smart farm operates on both automatic and manual modes, for various operations. The controller keeps monitoring the temperature, humidity, air quality and brightness inside the field.

KEYWORDS—DHT11; LDR;MQ 135;Arduino; Raspberry PI;

INTRODUCTION

Agriculture and allied activities play a vital role in a country's economic prosperity. The conventional methods in agricultural practices have become grossly inadequate to cater to the increasing needs. Thus it has become imperative to adopt novel technologies to raise agricultural standards. Smart Farming is an emerging concept, because IOT sensors are capable of providing information about farms and then act upon based on the user input. In this Paper, it is proposed to develop a Smart Farming System that uses advantages of cutting edge technologies such as Raspberry pi, Arduino and IOT. The paper aims at making use of evolving technology i.e. IOT and smart farming using automation. Monitoring environmental conditions is the major factor to improve yield of the chickens in the poultry. The feature of this paper includes development of a system which can monitor temperature, humidity, brightness inside field through sensors using Arduino board and raspberry pi display that data to remote location with the help of webserver on webpage. If there are any changes in environmental condition then notification and current data values sends on the application developed for the same to the farmer's smartphone/computer using Wi-Fi/3G/4G. The system has a duplex communication link based on a cellular-Internet interface that allows for data inspection and controlling inside conditions to be programmed through an android application. Because of its energy autonomy and low cost, the system has the potential to be useful for farmers.

The growth of chicken depends on the environmental condition such as temperature, humidity, air quality, gases etc. inside the poultry farm. If the environmental condition is not suitable for chickens then there may be problem

with growth of the chicken and there health issues. Healthy chicken grows rapidly and having good demand in the market. Poultry farm are design in such way that, environmental conditions can be control by providing facilities like ventilation, cooling and lightening on rough, wall and floor. The birds are surrounded by micro level climate and it is very much important for the health of the birds.

Day by day a research on advance automation technologies will increases and it is mainly focused on modern technologies for a poultry farming to monitor and control all environmental parameters like temperature, humidity, air quality, gases concentration which effects on the growth or health of the chickens. If the environmental condition are not suitable or at threshold adjust level then there may be harmful for digestive, respiratory and behavioral change in the chickens. If chickens may get suitable atmospheric condition and proper food then it may grow rapidly and health of chickens will be good so the weight of the chickens will be increases in a given span of time. Not only food but also climate plays very important role in the growth of the chicken. Smart Poultry farm designed in way so that the climate conditions can be control or adjust by ventilations, cooling and heater, etc. so we get best production of chickens in a given span of time period. Due to this production increases and also it effects on income of farmers.

SYSTEM MODEL

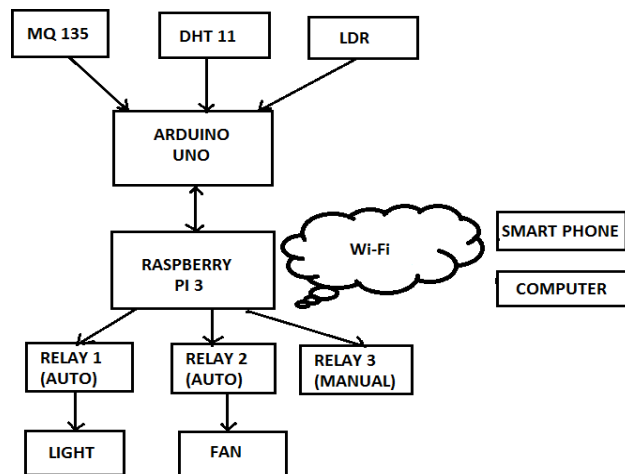


Fig. 1: Block Diagram

of Proposed System

PROBLEM FORMULATION

In the April 2015, Siwakorn Jindarat had developed a system, Smart Farm monitoring using Raspberry Pi and Arduino Uno” in that system mobile communication network is used for communication between farm and the user, but in that there is some disadvantages such as unavailability of network, number of users are limited, and information access is only possible on smart phone. Also in that system only automatic mode is available but in this proposed system both automatic and manual mode are available, so we can operate such system by Auto or Manual mode according to the requirement. For the communication between Farm and User we create a own small network, so that not only number of user can access data or information but also on any device such as laptop, computer, tablet, smart phone, etc.

Arduino Uno and Raspberry Pi 3 is main system in this developed system. It is used to control, monitor and decision making about the environmental condition inside the poultry farm. Raspberry Pi hardware has several versions that feature variations in hardware performance, memory capacity, and peripheral device support.

The developed system monitors and read all environmental parameters inside poultry farm by Arduino uno controller. After reading all data by Arduino, then it insert data into database and checking current data value with



predefine data value. If, input data value crossed the threshold value (predefine adjust value) then it will send high output to the port. If value is below the threshold level (predefine adjust value) then it will again start reading environmental parameters. In this developed system, the three different parameters are monitor for poultry farm such as temperature, humidity and luminescence. For humidity when the input data value of humidity goes above the threshold value then FAN OUT will be ON to control the humidity inside the poultry farm. If no then it will again start reading environmental data. Similarly for luminescence, if luminescence change is high then light will be ON, if no it will again start reading environmental data. All the real time notifications and results will be alert on Computer/Smart Phone/Laptop via IOT. This developed system will generate alert notification if any value of environmental condition will changed. The electronic devices such smart phone, desktop computer or laptop display values of temperature, humidity, gases and light intensity. The real time values of environmental condition are stored into database table and these values are further used for predictive analysis. Outputs of temperature, humidity and light sensors are fed to raspberry pi via Arduino, so according to sensor output environmental condition are control by turning on/off by fan, light, etc. and also the respective sensors values are shown on web page using IOT application..

HARDWARE

A. Raspberry Pi

Raspberry Pi is a cost effective yet, reasonably powerful solution that is perfect for this use case. This model of the small single-board pc is especially useful because it has a built-in Wi-Fi module. This enables us to save on the cost of an extra Wi-Fi module that would have been needed otherwise. Raspberry Pi is a mini computer which working on the Linux operating system that connects to a computer monitor, keyboard, and mouse. The simplest use for a raspberry pi is as a desktop computer. Along with the raspberry pi itself, micro SD card, and power supply, we need a HDMI cable and a suitable display.

B. Arduino

Arduino can connect to a computer via USB port (Universal Serial Bus) and perform with connected accessories in both analog and digital signal. Arduino uno is an open-source controller compatible with developed platforms. Arduino boards are able to read inputs, light on a sensor, a finger on a button, or a Twitter message and turn it into an output such as activating a motor, turning on an LED, publishing something online. Arduino has onboard analog to digital converter, so we can easily operate with analog signal.

C. Gas sensor

The MQ-135 is a cheap but efficient way to detect the air quality. It is capable of sensing the presence of various gases. It is used to detect gas leakage in household and industry. It is suitable for detecting LPG, i-butane, Propane, Methane, Alcohol, Hydrogen and Smoke. MQ-135 is selected due to its fast response, adjustable sensitivity and useful for gas leakage detecting Grove connector.

D. Humidity sensor

DHT11 sensor is used to read the temperature and humidity inside poultry farm. The data is received in the form of digital waves. Humidity sensor used to sense, measure and regularly reports the relative humidity in the air. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor includes a capacitive sensor wet components, high-precision temperature measurement devices and connected with a high- performance 8 bit microcontroller. The product has excellent quality, fast response, strong anti-jamming capability and high cost. The air is warmer, it can hold more moisture. So that relative humidity changes with fluctuations in temperature.

E. LDR

A Light Dependent Resistor (LDR) is also called a photo-resistor or photoconductor or cadmium sulfide (CdS) cell. It is basically works on the principle of photoconductivity. The passive component is basically a resistor whose resistance value decreases when the intensity of light increases. This sensor is used to monitor the amount of light falls inside poultry and based on this amount; it can be determined whether the Light bulb is ON or OFF condition. Optimal amount of light is needed for its proper growth.

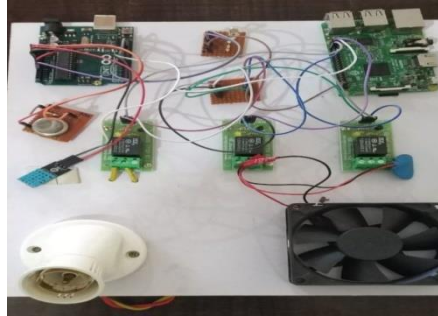


Fig. 2: Show the Hardware connection of the system growth.

SOFTWARE

A. Python

Python 3 must be installed on the server. This is used to run and train the machine learning models. It is the default and widely used implementation of the Python. Python doesn't convert its code into machine code, something that hardware can understand. It actually converts it into something called byte code.

PHP

PHP is a widely used open source general purpose scripting language that is especially suited for web development and can be embedded into HTML. PHP code may be executed with a command line interface, embedded into HTML code, or used in combination with various web template systems, web content management systems and web frameworks. The web server outputs the results of the interpreted and executed PHP code, which may be any type of data, such as generated HTML code or binary image.

Fig. 3: Flowchart of the System.

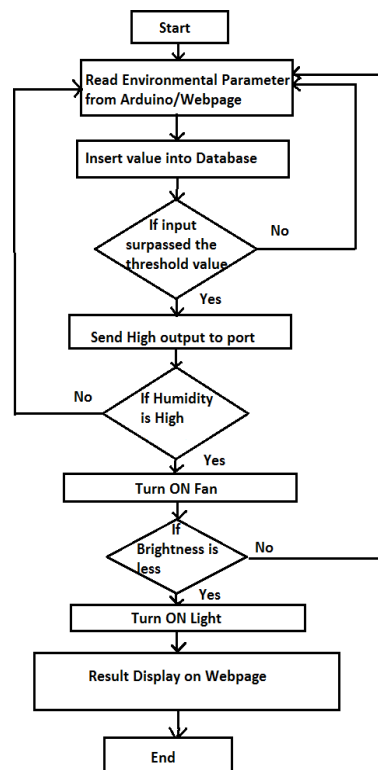


Figure show the flow chart of developed IOT based smart poultry farm system; it gives the flow of the developed system operating. Firstly, arduino uno measured the data value of sensors and compared this value with predefine adjust value, if input value crosses the threshold then particular notification is send to webpage vie internet and also particular controlling device should turn on/off with the help of raspberry pi. In this, arduino uno only measured the sensor output value, and this data is communicate with raspberry pi via USB and raspberry pi control this particular environmental condition with the help of external device.

RESULT ANALYSIS

The system developed has in poultry farm to test the environmental conditions and climate of a chicken farm, using the default configuration notifications. The main screen of webpage display firstly login form to allow the users for accessing information of sensors.



Fig. 4: Login Screen of Webpage

After successfully accessing the user name and password, then it will display dashboard screen which give the value of the farm environment conditions such as current temperature, moisture in the air, light, air quality, etc. We can also control the environmental condition inside the farm by automatically as well as manually. System also displays the controls of lights and fans, by selecting auto or manual mode.

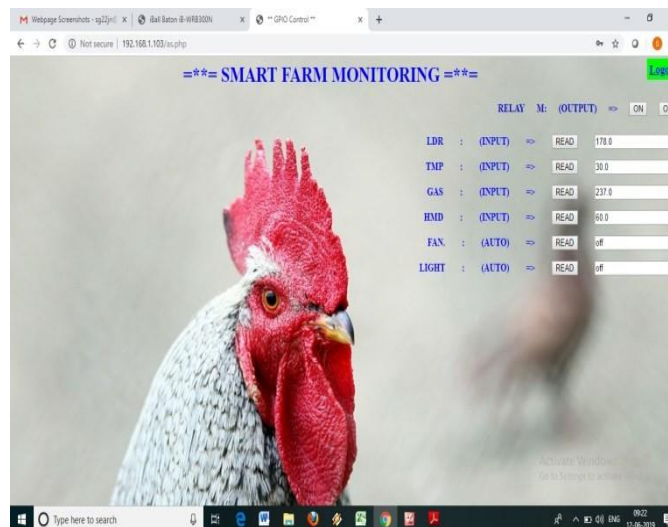


Fig. 5: Screen shows the output value of sensors

CONCLUSION

A very efficient solution for ensuring affordable smart farming has been developed. The novelty of the solution proposed lies in the cost efficiency and practicality of the project. This project ultimately aims at reducing the amount of manual labour required to be done by the poultry farmer. It also aims at helping the farmer be more at ease about his chickens by giving him real time updates and complete control over his field from anywhere in the world. The implemented system has been tested over poultry/chicken farm and it is been found that system is working very well. This implanted system will change the traditional farm into “Automatic Smart Farm”.

REFERENCES

- [1] Manakant Intarakamhaeng and et al, “The Model Farm Management Automation Technology with RFID”, Pathumthani office of Science and Technology,2008.
- [2] Md Saifudaullah Bin Bahrudin and Rosni Abu Kassim,”Development of Fire Alarm System using Raspberry Pi and Arduino Uno”,Faculty of electricalEngineering University Teknoloi MARA Selangor,Malaysia,2013.
- [3] Kumar, A. and Hancke,G.P.”A Zigbee-based Animal Health Monitoring System”,Senior Member,IEEE,2013.
- [4] Boopathy.S 1, Satheesh kumar.M 2, Mohamed Feroz.A 3, Dinesh.R 4 PG Student, Department of Embedded System Technologies Anna University, Regional Centre, Coimbatore, India, 2 ,3, 4, “Performance Optimization of Poultry Farm By Using Instrumentation with Help of Embedded Automation,” International Journal of Innovative Research in Science, Engineering and Technology An ISO 3297: 2007 Certified Organization, Volume 3, Special Issue 1, February 2014 International Conference on Engineering Technology and Science- (ICETS’14)
- [5] Drishti Kanjilal, Divyata Singh, Rakhi Reddy, Prof Jimmy Mathew, “Smart Farm:Extending Automation To The Farm Level,” International Journal of Innovative Research in Science, Engineering and Technology, ISSUE 7, JULY 2014, ISSN 2277-8616.
- [6] Siwakorn Jindarat, Pongpisitt Wuttidittachotti, “Smart Farm monitoring using Raspberry Pi and Arduino”, IEEE 2015 International conference on computer, communication and control technology, April 2015.
- [7] Rupesh Muttha, Sanket N. Deshpande, Megha A. Chaudhari, Prof.N. P. Wagh, “PLC based Poultry automation system”,International Journal of science and research, Vol: 3, Issue: 3, June 2014.
- [8] Eben Upton, Gareth Halfacree,”Raspberry Pi User Guide”, 4th edition May 2016.
- [9] Simon Monk,”Programming the Raspberry Pi”,2nd edition, Getting started with pythonUnited State of America: O Reilly Media, oct 2015.