Automatic Monitoring and Controlling System for Broiler House

Rohan D. Ramdurge [1], Dr. Mahadev S. Patil [2]

PG Student, Department of E&TC Engineering, Rajarambapu Institute of Technology, Islampur, India [1]

Professor, Department of Electronics Engineering, Rajarambapu Institute of Technology, Islampur, India [2]

Abstract: The most of small scale poultry farms are situated in rural areas. Generally farmers do not get adequate fund and advanced tools for their farms, so most of these farms had simple facilities and the automated level is low. Especially farmers are lagging in field of automation and control conditions of farms. With the development and popularization of the embedded technology, it is possible to develop automation system for small scale poultry farm. Hence the proposed system consist of Environment monitoring, water level management, heating bulb system control, broiler house illumination control and curtain open/close controlling. The system also provides remote access to farmer. Hence farmer is able to monitor these sections using his mobile.

Keywords: WSN, GSM, RTC.

I. INTRODUCTION

India is world's second largest emerging economy and along with it has rapidly growing poultry sector. Poultry is one of the fastest growing sectors in India with an average growth rate of 12 % for broiler production per annum [5]. The most of small scale poultry farms are situated in rural areas. Generally farmers do not get adequate fund and advanced tools for their farms, so most of these farms had simple facilities and the automated level is low.

The environment conditions of farms basically affect initial growth of livestock that means there is weight loss in birds [2], so farmers do not get appropriate weight of birds at the end which is not profitable for farmers. Especially farmers are lagging in field of automation and control conditions of farms.

With the development and popularization of the embedded technology, it is possible to develop a system for small scale poultry farm. There are few systems developed using PLC to provide automation [2]. These PLC based systems are costly.

Now days, there are some sensor networks developed to monitor environment parameter using Crossbow's Telos B motes. These WSN networks are developed for large poultry houses so such WSN could not affordable for small scale poultry farms. In some systems, the environment parameters are monitored using WSN network and farmers monitor these parameters with help of internet facility. The most of scale poultry farms are situated in rural areas so these may not be helpful due to lack of internet connectivity.

Hence in proposed system, we have developed low cost WSN network using Bluetooth module with help of pic microcontroller. The system consist of environment monitoring, water level management, display section, ventilation control system and illumination control.

II. OBJECTIVES

• Environment monitoring of poultry farm which helps to avoid adverse effect on livestock
• Reduce dependencies of labours which reduce production cost and increase profit
• Minimise power consumption
• Provide efficient lighting for poultry house

III. DESIGN METHODOLOGY

A. System Block Diagram
Fig1. Shows system block diagram which is divided in five parts such as farm environment monitoring, water level management, ventilation system, farm light controlling and display section.

In environment monitoring, the system monitors the parameter such as temperature, humidity, ammonia (NH3) gas and rain water. In this, it will collect these parameters using three wireless nodes and send to the master controller [3].
Master controller will check whether these parameters are in acceptable range. If one of the parameters is not in acceptable level, there is an indication related to that parameter.

In water level management, the sensor is mounted on top of the tank to check the level of water. If there is no sufficient water, microcontroller will start pumping motor to fill the tank. If farmer wants to know water in the tank, he will get message (SMS) to his mobile and he will be able to turn On/Off motor using mobile.

To display current time environment conditions such as temperature, humidity and ammonia concentration in air, along with level of water in tank, there will be LCD based display section. Display section continuously displays current environment conditions of poultry farm, suitable for user when he is in poultry farm.
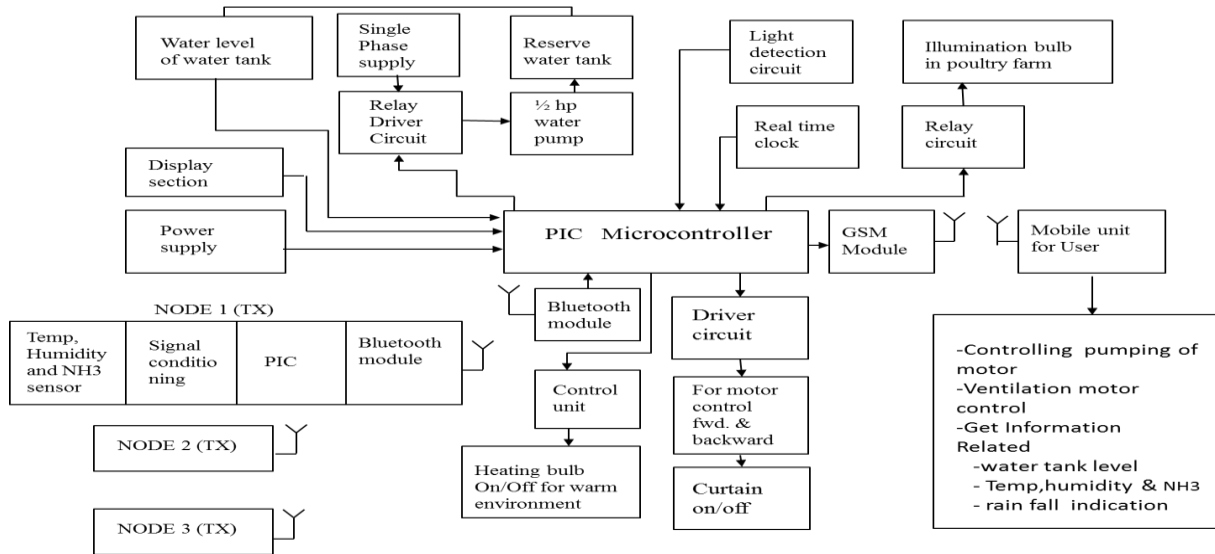
Fig.1 System Block Diagram

To provide ventilation to chicks in poultry farm, the curtains are opened/closed using motors which are driven by microcontroller. The microcontroller takes decision depend on feedback from environment monitoring sensors, it helps to keep adequate environment for chicks in poultry farm.

To provide warm environment to birds, many incandescent bulbs are used. As per feedback from temperature sensors, the controller controls switching of heating bulbs in order to maintain the temperature and minimize power consumption. In order to control lighting system of farm, microcontroller uses light detection sensor and real time clock. To communicate with user mobile, the system contain GSM module.

B. Software Development
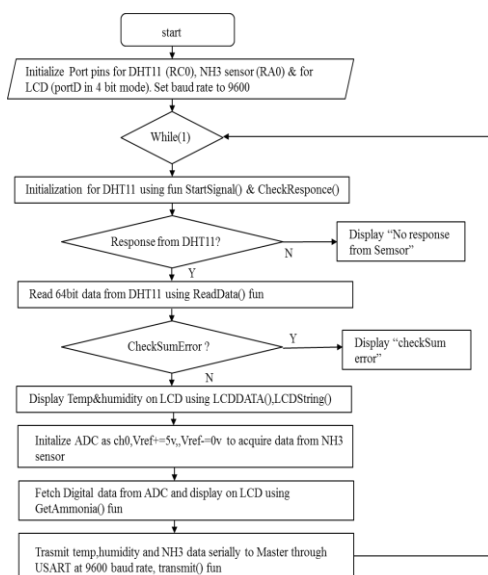1. software development of node:

Fig. 2 flow chart for Node (Slave)

Fig. 2 shows the flow chart of Node that is slave. The node acquires three environment parameter of poultry farm such as temperature, humidity and NH3 concentration. Node send serially acquired data to Master controller using USART at baud rate of 9600 for further process [4].

2. Algorithm for master controller:
1)   Start
2)   Initialization of RTC module
3)   Assign Port Pins for Level sensor ,Light sensor, rain sensor as well as heating bulb control, motor control and curtain motor control
4)   Initialization of interrupts (Port B change interrupts)
5)   Configure Port A pins for 4 bit Mode LCD interfacing
6)   LCD initialization
7)   Initial level check of water tank
8)   While(1)that is infinite loop

a)   Display message on LCD "Broiler House"
b)   Display Date and Time on LCD
c)   Send acknowledgement to slave controller serially at baud rate of 9600
d)   Receive data from slaves serially at baud rate of 9600
e)   Display Temperature ,Humidity and NH3 concentration on LCD
f)   Check received temperature is in within range or not?
i)   If (temp<=31) then Heat1=1 that is high intensity bulb is ON
ii)   Else if (temp>=32 && temp<=35) then Heat2=1 that is low intensity bulb is Off
iii)   Else if (temp>=36) then both heating bulbs are off
g)   Display acquired temperature, humidity and Nh3 sensor on LCD
h)   GSM initialization
i)   Display message on LCD "Message Transfer"
j)   Message send to farmer contain water level, motor control, illumination status, temperature ,humidity and NH3 sensor

28

k)   The master controller sense the level of water tank as well as it receives data serially from different nodes. Master controller also provides rain detection and light detection. RTC module is also interfaced with microcontroller to show current date and time. LCD display is provided to show current environmental condition of poultry farm.

IV. IMPLEMENTED ISSUES AND SYSTEM RELIABILITY

In this system, Bluetooth module HC05 used to form wireless sensor network. The Bluetooth module has transmission range up to 10meters. So there system has implemented for small broiler house. As the sensor nodes deployed in field so there may be chance of degrading in sensor performance. Sensor nodes operated on portable battery so battery got drained within several days.

V. RESULTS

To monitor environmental condition of broiler house, nodes are developed which acquire temperature and humidity surrounding as shown in fig.3. The signal conditioning circuit is developed for DHT11 and MQ135 sensor which shown in fig.3.1 and fig.3.2. The developed node acquires parameters using sensor and sends serially to master at the baud rate of 9600.Master receives data with help of master Bluetooth module which is shown in fig.6. In order to provide efficient lighting system to broiler house, the light detection circuit is developed along with relay based switching circuit. The RTC module is also interfaced to master controller to provide efficient lighting to broiler house. The fig.7.shows Light detection circuit with switching control circuit. Rain detection circuit is developed as shown in fig.8, to give rainfall warning. To sense water level of tank, low cost transistor based level sensing circuit is developed. The fig.9 shows level detection circuit. Electronic assembly required for curtain opening and closing circuit is as shown in fig.10

Fig.3.2 MQ135 along with signal conditioning (NH3 sensor)
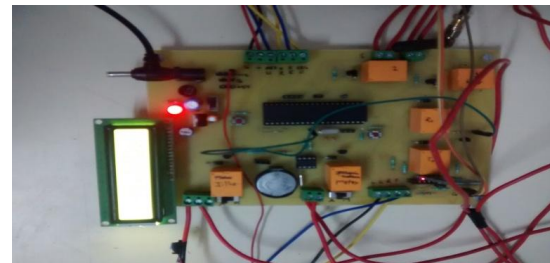

Fig .4 Deployment of node in actual field

Fig .5 Master controller with 16x2 LCD, HC-05 Bluetooth, RTC DS1307 and Relay controlling circuit

Time (Hr:Min:Sec)	Temperature (^{0}C)	Relative Humidity (%)
10:30:40	34	24
16:36:12	36	22
20:40:30	33	25

Table.1 Parameters acquired by master from wireless nodes

Fig. 3 Developed Node along with Bluetooth module

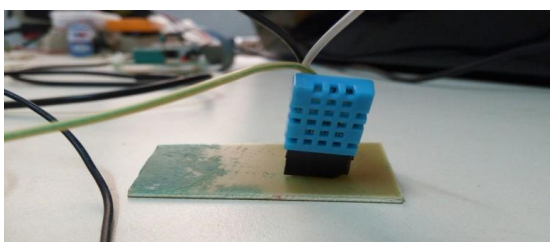Fig.6 Master controller shows recevied data using 16x2 LCD based display section

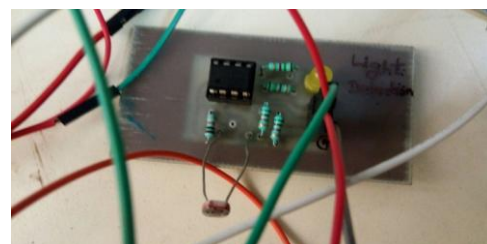Fig.3.1 DHT11 Sensor (Temperature and Humidity Sensor)

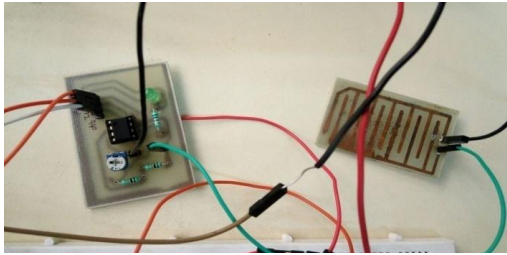Fig.7 LDR based Light detection sensor
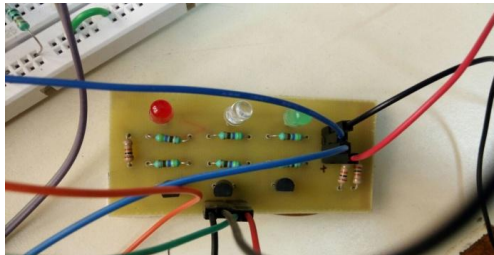
Fig.8 Rain fall detection circuit
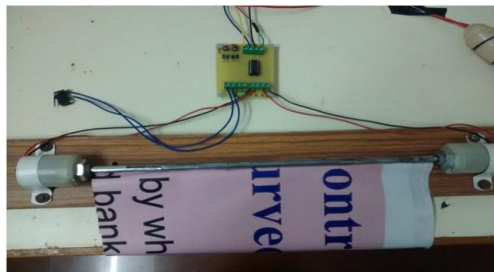
Fig.9 Water tank level sensing circuit

Fig.10-curtain open-close system

VI. CONCLUSION

Temperature, humidity and NH3 concentration of surrounding environment has been measured with the help of developed node. With help of node, farmer gets current environment condition of poultry farm. Water management easily managed with help of level measurement circuit in poultry farm. Here we have developed light detection circuit to control illumination system of poultry farm. Rain fall detection circuit is also developed to take preventive action such as closing of curtains. The RTC module is interfaced with controller to display current date and time. The GSM module is provided to send current status of broiler house to Farmer on mobile.

REFERENCES

[1] Nikolay Mihaliov, Daniel Todorov Lyubeniliev.(2014) "Investigation of an Efficient Poultry Lighting Solution",IEEE conference,978(1),4799-5817.
[2] Rupesh I. Mutta, Sanket N. Deshpande & Megha A. Chaudhari.(2014),"PLC Based Poultry Automation System",International Journal of Scientific Research ,3(6),2277-8179.
[3] Gopal Krishna Moorthy,Dr C.Yasshuwanth & Venkatesh K.(2014)," A Wireless Remote Monitoring of Agriculture Using Zigbee",International Journal of Scientific Research ,2(8),2277-3754.
[4] Mazidi, Mckinlay,Causey (2008),"PIC Microcontroller & Embedded Systems using assembly & C for PIC18", 1st edition,Pearson publication, South Asia.
[5] http://www.poultec.net/en/default.asp,29Aug 2015.