

Smart Poultry Farm: An Integrated Solution Using WSN and GPRS Based Network

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Abstract- In contemporary poultry farm, automation plays a very important role. We focus on the integration of wireless sensors and GPRS network to control and automatically monitor environmental parameters in a poultry farm. The environmental parameters like temperature, humidity, ammonia gas control etc. The person in-charge can able to get the internal environmental situation of poultry farm by receiving a message on registered mobile number. System will initiate the action automatically to control the environmental parameters when there is a sudden change in climate. Water level control and food control mechanism is also monitored and controlled with the help of sensor. All the sensors are connected with the ATMEGA324A microcontroller, which can control and monitor all data. The detail record of poultry farm with environmental condition is later viewed on a webpage. Thus the system design provides an efficient automated poultry farm monitoring system to monitor the healthy atmosphere for chickens in poultry farm without human interference.

Keywords– Poultry Farming, ATMEGA324A Micro-Controller, Wireless sensors

I. INTRODUCTION

Day by day automation technologies come up with new and innovative ideas. This research focused on modern technologies for a poultry farming to control all environmental parameters like temperature, humidity, ammonia gas which affects on the growth of the chickens. If the environmental condition is not up to the mark then there may be harmful for digestive, respiratory and behavioural change in the chickens. If chickens may get suitable atmosphere and proper food then it may grow rapidly and health of chickens will be good so the weight of the chickens will be increases. Climate plays very important role in the growth of the chicken. Smart Poultry farm designed in way so that the climate can be changed by ventilations, cooling and heater. Now monitoring and controlling of NH₃ that is ammonia gas. The parameters, Ammonia gas, Water Level, Humidity and Temperature are monitored and controlled

using microcontroller. The transmitted data should be receive by receiver and then transmitted to the GPRS through the microcontroller. Data will be saved and update on the webpage.

II. RELATED WORK

Muhammad Ammad Uddin, et. al has established, a technique to improve the productivity of a chicken farm by using a modern technology of wireless sensor networks. Here author has divide poultry farming in two type (1) Production of Egg and (2) Production of Meat. By using the application of wireless sensor network quality of chicken can by improve ultimately lead to improve the human health. In this paper quthor says that wearable wireless sensor can detect the infected chickens. the overall production, quality and economy can be improved by the system. [1]

K. Sravanth Goud, et. al has elaborated the advanced technique of wireless sensor network and mobile network to control n automatically moniroe the environmental parameters of poultry. Person can able to monitor environmental parameters by sending SMS back to the system. Parameters like temperature and humidity. If system does'nt receive command from redister mobie number. Then it will automatically perform its action. Hence by using this modern technique system can provide a modern technique for farm automation. [2]

Siwakorn Jindarat, et. al has designed, an Intelligent system over the Embedded system and smart phone for poultry management. To solve the problem author as used Raspberry Pi and Arduino Uno. This system should monitor the surrounding parameters of poultry environment including humidity, temperature, climate quality, the filter fan switches. This system is found very simple and useful for formers, as they can effectively control the poultry farm at anytime and from anywhere. [3]

Rupesh I. Muttha, et al. has studied the difference between traditional poultry farming and modern poultry farming. It is observed that modern chicken farming is more easy and useful as compare to traditional chicken farming. With the

help of modern technique it is also possible to monitor the environmental conditions like humidity and temperature. For a complete care of chicken it is important to monitor and control the environment of poultry for the better growth of chickens. The Poultry sheds can be controlled 24 hours by automation. It is help to provide an optimum output by reducing man power in poultry. [4]

Boopathy. S, et al. has describes that the measurement of different parameters in poultry farm such as temperature, humidity, level of water and valve control. In this, temperature sensor calibration has been done by help of two point formula. The level sensor outputs have been analyzed with respect to fuel in the generator. From the result of sensor output linearization of the particular instrument has been described. [5]

III. SYSTEM DESIGN

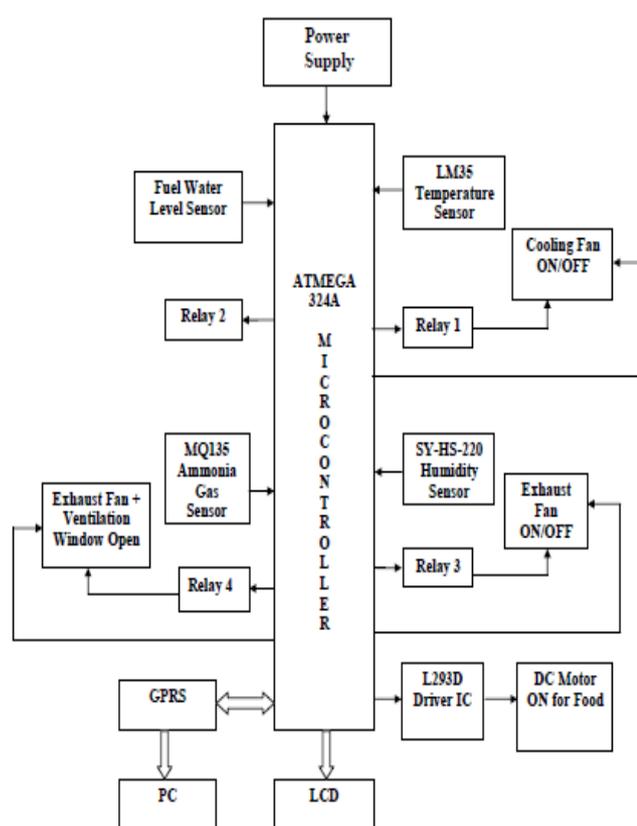


Fig 1: Block Diagram

ATMEGA324A has been used as a microcontroller. All the sensors are along with microcontroller. LM35 has been used as a temperature sensor, which can monitor and observed the environmental temperature and send the information to the microcontroller which can sense the current data and perform action according to that. When temperature goes beyond threshold value then automatically cooling fan will be ON to control the internal temperature of poultry. Once, the temperature is below the threshold value cooling fan will

automatically turn OFF. Similarly, SYHS22 is used as a humidity sensor. This can monitor and observed the environmental humidity and send the information to the microcontroller which can sense the data and perform action according to current value of humidity in a poultry farm. When humidity goes beyond threshold value then to control that humidity Exhaust fan will automatically ON.

Once, internal humidity of poultry farm is under control then fan will automatically turn OFF. MQ135 is used as a gas sensor. There are number of gases in a air like CO₂, CO, H₂S, CH₄, NH₃ etc. Here focus on the ammonia gas (NH₃) in the air. Because, mainly ammonia gas is affected on the growth of the chickens, it may causes several disease like Hand Foot disease, Mouth disease, Bird Flu etc. The threshold value of ammonia is 40%. When percentage of ammonia gas in a air is goes beyond the threshold value which is fixed in a system, then to control the percentage of ammonia in a air Ventilation Window will be open and Exhaust Fan will be ON.

Once, the ammonia gas in a poultry environment is under control fan will automatically turn OFF. Food control mechanism and water level control mechanism for a poultry farm has been designed. It has been able to provide a food to the chickens as per the requirement. So food should not get waste and health of the chicken will automatically monitor. The aim of design a food control mechanism is to avoid the wastage of food. Sometimes, when there is a sudden change in a climate chickens refused to have food, and if we providing continuous food to them then it may possible that food should be dirty because of the poultry wastage. So, whenever food has required that time only container will drop grains in a base container. To sense the amount of food load sensor has been plotted at the base container. So it is able to sense the weight of the grains, once the weight is low or empty it will sense it and drop grains in a base container. Similarly, Level Sensor has fixed in a water tank to measure the level of water.

The threshold value of water level has fixed. Once, the water level goes beyond that fix level then water may fill in that the tank. All the environmental data should be display on the LCD display. It displays the data like temperature, humidity, ammonia gas and water level. ATMEGA324A interface with GPRS module. All current environmental data of poultry should be get on mobile by message on a registered mobile number in a system.

IV. HARDWARE DESCRITION

Atmega324A is connected with the all the sensors like LM35 as a temperature sensor, MQ135 as a ammonia sensor, SYHS22 as a humidity sensor, Load sensor and Level sensor. Here GPRS module is used as GSM for sending SMS on

Registered mobile number as well as it send data to webpage. All environmental data monitor and observed by microcontroller will be display on LCD display.

1. ATMEGA324A Microcontroller

Having instruction set with 32 bit General purpose registers. Atmega having advanced RISC architecture. It is non-volatile by nature. The operating voltage required for Atmega is 2.7v to 5.5v. here we are providing voltage for microcontroller is 5V. Operating frequency required for atmega is 16MHz.



Fig 2: Atmega324A Microcontroller

2. TEMPERATURE SENSOR LM35

LM35 is a common temperature sensor. It is easily available in market. Voltage range is 4v to 30v. Here we have provided 5v. Range of temperature is between -55°C to $+150^{\circ}\text{C}$. it is easily suitable for remote application.

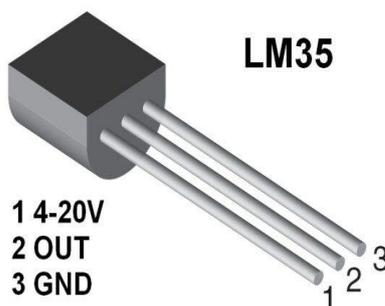


Fig 3: Temperature Sensor LM35

3. HUMIDITY SENSOR SY-HS-220

This humidity sensor is operate on DC. Range of this humidity sensor is 30-90° c RH. Humidity sensor is an analog sensor and gives the output into form of analog signal. This signal is feed to ADC which will convert it into digital form. Once converted into analog form, the microcontroller can process the digital humidity signal as per the application.

This sensor gives the value of change in humidity in the atmosphere as per the application.



Fig 4: Humidity Sensor SY-HS-220

4. AMMONIA GAS SENSOR MQ135

MQ135 is a gas sensor. It can recognise different number of gases like CO_2 , CH_4 , CO , NH_3 , it is highly sensitive for propane, butane, LPG. MQ135 having good sensitivity to Combustible gas in wide range. MQ135 has long life and simple drive circuit. The cost of MQ135 is very low.



Fig 5: Gas Sensor MQ135

5. LEVEL SENSOR

Fuel sensor is used to calibrate the fuel available in a fuel tank. It is basically used in petrol tank of two wheeler to detect the level of petrol. Here to measure the level of water in a poultry farm we have used the Level sensors.



Fig 6: Level Sensor

6. GPRS

GPRS is nothing but the General Packet Radio Services. It is used for sending SMS and broadcasting purpose. It is Always on and having internet access. Internet applications for smart devices through wireless application protocol. SMS

transmission speed of about 30 SMS messages per minute.. This is more faster than the ordinary SMS over GSM, whose SMS transmission speed is about 6 to 10 SMS messages per minute.



Fig 7: GPRS Module

V. FLOW CHART

The flow chart explains the functionality of the working model. The system monitor and read all environmental parameters in poultry farm by Atmega324A microcontroller.

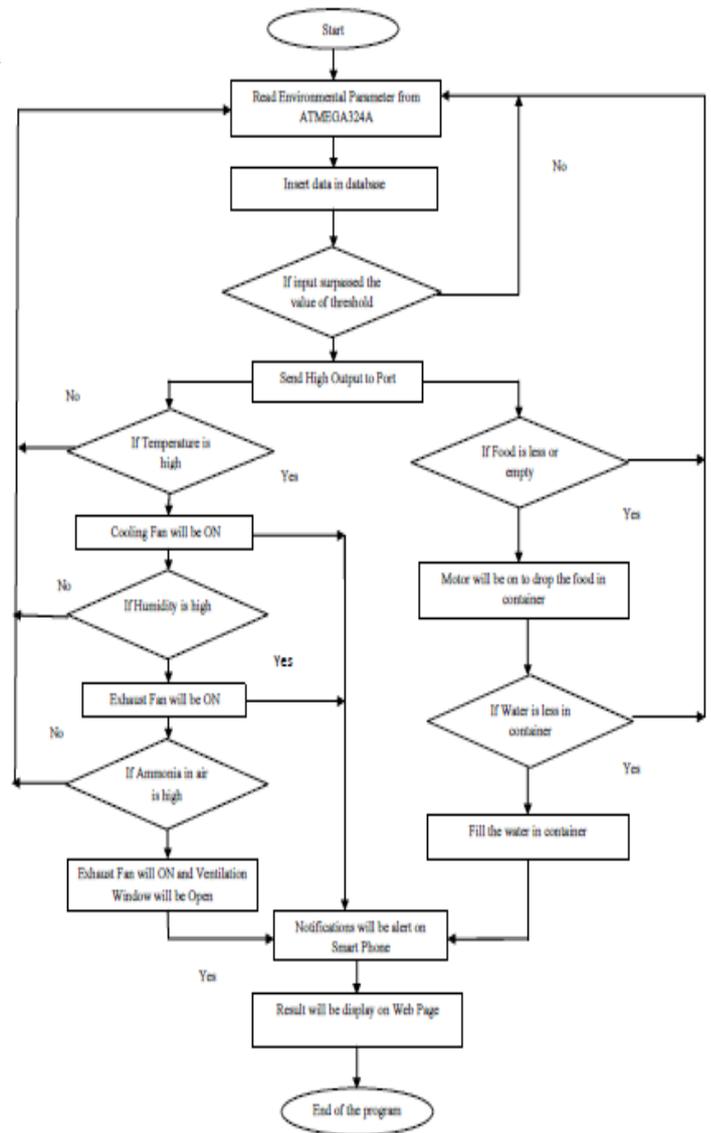


Fig 8: Flow- Chart

VI. RESULTS

Parameters	Threshold value	Action perform
Max Temp	Th Max <=40	Cooling Fan ON Send SMS
Humidity	Above 40%	Fan ON Send SMS
NH3- Ammonia	Above 40 %	Cooling Fan ON Ventilation Window OPEN Send SMS
Water Level	Up to 140	Send SMS
Food Level	Weight 1 Kg	Add food in container

VII. ADVANTAGES

- Quality of chicken will be improved.
- Man power means human efforts get reduced.
- All internal information of poultry will be available on web portal.
- Poultry owner can able to monitor internal structure of poultry by sitting in a room.
- Wastage of food and water has been avoided

VIII. CONCLUSION

Embedded system is an innovative for poultry farming. Which can be changes a traditional farm into a smart chicken farm. Various environmental parameters has been monitor to improve the health and growth of the chicken. Food control mechanism and water control mechanism help to provide time to time food and water supply to the chickens as well as help to avoid the wastage of food as well as water. Application of smart phone helping the farmers to monitor the internal environment of poultry as well updating data on web portal. So owner can able to monitor the environmental parameters by sitting in one room.

IX. FUTURE SCOPE

This system collected information of poultry farm and data should be sending to the web server and stored it. The developed system only monitors the parameters of poultry but, In future it may possible to monitor and control the environmental parameters through the internet of things that is nothing but the IOT. Poultry farm usually provided a lots of poultry waste. By using the poultry wastage Goober Gas can be developed for daily requirement of power energy in poultry farming.

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