Smart Poultry Farming

S. Arunkumar, N. MohanaSundaram

Abstract: ***India's broiler production is estimated to increase by seven percentage for the calendar year 2017, owing to increasing demand from middle class. Also, the countryis fifth largest egg producer in the world. This highlights the need for effective poultry industry, which can produce quality breeds to meet the industrial challenges. To increase the quality and reliability of this field, smart and economical way of automizing maximum human operations is required along with creation of database for future reference. In the poultry setup, the common challenges faced are emission of ammonia gas due to decomposition of uric acid of chickens. Also, maintenance of optimal temperature is necessary for the egg production. This paper provides a smart solution to automatically keep the ammonia gas content and temperature level of the area in control. Additionally, providing food to the breeds can be done on a timely basis without manual intervention. These can be achieved using cloud computing technique and with an exclusive web and app support, data can be logged. Hardware has been designed for this idea and the results obtained found to be satisfactory.***

Keywords: Smart Poultry Farm, GSM, Wi-Fi Module, Monitoring.

I. INTRODUCTION

The agricultural sector of India is one of the fastest growing sectors, with poultry industry gaining new dimensions. India is witnessing an 8 to 10% rising rate in broiler and egg production, while the rise of production of agricultural crops is just from 1.5 to 2%. Hence, the poultry industry of India is contributing a good per capita income for the GDP growth of India. Due to this, the poultry industry is undergoing a drastic shift in its structure and operation, thus becoming a major commercial practice.

For last few decades, with growing high level of awareness about safety aspects, demand for high quality chicken and nutrient rich eggs have become very high.With the world shifting towards automation, automating manual practices in the poultry sector will help in good farming management and manufacturing process. This results in good profit combined with quality achievement.

The practices which are highly dependent on human labor are controlling of ammonia gas emanation from bacteria decomposition, maintaining of temperature within standard levels, timely feeding of birds. Various works have undergone in automizing these works.

In [1], the chicken farming management is done using Embedded system and smart phone, with problem solving by Raspberry Pi and Arduino Uno. This intelligent system has been developed and tested in a sample chicken farm in this study. It is found that, it could sense the surrounding weather conditions and the filter fan switch is controlled based on the sensed data. Though this system was found to be comfortable for farmers, it faced problems in terms of integration of embedded system with various sensors

Also, the control can be achieved only at the specified location range.[2] has implemented wireless sensor network and mobile network to control the environmental parameters. By sending the code word SMS to the system GSM module, the current values of the parameters are received, based on which the user can take action. But this method suffers a great disadvantage, as problems like network error, un-recharged SIM fails to operate this setup.

[3] is an extension of previous work, where it focuses on combined approach of sensor network and mobile devices. It is a two way control, in which the user can know the status of the environmental parameters in the poultry farm by sending SMS. Based on the status received, the user can initiate suitable actions through the same mobile network. This in a way helps in finding the problem and initiating corrections using mobile and sensor network. But this also provides unsatisfactory results, when the network has a low coverage area.

II. PROPOSED SYSTEM

In the proposed work, GSM technology is introduced to know the status of the poultry farm at every instant and to update the data in a webpage that can be viewed by mobile app too. The parameters sensed is ammonia gas content in atmosphere and temperature level prevailing over the farm at any instant. This is achieved by using MQ6 gas sensor and DHT11 sensor. A weight sensor is attached with the food supplying conveyor belt to detect the quantity of food fed to the birds. The purpose of employing these sensors is to automate these processes.

Additionally, an emergency alert system coupled with Fire sensor is also provided to detect any emergency fire accident and take appropriate actions. This setup helps in identifying the status of all these parameters and automatically helps in taking necessary control actions. The user will also know these actions, by means of webpage or mobile app. The block diagram of the proposed work and operational flow chart is shown in Fig. 1&Fig. 2.

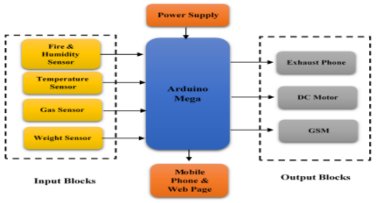

Fig. 1. Overall Block Diagram Of The Proposed Work

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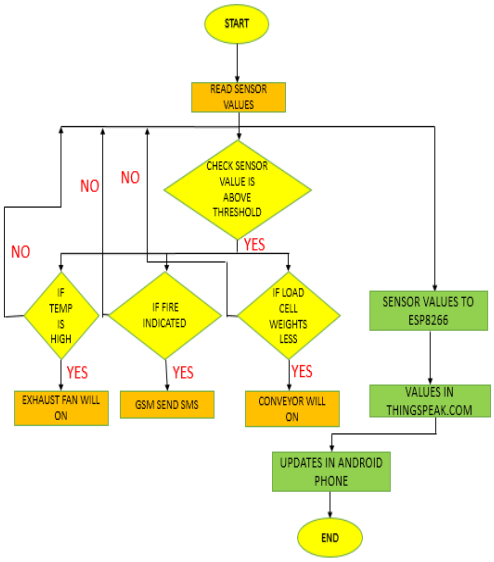

Fig. 2. Flow Chart of the Proposed Work

III. HARDWARE SETUP & RESULTS

The hardware setup has been constructed using the sensors coupled with Arduino board for controlling the parameters. The humidity, temperature, gas and weighing sensors are connected to Arduino via jumper wires. In the programming part, a threshold value has been set for each sensors. Whenever the values sensed exceeds far or falls below the threshold value, suitable action is initiated automatically.

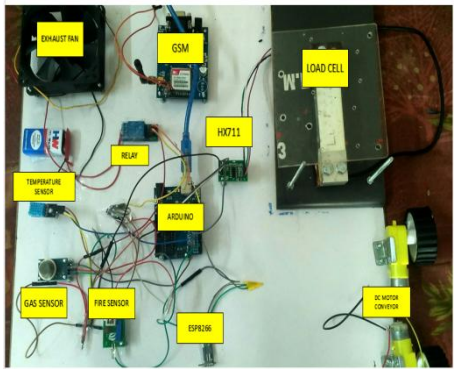

Fig 3. Hardware Prototype Module

If the value of ammonia gas content or temperature sensed is beyond the set value, Arduino will send HIGH command to the Fan port, thus turning ON the Fan.

If the load cell connected to the food conveyor reads value less than the reference value, the dc motor coupled to the conveyor belt will automatically turn ON. This helps in feeding purposes.

The fire sensor is used to detect any unexpected fire accidents. When it is sensed, it sends emergency alert to the user and the Arduino code turns on the fire extinguishers. Thus helps in ensuring the safety of the poultry farm.

The status of the temperature, humidity and ammonia gas in the poultry farm is updated by instant by instant in the serial monitor window which is shown in Fig. 4.

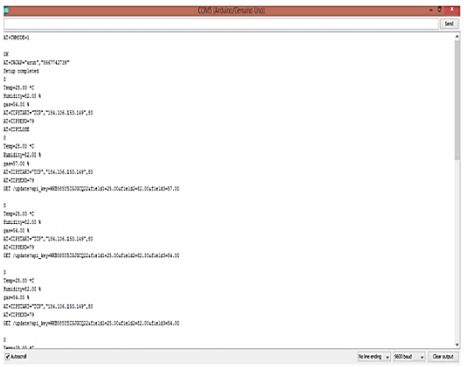

Fig. 4.Serial Monitor Window

In order to log all the data sensed and actions taken, the Arduino is connected to a webpage, exclusively designed for this project via ESP8266 Wi-FI Module. The webpage used for this purpose is www.thingspeak.com. It is an open source application based on Internet of Things (IoT) which uses HTTP protocol over the internet. All the sensor values at each and every instant are displayed graphically in the webpage. These can also be obtained in Android Mobile via Virtuino applications.

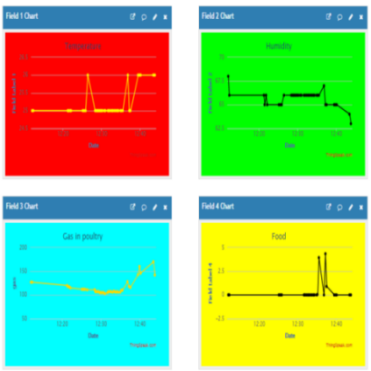

Fig. 5.Poultry Farm Status in the Webpage

These data are stored in the cloud, which can be exported in the form of excel sheet useful for future reference. An excel image is shown in Fig. 6.

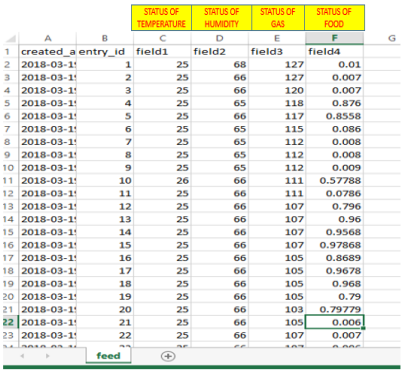

Fig. 6.Exported Data

The GSM technology implemented helps in tracking the status via mobile App. The app used for this project work displaying the sensed values are shown in Fig. 7.

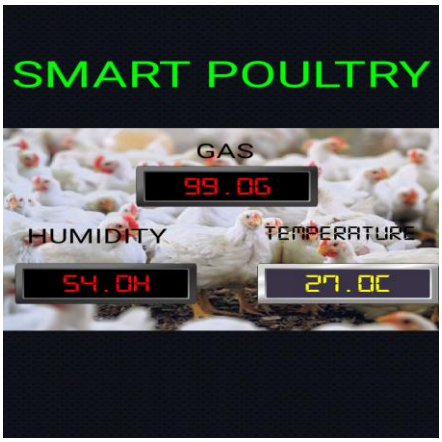

Fig. 7.Status In Mobile App

IV. CONCLUSION

The traditional way of poultry farming being replaced with the smart and intelligent techniques using embedded system based innovative application. It helps the farmers in real time monitoring and control of environmental context parameters such as temperature, humidity, air quality along with fire safety and food level monitor. The Cloud computing technique is employed in this project to achieve tracking of these parameter values and take necessary actions, through mobile phone or web page scheme. A hardware employing appropriate sensors has been developed and the results are analyzed both experimentally and through webpage. It is found to be an efficient and intelligent method of remote control for the farmers, which highly reduces cost, time and man power. This in turn provides improved productivity and profit for the farmers.

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