Automatic Food Feeder for Poultry Industry Using Arduino

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Abstract
Currently, in certain countries chicken poultry is an important industry in proving supportable food sources. To increase the health of chicken in the hutch many improved and creative methods are created which will increase the production of chicken meat and chicken eggs. Hence, automating the feeding system is appreciated to improve the poultry industry. The wastage level of chicken food is reduced when compared to the human feeding system and is the main advantage of this work. The system design uses Arduino, Ultrasonic Sensor, DC motor, RTC module and keypad for creating the automated food feeder.

Keywords—Arduino microcontroller, Ultrasonic sensor, DC motor, RTC, Poultry farming.

I. INTRODUCTION

Small and intermediate poultry growers need to meet the demand within society. As these industries have to meet the bulk need of the market it is necessary to produce birds within a short time and without increasing the time, expenditure and manpower. This work focused on automating the food feeder system, which reduces manpower and time. Most of the automated equipment available in the market for large-scale poultries but it is difficult for small and medium-scale poultries to incorporate. Large-scale poultries can afford the existing high-cost automated equipment's to feed the chickens. Small and intermediate poultries can't include large scale automated system because such types of poultries are run by farmers whose income is very low. The feeder in the small and intermediate poultries needs frequent refilling of food which takes more labour, time and also increases the expenditure for farmers. An automated feeder is necessary to reduce the expenditure and to efficiently feed the foodstuff to chickens by small and intermediate poultries. The use of the proposed system is useful to feed the food in a container at appropriate timings whenever it's needed.

II. LITERATURE SURVEY

The system focused by the author S. Aravind is on controlling the various types of operations in the poultry farms. It monitors the temperature, food level and water level and controls them automatically [1]. K. Sinduja's intensive is the full automation of the poultry industry using software and hardware was made and it creates new protocol to control the overall poultry working process. Mainly wireless sensors are
used in this project. Every value is monitor, stored and sends the message to the user using GSM [2]. Rupali B. Mahale used IoT based system to observe real-time data such as moisture, temperature and toxic gases and control them via server.

This system uses Arduino Uno on the farm side and Raspberry Pi board on the server side [3]. The work done by M.P. Archana focused on controlling the various types of operations in the poultry farms. The system contains a wireless sensor and mobile system to manage the work very easily. It observers the farm temperature, light intensity, ammonia gas and controlled automatically [4]. PLC based system is used by V. Kowsalyaa to measure the weight of the chicken and focused to kill the various germs in the poultry farm. It also uses conveyor control to move the objects from one place to another place [5]. The author ShubhamMitkari used IoT and Bluetooth based mobile application system which performs food feeding, sprinkling water and fork for soil mixture to reduce gases [6]. V.Ayyappan shows the poultry automation by controlling temperature, humidity, gas, water level using a PIC microcontroller and it does not have the food feeder [7]. B.Navaneeth fo-

cused on designing an automatic feeding system for the poultry farms having the birds 10000 to 50000. The system used a load cell and feeder channel in automating the system [8].

FPGA Spartan6 based system was used by S.S Ramgirwar and used few sensors to monitor the farm parameters like heat, moisture, water, percentage of ammonia and these data are stored on a web page. This system is an integrated solution for the poultry industry [9]. IoT based project is used to by Hitimana observe and control various factors remotely in poultry farm which are messaged to the owner and data's obtained are stored in the cloud [10]. Bilal Ghazal used a wireless sensor to measure the various poultry farm parameters like the intensity of light, moisture, temperature, and air quality. The data's collected are sent to the controller unit through a ZigBee transceiver [11]. SiwakornJindarat and PongpisittWuttidittachotti employed embedded systems and smartphone to develop an intelligent system to monitor and control the chicken farming parameters [12]. The author O.T. Arulogun designed a poultry feed providing system using a PIC microcontroller and a mobile intelligent system to move the feeder all over [13]. An automatic pet feeder controlled by phone app was developed by Ravi Babu. The system dispenses the required food on time. The required information in handling the pet's food container is sent to the dispenser from the phone app [14]. Geetanjali A. Choukidar controlled the poultry farm environmental parameters by using wireless sensors and GPRS network. The data's obtained from the sensors are sent to the webpage through GPRS and are stored in the server [15].

Muhammad Ammad-uddin proposed a system with a wearable wireless sensor node to analyze the humidity, temperature, light, air composition and airspeed which helps in identifying infected chickens and improve productivity [16]. The author Hua Li designed an online henhouse observing system which was created on wireless sensor network technology and computer network technology. Data fitting methods and software are used for data loss recovery and self-decision making [17]. Mobile system and wireless sensors were used by the Author K.SravanthGoud to remotely monitor and control the poultry environmental condition [18]. Olaniyi used a fuzzy logic system in providing water and food to the birds in the poultry farm with stated time durations [19]. The feeding machine proposed by Zainal consists of Arduino to control the food flow to food containers and a temperature sensor to maintain the goodness of the chicken food [20]. Table 1 presents a survey from the existing poultry farm.

TABLE I

A SURVEY FROM THE EXISTING POULTRY FARM

Item	Shed-1	Shed-2	Shed-3
Age of Chickens	0-9th days	10-29th days	30-50th days
Size of the shed	Small 120 Sq. Ft	Medium 400 Sq. Ft	Large 400 Sq. Ft
Number of Chickens in the shed	80-100 chicks	80-100 chicks	80-100 chicks
Food Quantity per chicken	40-50 g/day	80-90 g/day	80-90 g/day
Feed Timing	Morning 6AM Evening 5PM	Morning 6AM Evening 5PM	Morning 6AM Evening 5PM

III. PROPOSED SYSTEM

Most of the implemented system focuses on environmental conditions and few have involved in the feeding system. Many small and average poultry industries are run by economically weaker peoples. The area involved in the poultry farm also small. The main problem is the food wastage and it has to be reduced. The proposed system concentrates on automating the food feeding system which highly reduces the food wastage. Figure Irepresentthe components for design and Automatic Food Feeder for Poultry and Figure II shows the circuit diagram for the planned system.

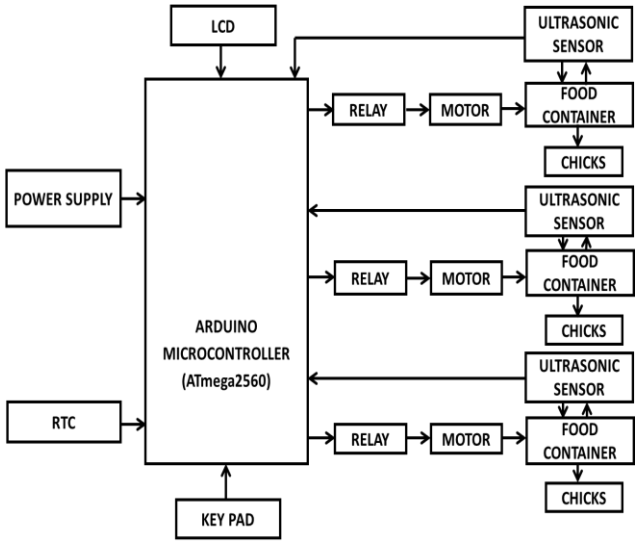

Fig I .Components for design and automatic food feeder for poultry.

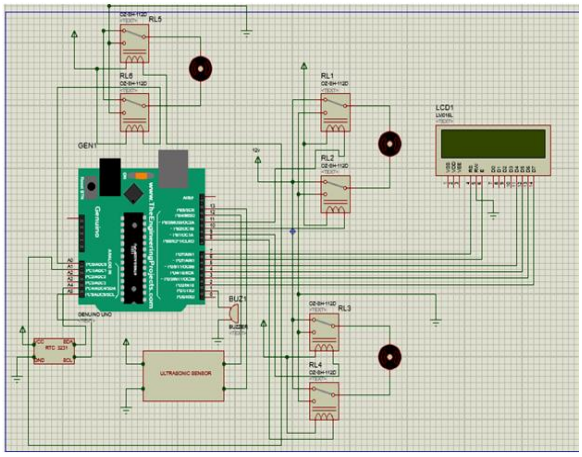

Fig II. Circuit diagram of the system

A. Arduino Mega and Arduino IDE:

Arduino is an open source, simple hardware and software that can be used easily. ATmega2560 microcontroller is used in Arduino mega board. It has 54 I/O pins in which 15 pins will provide PWM output. It also has 4 UARTs, 16 analog pins, and a 16MHZ crystal oscillator. All these can be controlled by a set of instructions programmed through the Arduino IDE software. Arduino IDE supports C and C++ programming languages.

B. RTC module:

DS3231 RTC module is a very accurate I2C real time clock which can count seconds, minutes, hours, month and years.

The main advantages are temperature compensated, high accuracy and low cost. It also has an automatic power failure battery switch circuitry. It provides exact Time and date to the system from which feeding time is automated.

C. Ultrasonic sensor:

HC-SR04 is a sensor used to measure the object level using Ultrasonic sound waves. This sensor has a control unit, transmitter and receiver. This sensor provides non-contact range finding with good accuracy and firm readings from 2 cm to 400 cm in an easy to use pack. It transmits 40KHZ pulses and checks for the reflected pulse from the obstacle. In this system, it is connected to the food container located at the top. This sensor is used to refill the container by knowing the quantity of food in the container.

D.LCD Display:

The LCD is used to displays the output from the system. It consumes less power than LED because it works on the principle blocking light rather than emitting it. The RS pin controls the LCD's memory and holds on the screen. Read or Write mode is selected using the R/W pin. Enable pin allows the reading and writing process. LCD is used to show the Time, Date and Food level in this process

E. DC Motor:

The motor is connected to the centre of the container. The DC motor is used to open the food container valve. Based on the time set by the RTC module The Valve will be open (Shaft rotate in clockwise Direction): the food is fed to the chicks. Ones the time set by the RTC module is over, the shaft rotates back and closes the valve opening which stops the food supply.

IV. RESULTS AND DISCUSSION

The working flow of the systems is represented as flowchart in figure III. When the system is turned ON, the time for opening and closing of the food valve are set using the RTC module and is shown in the LCD display. When the time is 6AM in the morning and 5PM in the evening the DC motors are turned on which rotates the shaft of the food feeder and the food is filled in the container and the motor is turned off when the container is filled.The intermediate time between the opening and closing of the valve is determined by the size of the boxes kept below. Here three different sizes of boxes are being used based on the age of the chicks. The ultrasonic sensor is connected to the top of the food container and is mainly used to measure the level of the food in the container. The status of the food container is displayed on the LCD. If the container is empty the buzzer sound is produced continuously. Figure IV represents a photograph of the design and implementation of the embedded development board.

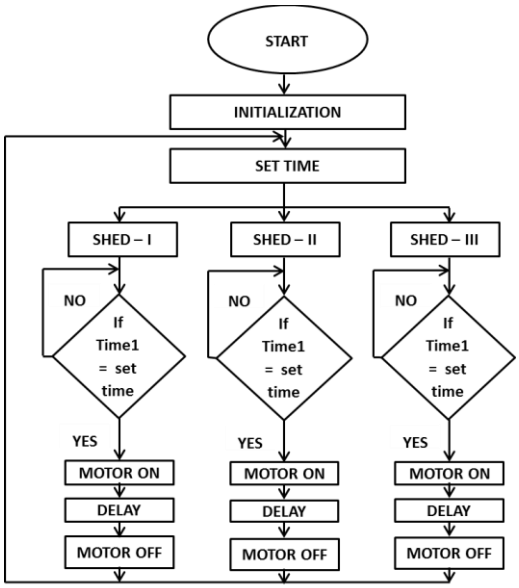

Fig III. Working flowchart for design characterization of automatic food feeder for poultry

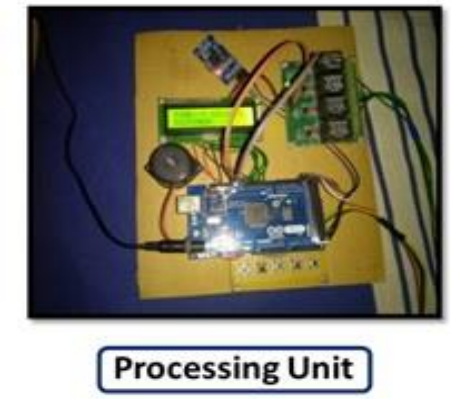

Fig IV. Photograph of design and implementation of embedded development board.

V. CONCLUSION

Small scale and medium scale poultry farming are commonly adapted by many of the Indian poultry farmers. The participation of the labours and time for these poultry farms is reduced for farmers by implementing this automatic feeding system. This project helps to solve the food wastage, labour and time required for the poultry farmers. It can be concluded from the project that there is a possible chance for an automatic system to feeding the birds in small and medium scale poultries and this process is easy to handle, low cost and user friendly.

Conflict of Interest:

Authors do not have any conflict of interest.

REFERENCES

[1] S. Aravind, S. Janaprabhu, B. Pavun Kumar, S. Sathish Prasath and M. Mathan Raj, "Automatic Feeding System for Poultry Farms," *Advances in Natural and Applied Sciences*,vol. 11, no. 2, pp.118-122, Feb. 2017.

[2] K. Sinduja, S. Sofia Jenifer, M. Sri Abishek and B. Sivasankari, "Automated Control System for Poultry Farm Based On Embedded System," *International Research Journal of Engineering and Technology*,vol. 3, no. 3, pp. 620-624, Mar. 2016.

[3] R. B. Mahale, and S. S. Sonavane, "Smart Poultry Farm Monitoring Using IOT and Wireless Sensor Networks," *International Journal of Advanced Research in Computer Science*,vol. 7, no. 3,pp. 187-190, May-June 2016.

[4] M.P. Archana, S.K. Uma and T. Raghavendra Babu, "Monitoring and Controlling Of Poultry Farm Using IOT," *International Journal of Innovative Research in Computer and Communication Engineering*,vol. 6, no. 4,pp. 3573-3579, Apr. 2018.

[5] V. Kowsalyaa, P. Manishab, S. SelvaKumarc, G. Priyankad and R. MadhanRaje, "*Automation of Poultry Farm Using PLC," International Journal of Advanced Science and Engineering Research*, vol. 4, no. 1,pp. 113-119, Apr. 2019

[6] S. Mitkari, A. Pingle, Y. Sonawane, S. Walunj, and A. Shirsath, "IOT Based Smart Poultry Farm," *International Research Journal of Engineering and Technology*, vol. 6, no. 3,pp. 2380-2384, Mar. 2019.

[7] V. Ayyappan, T. Deepika, S. DivyaDharshini, M. Elayaraja and R. Shanmugasundaram, "IOT Based Smart Poultry Farm," *South Asian Journal of Engineering and Technology*, vol. 3, no. 2,pp. 77-84, Mar. 2017.

[8] B. Navaneeth and A.K. Murty, "Automatic Poultry Feeder," *International Journal of Advance Engineering and Research Development*, vol. 2, no. 7,pp. 338-343, Jul. 2015.

[9] S.S. Ramgirwar and N.A. Dawande, "FPGA Based Smart Poultry Farm Management System," *International Journal of Advance Research In Science And Engineering*, vol.7, no. 5, pp. 265-27, Mar. 2018.

[10] Hitimana, G. Bajpai, R. Musabe and L. Sibomana, "Remote Monitoring and Control of Poultry Farm using IoT Techniques," *International Journal of Latest Technology in Engineering, Management & Applied Science*,vol. 7, no. 5, pp. 87-90, May 2018.

[11] B. Ghazal, K. Khatib and K. Chahine, "A Poultry Farming Control System Using a ZigBee-based Wireless Sensor Network", *International Journal of Control and Automation*, vol.10, no.9, pp.191-198, Sep. 2018.

[12] S. Jindarat and P. Wuttidittachotti, "Smart Farm Monitoring Using Raspberry Pi and Arduino", *International Conference on Computer, Communication, and Control Technology*, Sarawak, Malaysia, pp. 284-288, Apr. 2015.

[13] O.T. Arulogun, O.M. Olaniyi, O.A. Oke and D.O. Fenwa, "Development Of Mobile Intelligent Poultry Feed And Water Dispensing System", Journal of Engineering and Applied Sciences., vol. 5 no. 3, pp. 229–233, 2010.

[14] B. Ravibabu, P. Pavankumar and P. G. Kuppusamy, "Arduino Mega based PET Feeding Automation", *Journal of Electronics and Communication Engineering*, vol. 14, no. 4, pp. 13-16, July 2019.

[15] G. A. Choukidar and N.A. Dawande, "Smart Poultry Farm Automation and Monitoring System", *International Conference on Computing, Communication, Control and Automation*, Pune, India, PP. 17-18, 2017.

[16] M. Ammad-uddin, M. Ayaz, E. H. Aggoune and M. Sajjad, "Wireless sensor network: A complete solution for poultry farming", *IEEE 2nd International Symposium on Telecommunication Technologies*, Langkawi Island, Malaysia, 24-26, Nov 2014.

[17] H. Li, H. Wang, W. Yin, Y. Li, Y. Qian and F. Hu, "Development of a Remote Monitoring System for Henhouse Environment Based on IoT Technology", *Future Internet*, vol. 7, pp. 329-341, Sep. 2015.

[18] K. SravanthGoud and A. Sudharson, "Internet based Smart Poultry Farm", *Indian Journal of Science and Technology*, vol 8, no. 19, pp. 1-5, 2015.

[19] O. M. Olaniyi, A. F. Salami, O. O. Adewumi and O. S. Ajibola, "Design of an Intelligent Poultry Feed and Water Dispensing System Using Fuzzy Logic Control Technique", *Control Theory and Informatics*, vol.4, no.9, pp. 61-72, 2014.

[20] Z. H. C. Soh, M. H. Ismail, F. H. Otthaman, M. K. Safie, M. A. A. Zukri, and S. A. C. Abdullah, "Development of automatic chicken feeder using Arduino Uno", *International Conference on Electrical, Electronics and System Engineering*, Kanazawa, Japan, pp. 120-124, 2017