Low-Cost Automated Poultry Farm

Prasad Gade[1], Ronak Patel[2], Harsh Pandey[3], Parthav Patel[4], Prof. Rahul Jadav[5]

[1, 2,3,4]*UG Scholar of Laxmi Institute of Technology, Sarigam, Gujarat, India*
[5]*Asst. Professor in Electrical Engineering Dept. of Laxmi institute of Technology, Sarigam, Gujarat, India*
[1,2,3,4]prasadgade1@gmail.com
[5]rahulj.lit@laxmi.edu.in

Abstract— **This paper presents a low cost automated synchronized system helpful in poultry farming sector. The system and its automation supports growth process of chickens is a poultry farm. All the processes related to poultry farming are automated and synchronized simultaneously. Increase in production, decrease in mortality and user-friendly operation are main aims of the project. The invention is economical and profitable for farm owners to install and maintain. The project includes temperature control unit, water level control, over-crowding protection and Wifi module for control using smart phone.**

Keywords— **Automation, Temperature management, Atmega328P, WiFi module, Economic, User-friendly.**

I. INTRODUCTION

The invention gives emphasis on poultry farming sector and its stake holders. As poultry farming is a wide business and its demand is increasing rapidly with the increasing population. At the same time its profitability is limited with orthodox approach and lack of technology. By adding automation into this sector, profitability and production can be increased by systematic management and avoiding human errors and overcoming existing loop holes. Also this invention overcomes drawbacks of existing systems by reducing complex mechanisms and introducing simple but essential features.

Poultry farming is that the raising of domesticated birds like chickens, ducks, turkeys and geese for the aim of farming meat or eggs for food. Approximately fifty to sixty billion chickens are raised annually as a supply of food, for their meat and their eggs. There are some parameters required to maintain for a productive poultry farming. The main factors are temperature, feed water, food and vaccination. All these processes need to be done in a systematic manner and in time.

In current situation, farmers monitor the farms manually. They do not maintain all the parameters exactly as required which causes harm to the chickens. Looking at the temperature part, the new born chicks need around 35°C to survive ideally. If the temperature goes lower that the limit they suffer heart diseases and also catch fever preventing them from food and water intake due to which death occurs.

Usually small scale farmers have no system to regulate this temperature.

Water also plays an important role. Farmer has to make sure the feed water is supplied throughout. Currently this process is done manually by farm workers which sometimes causes irregularity and eventually affects the chickens.

When the temperature gets lower than ideal, the chicks get in search of heat and come close to each other resulting in over- crowding at a particular area. In this scenario some of the chicks die as the others climb over them. This needs to be avoided so we also introduce overcrowding protection of chickens by buzzers which would help in separation of the chicks.

Food and supplements are needed to be given perfectly as per required criteria. Many farmers do not give particular attention to timings and proportions which degrades the quality of meat and eggs produced.

Vaccination is most crucial parameter. If vaccination is failed to be given, the birds catch diseases such as fowl pox, fowl cholera, infectious bronchitis, infectious bursal disease, etc. Therefore proper attention needs to be given for vaccination. This process is carried out manually and in some cases vaccination is also missed which results in death of chickens or they get infected.

For all these processes, farm owners need man power which reduces profits and even after that there are many drawbacks in the traditional system.

We aim to develop an automated system for covering all the poultry farming processes and in a smart synchronized manner. Our proposed system consists of the following features;

1. Temperature and Humidity control unit
2. Over-Crowding Protection
3. Automatic water filling
4. Vaccination reminder
5. Smartphone connect through Wi-fi
6. Low investment cost

The system will aim to modernize and upgrade the existing poultry industry and empower the farm owners by increasing their profits.

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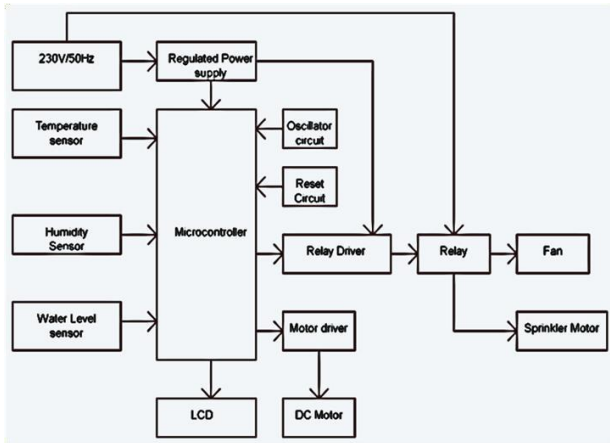
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II. BLOCK DIAGRAM

Fig-1: Block Diagram of the Farm

Figure shows the Block diagram of the proposed low cost automated poultry farm. The above block diagram shows a general layout of the system in which the microcontroller controls all the processes by relay. The sensors sense and provide particular input to the microcontroller after which it transfers signal to the relay and the action is executed when the relay gives command to the components to perform that particular action.

AC supply is given initially and it is regulated with the help of voltage regulated integrated circuit, power adaptors and transformers. It forms a primary circuit and the relays are connected to this circuit. The microcontroller is fed with regulated dc voltage which is essential. All the sensors and other components work on dc supply.

The circuit comprises of the above components and it is divided into two parts. One is the relay circuit and other is microcontroller circuit. The relay circuit contains relay for all the operations and AC connection provision. The microcontroller circuit contains WiFi module, Atmega microcontroller and connections of all the components. The components are attached in second circuit. The transformers are connected in first circuit.
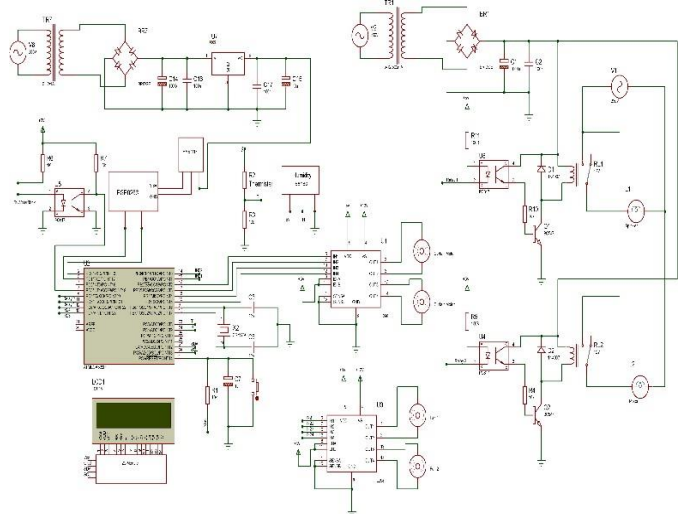

Fig-2: Circuit diagram of the Farm

Figure shows the general circuit diagram of the controller of the farm which is used to operate various elements of the poultry farm. We will be discussing all the elements in step by step form for better understanding of the poultry farm to ensure the automated operation of all the elements in a synchronized manner and also the performance in all conditions and also what is the significance of the given particular in the automated operation of the proposed topology of the poultry farm.

The following are the main parts of the farm:

A. Microcontroller ATMEGA328P:

ATmega328P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328P achieves throughputs approaching 1MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

B. WiFi Module ESP8266:

IC 7805 is a 5V Voltage Regulator that restricts the output voltage to 5V output for various ranges of input voltage. It acts as an excellent component against input voltage fluctuations for circuits, and adds an additional safety to your circuitry.

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C. Voltage Regulated IC AMS1117:

The AMS1117 is a popular SMD package 3-pin voltage regulator that is available in many models for fixed and adjustable voltage requirements. The IC can deliver a maximum current of 1A and the output voltage can vary from 1.5V to 5V. It also has a low drop out voltage of 1.3V when operating at maximum current.

D. Voltage Regulator IC 7805:

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E. Temperature and Humidity sensor DHT11:

DHT11 is a Humidity and Temperature Sensor, which generates calibrated digital output. DHT11 can be interface with any microcontroller like Arduino, Raspberry Pi, etc. and get instantaneous results. DHT11 is a low cost humidity and temperature sensor which provides high reliability and long term stability.

F. Water level sensor:

Water level sensor consists of several conductors in parallel with the sensor to detect the water depth or height. Water level sensor outputs an analog signal to be read by a microcontroller and processed to measure water level. Water level sensor is relatively cheap and easy to use.

G. LCD (Liquid Crystal Display):

LCD or Liquid Crystal Display is an electronic component that is commonly used to display data in form of letters, numbers, or pictures. LCD uses CMOS Logic technolo.gy that does not generate light, but instead reflects light around from the front-lit or transmit light from the back-lit.

H. Stepper Motors:

A stepper motor is an electromechanical device it converts electrical power into mechanical power. Also, it is a brushless, synchronous electric motor that can divide a full rotation into an expansive number of steps. The motor's position can be controlled accurately without any feedback mechanism, as long as the motor is carefully sized to the application. Stepper motors are similar to switched reluctance motors. The stepper motor uses the theory of operation for magnets to make the motor shaft turn a precise distance when a pulse of electricity is provided.

I. Relays:

Relays are switches that open and close circuits electromechanically or electronically.

Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized. When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized. In either case, applying electrical current to the contacts will change their state.
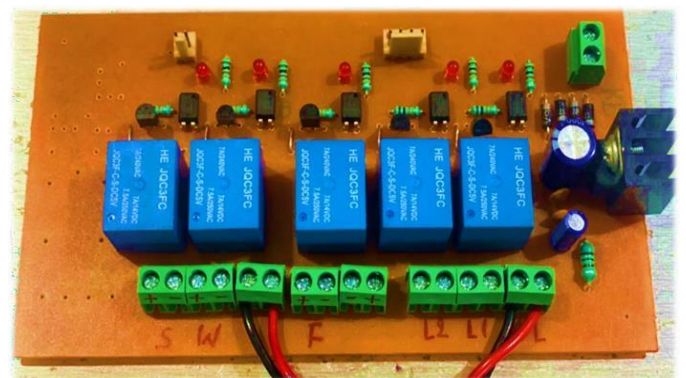
III. HARDWARE MODEL

Fig-3: Relay circuit of the Farm Model

The figure shows the Relay unit of the proposed topology for the operation of the farm model and to operate the specific motor when the actuating signal receive

Figure-4 shows the Micro controller unit which can be considered as the heart of the automated poultry farm which we have proposed in this paper. The programming of the microcontroller is done with the help of one algorithm. The algorithm we will be discussing in the proceedings.

The operational algorithm of the farm is depicted as below:

- *Step 1:* Give 230 V / 50 Hz supple to the circuit by plug and adaptor.
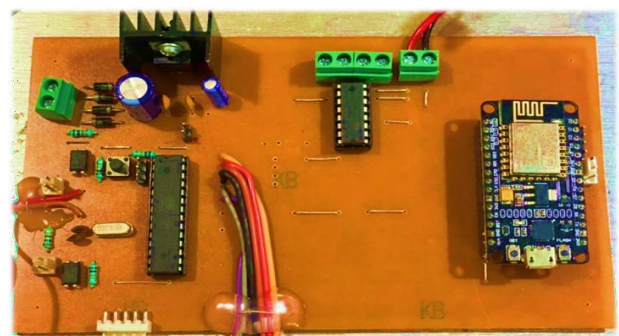- *Step 2:* Temperature and humidity sensor will sense the temperature.

Fig-4: Microcontroller unit

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- *Step 3:* If temperature ≤ 29 degrees, curtains will be closed, lamps will be on, fan will be off, sprinkler motor will be off. This will increase warmth.
- *Step 4:* If temperature ≥ 34 degrees, curtains will open, lamps will be off, fan will be on, sprinkler motor will be on and sprinkle water on the roof for lowering the temperature
- *Step 5:* Buzzer will start and function after every 15 minutes to prevent over-crowding of chicks and reduce death.
- *Step 6:* If water level goes below sensor 1, water motor will be on and tank water will start to fill.
- *Step 7:* If water level goes above sensor 2, water motor will stop and indicate that the feed water tank is full.
- *Step 8:* Vaccination reminder alerts will appear in application at definite day intervals of vaccination as per set command.

BY following the algorithm the programming work of the microcontroller is followed and then the final operation and coordination with the stepper motors and other auxiliaries is tested and ensured.

Now as to make the poultry farm more automated the farm microcontroller is connected to the mobile phone with the help of Wi-Fi module.

One application is developed for the proper operation of the poultry farm with the help of which the efforts of the operator of the farm can be reduced more. Figure shows the user interface of the application which is developed for the ease of the operator.
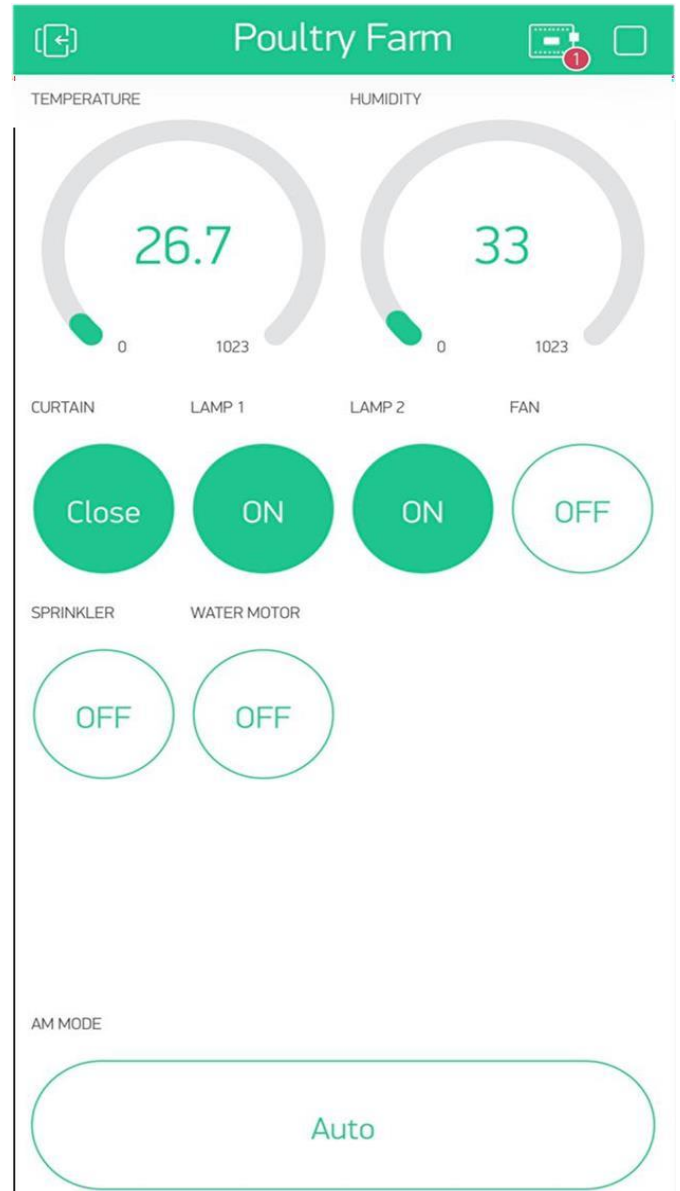

Fig-5: Mobile application Interface

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The user interface of the mobile application is prepared in such a way that one semi-skilled to unskilled person can easily operate and run the whole operation of the poultry farm. Therefore, it can be said that the efforts required in operating the farm is more reduced. Which in turn can be said the time saving and money saving work done while sitting in a corner of the farm with less manpower.

IV. CONCLUSION

In this paper one derived topology is proposed to reduce the effort of the owner and the operator of the poultry farm. After observing the functioning and reviews, it can be said that the proposed system is efficient, effective and profitable to the poultry farming industry. It reduces the stress of farm owners to look after all the operations. It lessens the need of man power which turns out to be profitable for the owner as he does not need to give salary and appoint more workers. It is possible to control and handle multiple farms through this system. It is also easy to understand and implement. The initial cost is also less compared to complex existing systems in the market.Following advantages are found in this automation which would turn out to be a great advancement in the field of poultry industry. Customization of the system is also easy and any additional features can be added into the same. Hence, the research is helpful for the poultry farming sector and has a capability to empower and encourage the poultry farmers by lowering their problems and increasing the profits.

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