

POULTRY FARM MONITORING AND CONTROLLING USING PLC WITH INTERNET OF THINGS

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Abstract:

This project provides continuous monitoring and complete automation of the poultry farm which helps to avoid adverse effect on livestock. Power consumption is being reduced as using of solar panel is totally fitted in the poultry area. The Live hoods feeding, water and medicine are directly stored and uploaded in the IoT. Every updates will be intimated to the user on the system being progressed through SMS. Using of Google assistant the entire process is also been controlled.

1.INTRODUCTION:

The poultry farm is one of the major contributions to the world economy. More than 50 billion chickens are raised annually as a source of food. An average human consumes 70 pound (appx) of chicken in a year. The consumption of the chickens is gradually increasing day by day. According to ICRA's estimate per capita meat consumption is around 3.6 kg per annum which puts total broiler meat market size at Rs.730 billion in terms of retail price. The

egg production is at 84 billion eggs translating to a per capita egg consumption of 63 eggs per annum. One of the key roles involved in the development of human civilization is in the area of agriculture. With the continuing increase in the world's population, the demand for food supply is extremely raised^[1,14]. Applying engineering processes to poultry farming may help to maximize the benefit to human kind in terms of cheaper and plentiful availability as well as contribute to the growth of the economy. India is world's second largest emerging economy and along with it has rapidly growing poultry sector^[2]. Poultry is one of the fastest growing sectors in India with an average growth rate of 12 % for broiler production per annum. The environment conditions of farms basically affect initial growth of livestock that means there is weight loss in birds, 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. The most of scale poultry farms are situated in rural areas

lagging in technology. So, the technology in the poultry automation would result in high production rate and increase in economy of the country. The labor for this humongous sector is a problem faced now a day so we decided to automate the complete process like egg hatching, feeding system, watering system, temperature control, medicine system. So, for this system we have proposed of using a Mitsubishi PLC and a HMI system collaborated with an IOT system. The PLC system is chosen because the of the input, temperature and life features of the PLC^[3]. The whole action can be single handedly controlled by the PLC. The IOT system is enabled for increasing the communication with the poultry owner. The wireless HDMI touch display system is used for continuous monitoring. The whole system can be stopped by using a google assistant voice control system^[4].

2.EXISTING METHODOLOGY

2.1 SYSTEM ANALYSIS

This chapter reviews the system and related studies in the world of poultry, Existing system and The Feature of poultry automation.

2.2EXISTING SYSTEM

In an existing temperature control system the most of the poultry farming uses the traditional method of heating like using boilers to heat up the farm. For the cooling system, water is sprayed inside the farm by using the fogger^[5]. Most of the time chicken died with external climatic conditions, the

light or the boilers fixed inside the farm doesn't provide the sufficient heat to a farm. The death rate of chicken is high in the existing method of farming. The shortage of workers is also a problem faced by a poultry owner's^[6]. The workers works inside the farm get affected by many diseases and birds as well^[7].

2.3 DEMERITS IN THE EXISTING SYSTEM

- i. Death rate of chicken is high
- ii. Efficiency of the current system is very low
- iii. Lack of workers
- iv. Infection for both humans and chickens
- v. Maintaining the temperature is tedious process

2.4 CHALLENGES FACED BY THE POULTRY INDUSTRY

Constraints have been identified in the areas of husbandry, feeding and health, availability of inputs, information and credit. The negative effects of the hot climatic conditions of the sub-region have also been a challenge^[8]. Adverse effects of excessive exposure to high temperatures include excessive panting, poor growth and development of birds and reduced egg production and size, and lower egg shell quality. It is very disappointing that the poultry industry has been plagued by large imports of day old chickens, eggs and feed despite the availability of local birds which are more sumptuous, nutritious and healthy.

2.5 DEMERITS OF EXISTING FARMING

But despite its clear advantages in terms of profitability and affordability, the batter cage system and similar intensive farming techniques also come with disadvantages^[9]. Most notably, chickens and hens in intensive poultry farming often suffer from different conditions and pain. A lot of intensively reared chickens suffer from lameness as a result of fast growth, a result of selective breeding and concentrated feed. In addition, the way the cages are designed and as the chickens grow, their droppings accumulate on the floor. When the droppings decompose, ammonia is released. The ammonia then fills the air with unhealthy fumes and this puts chickens at risk of incurring painful blisters, hock burns or ulcerated feet^[10].

3. METHODOLOGY

3.1 PROPOSED SYSTEM

The labor for this humongous sector is a problem faced now a day so we decided to automate the complete process like egg hatching, feeding system, watering system, temperature control, medicine system. So for this system we have proposed of using a PLC and a HMI system collaborated with an IOT system. The IOT system is enabled for increasing the communication with the poultry owner. The wireless HDMI touch display system is used for continuous monitoring. The whole system can be stopped by using a Google assistant voice control system.

3.2 FEATURES OF THE FARM HOUSE AUTOMATION SYSTEM ARE:

- Automatic lighting
- Climate control
- Fire and smoke detection
- Humidity and moisture control
- Feeder control
- Remote mobile connectivity
- Instant alert system

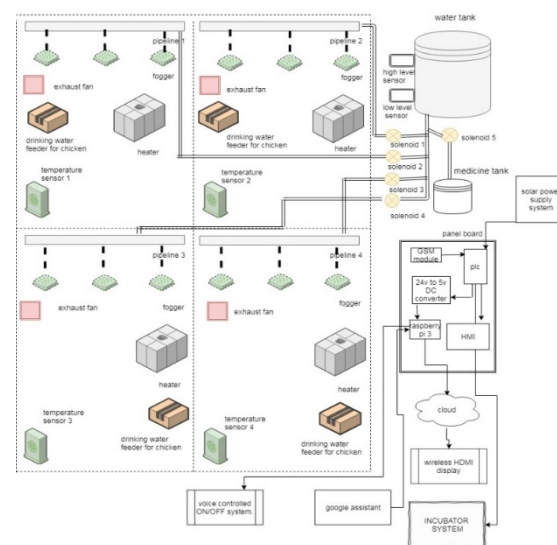


Figure 1 Conceptual diagrams for proposed system

4. COMPONENTS AND SYSTEM DESIGN

This section will discuss about the system design and the electronic components that had been used in the system process.

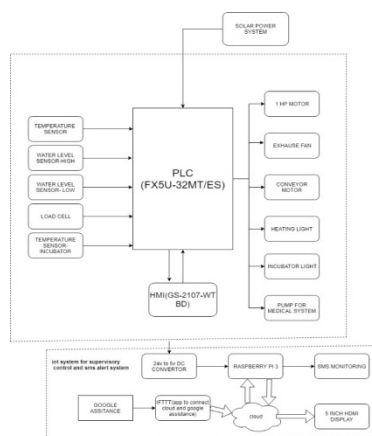


Figure 2 Functional block diagram

5. COMPONENTS

5.1 TOOLS REQUIRED

1. Languages
 - a. Ladder logic
2. GX WORK3 (fx series plc)
3. ESP8266.
4. F- Series PLC
5. HMI

5.2 FX5U-32MT/ES

The first model in the iQ-F series is the FX5U, offering high performance in a compact, cost effective package. The FX5U continues the FX tradition of total flexibility by offering a huge range of new and existing add-on options which further enhance the built-in functions of Ethernet, analogue I/O, data logging, position control, security, communications and networking functions incorporated as standard.

The FX5U will provide users with the ability to specify more powerful systems but with fewer overall components, saving time and cost.

- FX5U CPU base units with very fast processing time
- Versions with up to 256 inputs and outputs
- Expanded input/output area for networks and complex applications
- Can be upgraded by combining with expansion modules
- Built-in SD card slot
- Run/Stop/Reset switch
- Built-in Ethernet port, RS485
- Displays the input and output states via LEDs
- Integrated real-time clock
- Programming software GX Works3

5.3 GS-2107-WTBD (HMI)

Mitsubishi Electric GOT2000 HMIs provide the user with a comprehensive range of options to ensure application or process is covered. Comes equipped with a high speed CPU for responsive HMI operation even under high load processes including logging and device data transmission. Supporting a wide variety of communication options including RS232, RS485/422 and Ethernet making this series of HMI very versatile

- Premium processor coupled with expanded memory
- Multi-touch operation
- Wide variety of communication functions to ensure your application is covered
- Double the speed for monitoring & booting of previous generation
- Simplified setup and debugging controls for simple setup

- Supports a wide variety of image formats, including PNG

5.4 FR-D720S-255-EC (VFD)

- Simple cabling, the integrated spring clamps connect control and power lines quickly which ensures reliability and simple cabling.
- Easy parameterization software FR-Configuration encourages easy functions such as graphical machine analysis to optimize the drive system^[12].
- An integrated digital dial gives the user direct access to all of the important parameters.
- The integrated four digit LED display monitors and displays current operating values and alarm messages.
- Features a second transistor output which is sink selectable source logic safety input instead of sink logic.
- Directly connect to PLC's instead of safety relays.
- Features a Sensor-less vector control which enables exceptional speed and torque performance.
- Serial interface (RS485) as standard.
- Emergency safe stop input compliant to EN 61800-5-2.
- Maximum short-term overload capacity of 200% for 0.5s.
- Automatically restart after power failures.

5.5 MR-JE-20A (SERVO DRIVE)

- Advance one touch tuning
- Instantaneous power failure override
- Large capacity drive recorder
- Absolute position detection system
- Performance Features;
- SSCNET III/H
- Fast and accurate
- high resolution encoder
- Energy conservation

5.6 ESP8266

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield offers.

The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community. This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area^[11].

6. SOFTWARE SPECIFICATION

6.1 GX WORKS 3

- It is the latest generation of programming and maintenance
- Software offered by Mitsubishi Electric specifically designed for the
- MELSEC IQ-R Series control system.
- It includes many new features such as graphic-based system configuration, integrated motion control setup,
- Multiple language support, providing an intuitive engineering environmentSolution.

6.2 ARDUINO IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino board. The source code for the IDE is released under the GNU General Public License, version 2^[18]. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main^[15] into an executable cyclic executive program with the GNU toolchain, also included with the

IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

6.3 BLYNK

Blynk is a Platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets^[19]. It's really simple to set everything up and you'll start tinkering in less than 5 mins. Blynk is not tied to some specific board or shield. Instead, it's supporting hardware of your choice. Whether your Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or this new ESP8266 chip, Blynk will get you online and ready for the Internet Of Your Things^[13].

7. CONCLUSION

This project can be adapted to requests formed in the design process, updating the sensor information and reflecting the real factors of environmental poultry farming. Each node has been set to receive the environmental factors (temperature, water level and food level)^[16-17]. If any of these observing conditions drops below the predefined threshold, the sensor node will intimate the farmer and automating heating method, filling of water and filling of food takes place. This system will be labor-saving for the farmer and report

environmental changes immediately, thereby enabling the farmer to prevent adverse strictly implemented throughout the redaction method and compiled into the feasible machine language once Consequences.

The first set is formed of various sensors dedicated to measure the environmental parameters in the farm building as temperature, humidity, airflow, and others. The sensors are connected to a local control unit that acquires the readings and sends the data. The main controller receives all the information, processes it, and responds according to predefined algorithms.

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