**Career episode 1**

**Introduction**

**1.1**

I have briefed my detail project work on “**GSM based poultry farm automation**” during my bachelor degree in electronics and communication engineering. I conducted the project under the supervision of entersupervisor’s name with a positionat entering the university name with location. The project was started from enter starting date and accomplished in enter completion date. This project was mainly focused on providing a fully automated system for a poultry farm and with flexibility for controlling all the devices from a remote location using GSM technology.

**Background**

**1.2**

The development and implementation of the embedded system are increasing in rapid pace from past few decades. The area of the embedded system is widening day by day which includes industrial sectors, health care system and security systems too. Automation in agriculture business is also a no exception. There is a long history behind the evolution of poultry business which plays a significant role in the world economy. According to a survey, more than 50 billion chickens are consumed as the main source of protein. For the better productivity and get maximum profit from the farming, we have to provide better environmental conditions such as controller temperature humidity, the flow of air, continuous water and feed. This is not possible in traditional poultry farming system. There are many companies in the market which provides the full automation for large-scale farms and they cost more. This is not idle for small farmers in a country like India.

To solve the existing problems of traditional farming, we proposed this project work which is very economical and provide full automation in the farming. This is a GSM-basedsystem for controlling devices from a remote location through SMS.

**Objectives**

**1.3**

To design and fabricate the GSM-basedpoultry farm automation system was the main motive of this project. Other minor motives are listed in the following points.

* To maximize the productivity of the farm by providing a suitable environment for the birds.
* To reduce running cost and increase profit by reducing the manpower and saving electric bills.
* To provide a facility for the owner to control all the devices and system from the remote location.

**Organizational chart**

**1.4**

The project was conducted under the department of electronics and communication engineering. The followinghierarchy shows the information flow along with my position in the project development phase.

Figure: hierarchy for the poultry farm automation.

**Roles and responsibilities**

**1.5**

I was assigned as a team head of the project for completing the project within the estimated timeframe. I gave credit to all my teammates for accomplishing their tasks on time sensibly. The major responsibilities that I had taken during the execution phase are listed in the following points.

* I performed detailed study collecting information from sources like books, articles, journals and academic project documents available.
* Next, I selected suitable and high-performance components for the project work and made BOQ.
* I designed the circuit connection in Proteus software for the proposed automatic poultry farming system.
* Then, I wrote coding to interface other components with the microcontroller according to the circuit connection and also simulated.
* I optimized the connection, prepared circuit layout and preformed PCB fabrication.
* After that, I fabricated all the components on the PCB board to developthe system.

**Personal engineering Activities**

**1.3**

**1.3.1**

I spent a couple of weeks for the literature review process for strong understanding about the project domain before jumping into practical work. I gleaned information through numerous articles, journals, academic books,and related project documents.I also searched different websites related to the project.I studied about GSM modules, its working principles, advantages,and disadvantages. I also went through datasheet of a number of microcontrollers and Arduinos to use them as central processing unit based and compared their performance as well as cost to make the system cost-effective. Then, I searched about various sensors such as temperature, humidity and water level etc. to implement them to measure the required parameters inside the farm. I also downloaded required software for the project work such as Proteus, Atmel Studio, Eagle software,and Android studio. Then, I arranged a team meeting for further discussion on the project work and prepared Gantt chart for scheduling tasks. At last, I pointed out possible technical problems and their solution statements from documentation of similar projects.

1.3.2

Next step in the process was a selection of components to develop more effective automation for poultry farming. I consulted with the supervisor and discussed in the project group. After that, I made the decision to use low power consuming, high-performance 8-bit CMOS ATmega89S51 microcontroller having 4KB flash memory with 44 pins as a master control unit for the whole system. Then, I purchasedquad-band GSM sim900 operating at 850,900,1800 and 1900Mhz frequency range with a baud rate of 115200bps. Next, I bought LM35 temperature sensor which has a range of -55 to +150°C with an accuracy of 0.25°C at normal room temperature and 3/4°C within the temperature range which gave a linear output of 10mV per °C rise in temperature. Then, I bought a 12V DC motor, 12Vwater pump,andultrasonic water level transmitters. After that, I made a purchase of DHT11 with humidity range of 20-90% with a tolerance of 5% to measure the humidity inside the farm as well as a pressure sensor. I bought keypad of 4\*4 size and liquid display system of16\*4 size which was capable of displaying alphanumeric character as well as custom character. Moreover, I purchased components like a 220V-12Vstep-down transformer, voltage regulator, full wave rectifier, capacitor and resistors to provide continuous power supply. After that, I prepared BOQ to manage the project cost under the limit to prevent over-cost.

1.3.3

To design the circuit diagram was also my responsibility. Therefore, I prepared the proposed system circuit connection in Proteus. The pool of large set of components, dragging and dropping of elements during the designing phase helped me to finish the designing in lesser time. I made the selected microcontroller as a master controller for the system and connected GSM module to send and receive a message to/ from user to control the devices. Then, I interfaced Keypad to enter the security code to open the main door of the farm. Next, I connected LCD unit for displaying message sent from the microcontroller which generally displayed the environmental parameters, water and feed level of that particular instant. I connected purchased sensors to measure environmental conditions and sent those parameters to the microcontroller. I also designed the circuitry connecting transformer, full wave rectifier, filter and voltage regulator of 12V and 5V to provide regular uninterrupted power to the system.

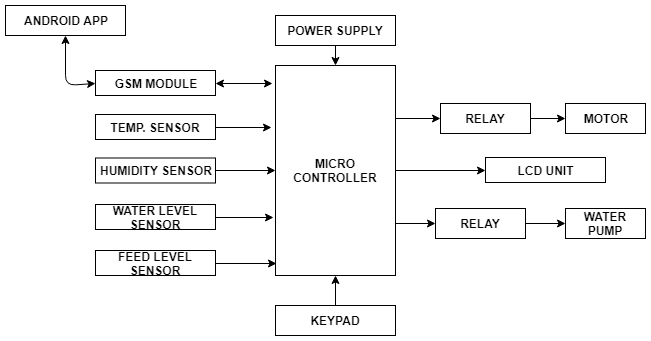


Figure: an Overall block diagram of the proposed poultry automation system.

1.3.4

After that, I performed the programming of a microcontroller using Keil IDE which facilitated for programming of almost all microcontrollers with the powerful compiler. For this purpose, I utilized C-programming language though it also has support for C++ and assembly languages. Next, I converted the code into hex file which is microcontroller compatible. Then, I uploaded the code into the Proteus circuit to simulate it. I simulated the connection and observed outputs. I made some changes both in coding as well as in circuit connection to get the desired output result. Furthermore, I also developed an android application for smartphones to interact with the system through SMS using Android Studio and Java as a programming language.

1.3.5

In the next step, I checked the functionality of an individual component as well as overall connection. Prior to that, I utilized bootloader to download code into the microcontroller. I prepared a similar circuit connection using a breadboard and connected all components on the board to observe the output result from physical testing. After ensuring that the connection was 100% accurate. I went for preparation circuit layout to develop PCB board using Eagle software. But before that, I optimized the circuitry for efficient performance of the system. Afterthat, I printed the connection on the glossy paper and transferred it on the copper plate. Before that, I cleaned the copper board surface to remove other external impurities including an oxide layer. Then, I etched the copper board using ferric chloride solution for chemical etching which was economical. I scrubbed copper residue and cleaned the surface carefully. Next, I conducted continuity testing of prepared PCB to ensure proper connection.

1.3.6

The final step in the development phase was the fabrication process. Before that, I tested the PCB board by placing all the elements on the board and connecting the power supply system. It was not possible to implement the project work in the real farm. Therefore, I prepared the prototype connecting all the components and preparing a small model of the farm. I placed each component on their places and observed the result from the experiment. I found that all the devices were working properly and I inserted Prepaid SIM card on the SIM slot of the GSM module prior to the testing phase. The developed android application was working perfectly and communication between user and system was smooth and fast.

**Technical problems and solution statement**

**1.3.7**

During the testing of the prepared system, I found one problem with the water level sensor. In the idle condition where the water level was above the level of attachment of the water sensor and the water pump was remained OFF. But whenever the water level went slightly below the sensor level the water pump turned ON which pumped water on the tank. During this phase, the water pump turned ON/OFF within the small interval of time regularly. To solve the problem, I reviewed the program as well as connection. I found the cause for the problem which was in programming. Then, I calculated the time required to fill the tank considering the water flow rate through the pump and placed the sensor at bottom of the tank. This not only solved the problem but also eliminate the requirement of another water sensor.

The second problem I encountered in the testing phase of the circuit connection on the breadboard. At the normal condition, the system performed according to our requirement when every device performed their tasks smoothly. But when critical condition reached, then it sent a message to the user. It sent SMS but it sent one SMS for every execution cycle till the critical condition was removed. This was wastage of money through numerous SMS and was undesired. I shared the problem with supervisor and he suggested me to define interrupt in the programming which activated the counter if the critical condition was reached and the system sent a repeated message to the user with the interval of 15minutes. This solved the problem and system worked smoothly.

**Creative work**

**1.3.8**

I used LM35 in the project to measure the temperature inside the farm though DHT11 has the ability to sense temperature along with humidity. The accuracy of LM35 was 3/4°C throughout its temperature range whereas the accuracy of DHT11 was+- 2°C. Since temperature variation with 2°C has a significant effect on the health of birds. I used LM35 to ensure more accurate temperature was measured and maintained on the farm.

**Engineering standards and ethics**

**1.3.9**

I followed the codes and ethics of electronics and communication engineering while executing project work. I designed the PCB layout based on the international rules for PCB design. I followed ISO 31.200 and IEC60034 standards for implementing ICs along with microcontroller and DC motor for door system respectively. I used the GSM module based on the IEEE802 standard for wireless communication. I createa very good working environment in the group and had cooperation among the members. I gave enough credit to others’ work referenced in the execution phase. Furthermore, I executed each task under the regulations set by our department.

**Project management**

**1.3.10**

Proper scheduling of tasks and management of available resources was very essential for completing the project successfully. Therefore, I took the responsibility for managing the project alone and started work from the preparation of Gantt chart. I arranged team meetings twice a month to have a discussion on project progress and further planning. I also visited the electronics and communication department to have chat with professors and supervisor on encountered challenges. I allocated the weekly tasks to all the teammates considering their area of interest and updated Gantt chart accordingly to keep track of project progress. Furthermore, I explained every important topic of project work to all the faculty members through power point presentation. I prepared and submitted a number of reports and final documents which included encountered challenges and applied techniques for eliminating those difficulties.

**Summary**

**1.3.11**

A fully automated poultry farming system was designed and fabricated achieving all the objectives within the estimated constraints. Timely completion was only possible due to the effort from all teammates and regular guidance from the supervisor. This project can be implemented in any poultry farm from small to large at very low cost as compared to commercially available systems. With slight modification, it canbe used for controlling environment condition of greenhouse too. The major limitation of the project is that it is not reliable where a network connection is weak which delays the transmission of the message. We can implement an alarm system on the farm if any intrusion is encountered for more security. I got a chance to upgrade my theoretical knowledge as well as practical skills for other projects. It improved my leadership skills and managerial skills as I was leading the project work. My public speaking and presentation skills were significantly enhanced due to regular meeting and presentation. It also improved my technical writing and documentation skills too.