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CPE323
MICROPROCESSOR

ChickMeUp: An IoT-based project for Smart Poultry Farms

Performance Innovative Task

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ABSTRACT

Poultry farming is one of the livelihoods of many Filipinos. The growing market of poultry products has demanded a proper monitoring of chickens and smart systems of poultry farms to increase quality of goods, lessen mortality and labor. This study presents an IoT-based system for smart poultry farms using ESP32, capable of monitoring the environmental conditions as well as automating the routine tasks such as feeding and temperature control. The system was developed by utilizing sensors and actuators, controlled through the Blynk application for real-time monitoring and management. Through a series of comprehensive tests, which includes functionality test, temperature test and water and food level test, the system demonstrated effectiveness in regulating the environmental conditions inside the poultry house as well as automatically refilling the water and remotely feeding the chicken. In conclusion, a successful IoT based smart poultry farm was created with the efficiency of helping poultry farmers in their day-to-day livelihood. It is recommended to have a large poultry house and waste management system.

Keywords: automation, ESP32, internet of things, heat stress, monitoring system, poultry farm, poultry house

CHAPTER I

A. Introduction

The poultry industry is an integral part of the Philippine economy. It provides a source of livelihood for millions of Filipinos and also increases the country's agricultural output. As the sector continues to expand, the demand for livestock products, both domestically and internationally also increases. Understanding the challenges in poultry farming is important in addressing issues that impact food security and livelihoods. According to the Department of Science and Technology, the mortality rate of the native chicken industry in the Philippines is 40%. The most common factors that cause mortality in poultry are temperature and ventilation. The high mortality rate in chickens not only signifies a loss in potential income for farmers but also reflects the need for improved farm management practices.

B. Statement of the Problem

Poultry farming is one of the livelihoods of many Filipinos especially in rural areas. According to reports from the Department of Agriculture, 13% of the agriculture gross value were from poultry production and 40% were from dressed chicken production. These values were accumulated between 2009 and 2018. Additionally, the poultry subsector logged 2.5% growth rate in the second quarter of 2021 (DPA Press Office, 2021). It is proven that the demand of poultry products has increased over the years due to its health benefits especially on its high protein, low sodium, and low cholesterol. According to Poultry World, chicken meat and poultry products surpassed the pork for protein choice of Filipinos in 2019 (Poultry World, 2022). Because of this, proper monitoring of chickens and other poultry products is a need in order to have quality goods to be distributed to the market. A Monitoring System in poultry farms is needed to evaluate the growth of the chickens and to maximize the efficiency of production.

Temperature Monitoring in Poultry Farms

Traditional poultry farming has been practiced by poultry farmers for many years. This includes the monitoring of temperature and feeding practices of farmers. For instance, in monitoring temperature inside the poultry farm, farmers need to lower the temperature significantly so heat stress on chickens will be avoided. Heat stress is the first and the most important environmental challenge in poultry farming all over the world. Its effects can cause chickens, broilers and hens to reduce growth and egg production. (Lara & Rostagno, 2013). Additionally, this may cause the deaths of chickens. In order to avoid such events, farmers must adjust temperature via cooling and ventilation. Farmers must spray water on the roof to prevent the direct sunlight inside the poultry farm. Another practice is ensuring that cooled air is not directly pointed to the direction of the bird. (Arts, 2020).

Feeding Procedure

One way of feeding chickens, broilers and lay hens practiced by poultry farmers is the cafeteria style. It is the most time-honored method of feeding chickens with a balanced diet. In order to do this, farmers must lay a mix of grains, steamed beef scrap, and other ingredients in a large tray where chickens were left how much ingredient they will eat (Plamondon, 2009). There are numbers of chickens that need to be fed and it takes time for the farmers to lay food.

Overall, both temperature monitoring and feeding procedures of farmers take time and labor intensive. Thus, this project aims to address the following problems:

1. Time consuming step and process of the traditional monitoring system.
2. Heat stress in a poultry farm environment results in the death of chickens and reduced growth and production of chicken and eggs.

C. Objective of the Study

This study aims to create an IoT-based project for Smart Poultry Farming using ESP32. The creation of this project includes the ff:

1. To monitor and display the status of temperature, food and water inside the poultry house using sensors, LCD and Blynk Cloud mobile application.
2. To remotely feed the chicken with food and automatically refill water with the use of IoT devices.
3. To automatically adjust the temperature and circulation fan inside the poultry house.

D. Scope and Limitation of the Study

This project focuses on the use of ESP32 microprocessors to create a Smart Poultry Farm management system. The project will make use of sensors such as dht11, HC-SR04 Ultrasonic Sensors, and others to monitor the temperature and food and water levels. Cloud services such as Blynk IoT and Firebase will also be utilized to integrate the components further. The project will also include automatic and manual activation of relays and a servo motor for the automation of Smart Poultry Farm management devices.

This project will only be limited to a single Smart Poultry Farm house. It will also not include the selection of the right food and the filtration of water. Remote access to the system is also limited via WiFi.

E. Significance of the Study

The result of this research may be beneficial by significantly enhancing efficiency through automating routine tasks such as feeding, temperature control, and monitoring environmental conditions. This research may also improve the welfare of the chicks by maintaining the appropriate temperature, humidity, and light conditions, which helps promote better health and growth rates among poultry. In addition, this research could be of importance and beneficial to the following:

For the *poultry farmers,* this study will give important insights into feeding efficiency, and for ensuring the well being of their poultry, ultimately leading to an increased profit and sustainability in their farms.

For the *consumers,* this study will give improved quality and safety of poultry products, ensuring healthier options and greater confidence in the food supply chain.

For the *future researchers,* the results of this study may be used as reference data for the future advancements in poultry farming techniques and overall agricultural sustainability.

CHAPTER II

Review of Related Studies

The use of microprocessors and various types of sensors, as well as implementing an IoT-driven system in poultry farming is a growing area of interest, as it can significantly enhance the efficiency and productivity of farms. There are different approaches in developing an automated poultry farm, the researchers focus on reviewing the recent works in this field, as it is relevant to their study.

THE PROBLEM ON HEAT STRESS

Impact of Heat Stress on Poultry Production

Heat stress is one of the most important environmental stressors challenging poultry production worldwide, as it greatly affects the growth, egg production, and the overall quality and safety of poultry products. This review summarizes known research on the relevance and impact of heat stress in chicken production, with a particular emphasis on broilers and laying hens. Many strategies have been studied to reduce the negative effects of heat stress, ranging from environmental management measures to dietary changes and additive supplements. However, the effectiveness of these strategies can vary and have inconsistencies across studies. Recent studies have explored innovative approaches such as early-life conditioning and genetic selection for enhanced heat tolerance in poultry breeds. Despite the potential of these studies, more study and research is needed to fully maximize the benefits of these solutions, particularly for poultry production in hot climates.

IoT BASED PROJECTS FOR SMART POULTRY FARMING

Implementation of Smart Poultry Farm Management System with IoT

Agriculture has been one of the major sources of livelihood in the world. Along with the growth of population comes a great demand for high quality poultry products. The existing system in the traditional poultry farms relies more on manual labor which makes it more tedious to manage. The proposed smart poultry farm aims to automate the manual process in the traditional poultry farming, including sending timely feedback to the operator of the system when required and address the disadvantages that comes with the existing system. The system is implemented using ESP32 microprocessor, actuators, and sensors to monitor various environmental parameters which are crucial in poultry farming. These parameters include humidity, temperature, ammonia and methane gas concentration level, light intensity and water level. The ESP32 receives the data from the sensors which is then displayed in an online IoT platform to monitor the conditions in the farm remotely. The actuators used in the system include heater and fogger to control the temperature and humidity, exhaust fan to maintain proper air circulation, a light bulb to increase the light intensity when it is below the threshold values and a water pump to supply water to the tank.

IoT Based Smart Monitoring System for Efficient Poultry Farming

A poultry house's environment is a crucial factor in production that may be monitored and optimized to produce good quality chicken and chicken eggs. The proposed smart monitoring system uses Internet of Things (IoT) technology to track and regulate environmental conditions in poultry farms. Key elements such as temperature, humidity, and air quality are monitored to improve bird health, reduce mortality rates, and increase production efficiency. The system consists of an ESP32 microcontroller with Wi-Fi capabilities, as well as temperature (DHT11), humidity, motion detection (PIR), and gas detection (MQ135) sensors. A buzzer alerts the farmer to intrusions, and Wi-Fi access provides notifications. Furthermore, the system regulates lamp brightness to adjust internal temperature as needed. Despite being installed as a prototype in a small-scale poultry house, tests proved the system's efficacy in meeting its objectives.

IoT Based Smart Poultry Farm in Brunei

Maintaining the climate inside the poultry farm is important because it affects the health of the chickens, including the people working in the poultry farm. The traditional system involves manually monitoring climatic conditions such as temperature, humidity, water and air level quality, lighting, ventilation and heating. The proposed system is based on the intensive closed production system considering four important factors of the poultry farm namely, temperature, humidity, air quality level and the food feeder and automated process of monitoring and controlling these parameters using IoT, WSN, Mobile Technology and RESTful web services. The system is composed of three important modules which are the Temperature and Humidity sensor module, Air quality sensor module, and Feeder sensor module. It utilizes an Arduino Mega 2560 R3 as the main development board, the sensors and relay will be connected to the development board. The arduino will collect the thermal parameters through the temperature and humidity sensor module, air quality level through the air quality sensor module, and the food level through the feeder sensor module and send it to the database through the NodeMCU Wi-fi controller. The system also uses four types of alert notification such as LCD and LED alert attached to the prototype, SMS alert notification through a mobile phone, e-mail alert notification and WhatsApp notification. The research concludes that using IoT and mobile technology in poultry farming is a better way to maintain and improve the overall climatic condition inside the poultry farm and reduce the mortality rate of poultry farms in Brunei.

Design and Implementation of Monitoring and Control System for a Poultry Farm

This system utilized basic components and sensors to facilitate and control a poultry farm. The system detects changes in the sensors and updates the information. A relay module is used to turn on and off the actuators in the poultry farm. The system uses a XC5-48RT-E PLC as its main controller, HMI and LCD display, MQ-2 Gas sensor module to detect gases like LPG, alcohol, propane, hydrogen, CO and methane, HSR16 temperature and humidity sensor, light sensor, and a load cell as a weight sensor to monitor the weight increment of chicks in the farm. The research concludes that the proposed system helps the farmers to control and manage the farm easily and automatically and monitor the changes that occur in the farm.

Design and Implementation of an Automated Feeding System for Poultry Farms

The proposed automated feeding system consists of the following: L298N motor driver, HCSR04 ultrasonic sensor module, piezo buzzer, 12V DC solenoid water air valve, voltage regulator circuit, switching system, 12V power adapter and stepper motor. The system uses an Arduino Uno to communicate between the hardware and software parts of the system. The system controls the dispensing of feed (liquid and solid) through the program written on the ATmega328P microcontroller via the Arduino Uno. The study shows that the system is effective in improving power management in the farm and significantly saves time and energy.

IoT-driven Transformation of Poultry Farming: Ensuring Health, Hygiene, and Efficiency

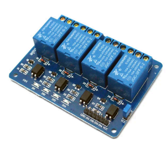
With an ever-increasing global demand for poultry products, the need for efficient and sustainable poultry farming practices has never been more crucial. The project introduces an innovative approach to poultry farming by integrating advanced technologies like the Internet of Things (IoT), Wireless Sensor Networks (WSN), and edge computing. Unlike traditional manual monitoring systems, this system employs smart sensors for continuous real-time tracking of critical environmental factors such as temperature, humidity, gas levels, and lighting. Utilizing edge computing, it autonomously adjusts farm actuators to optimize conditions for poultry health and productivity. Special attention is given to maintaining food and water hygiene within the poultry environment. To mitigate contamination risks and spread of disease, precise food measurement mechanisms are tailored to the chicks' specific age, ensuring the dispensing of the correct amount of fresh, clean food during each feeding cycle. This meticulous approach maintains high feeder hygiene standards. Ultimately, this proactive system significantly enhances poultry health and farm productivity while prioritizing disease control. By implementing these health-conscious practices, it ensures the production of robust, healthy chickens, meeting consumer standards and reshaping poultry farming practices for greater sustainability and efficiency.

CHAPTER III

This chapter presents the methodology of the project. It shows the list of components used and its functions, circuit diagram, system's flowchart, schematic diagram and the prototype.

A. Component list and its Function

1. Hardware Components

Component	Image	Functions
16x2 LCD with I2C Module		This component is used to display the temperature, water and food level in the poultry house. This component will be displayed outside the poultry house.
3.7 V Battery		This component is used to power the DC motor water pump.
4-channel Relay Module		This module is used to to switch electrical devices or systems on and off. It is used to to switch higher power devices such fan, dc water motor and fluorescent light bulb.
5V-12V DC Motor Water Pump		This component's primary usage is to circulate, pressurize, and emulsify liquids In the system it is used to refill the water container inside the poultry house.
DC Fan		This component is used to cool down the environment inside the poultry farm once the temperature reaches more than 35° C.

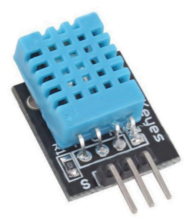
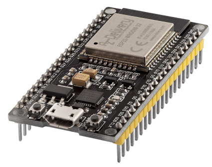
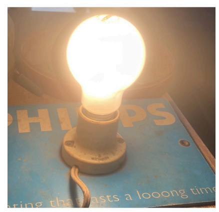
DHT11 Sensor		This component is used to read and measure the humidity and temperature inside the poultry farm. Once the temperature reaches more than 35° C it will send signal to the ESP 32.
(2) ESP32		This component is the main brain of the whole system. It is responsible for all the processes and instructions that is needed for the system.
Fluorescent Light Bulb		This component is used to warm the chicks inside the poultry farm.
(2) HC-SR04 Ultrasonic Sensor		This component is used to measure the water and food level inside the poultry farm. Once the food and water level is not enough to feed the chicks, it will send signal to the ESP 32.
Microservo Motor		This component is used for the close and opening of the feeder inside the poultry farm. It will be controlled manual using the mobile application called Blynk.
Piezo Buzzer		This component is used to alarm the poultry farmers that the temperature inside the poultry farm reaches over its normal temperature. Once the temperature inside the poultry farm reachers more than 35° C this component will turn on.

Table 1: Hardware Components for ChickMeUp

2. Software Components

Component	Image	Functions
Arduino Core / C++ programming language		This language is used to to write instructions for the whole system. This programming language will help the project proponents to write the functions of the IoT-based project and to easily contact integrated sensors.
Arduino IDE		This will be utilized to write, compile and upload the code to the physical board / ESP 32. Arduino IDE is an open-source hardware and software compiler that easily writes and upload codes which is perfect specification in building this project.
Blynk Cloud		To control, monitor and manage the system using mobile phones. This will help the system to display the information (temperature, food and water level) inside the poultry house. It will serve as the main interface of the user when he/she is far from the poultry house.
Firebase		

Table 2: Software Components for ChickMeUp

B. Circuit Diagram Flow

This section presents the graphical representation of ChickMeUp: An IoT-based project for Smart Poultry Farms. This simplifies the schematic diagram in figures 5, 6, 7. The system is composed of two ESP32 as microcontrollers, one for water and food systems and one for automation of systems related to temperature of the poultry house.

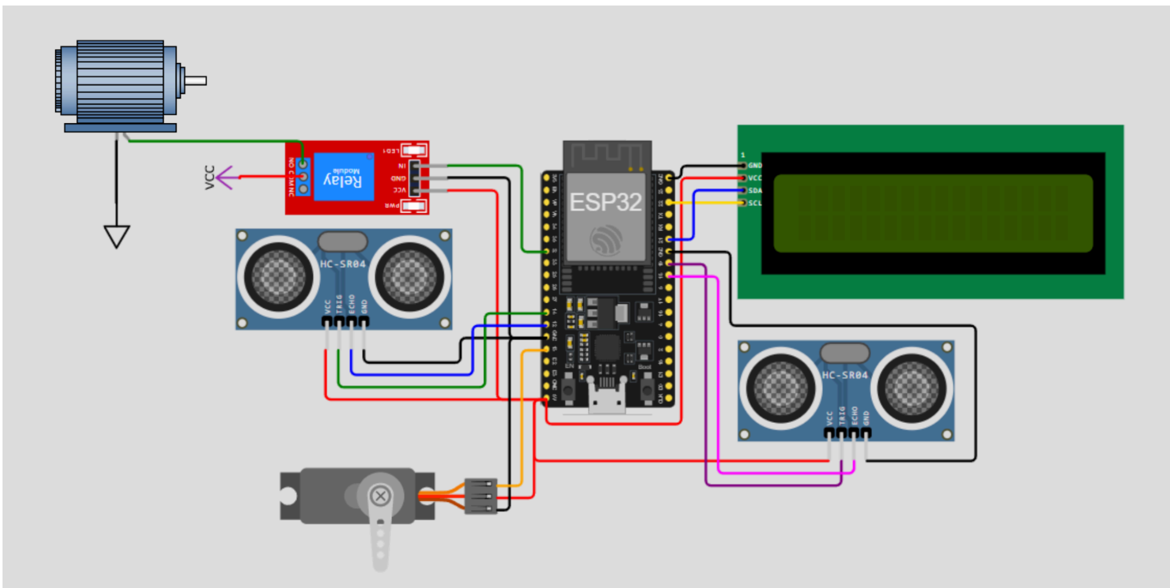


Figure 1: Circuit Diagram for ESP32 -1 (Feeder System)

Figure 1 illustrates the circuit diagram for the feeder system of the created smart poultry farm. It involves the following components: ESP32, two ultrasonic sensors (water level and food level), servo motor, relay module, dc motor water pump, and 16x2 I2C LCD. All components are connected to the ESP32 for I/O processes.

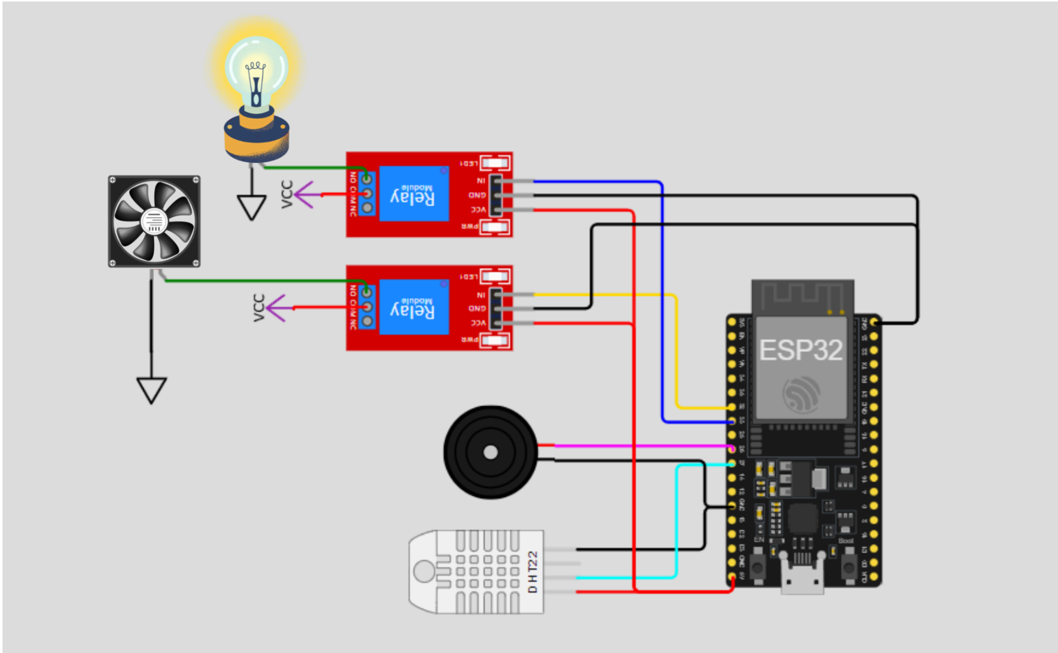


Figure 2: Circuit Diagram for ESP32 - 2

Figure 2 shows the circuit diagram for the temperature system that was used for the smart poultry farm. It involves an input device, specifically a DHT11, to read the temperature inside the poultry farm and output devices which consist of a piezo buzzer, a fan for cooling, and a light bulb. The piezo buzzer and fan are automated based on the readings from the DHT11. The light bulb can be remotely controlled using Blynk, a mobile application for IoT projects.

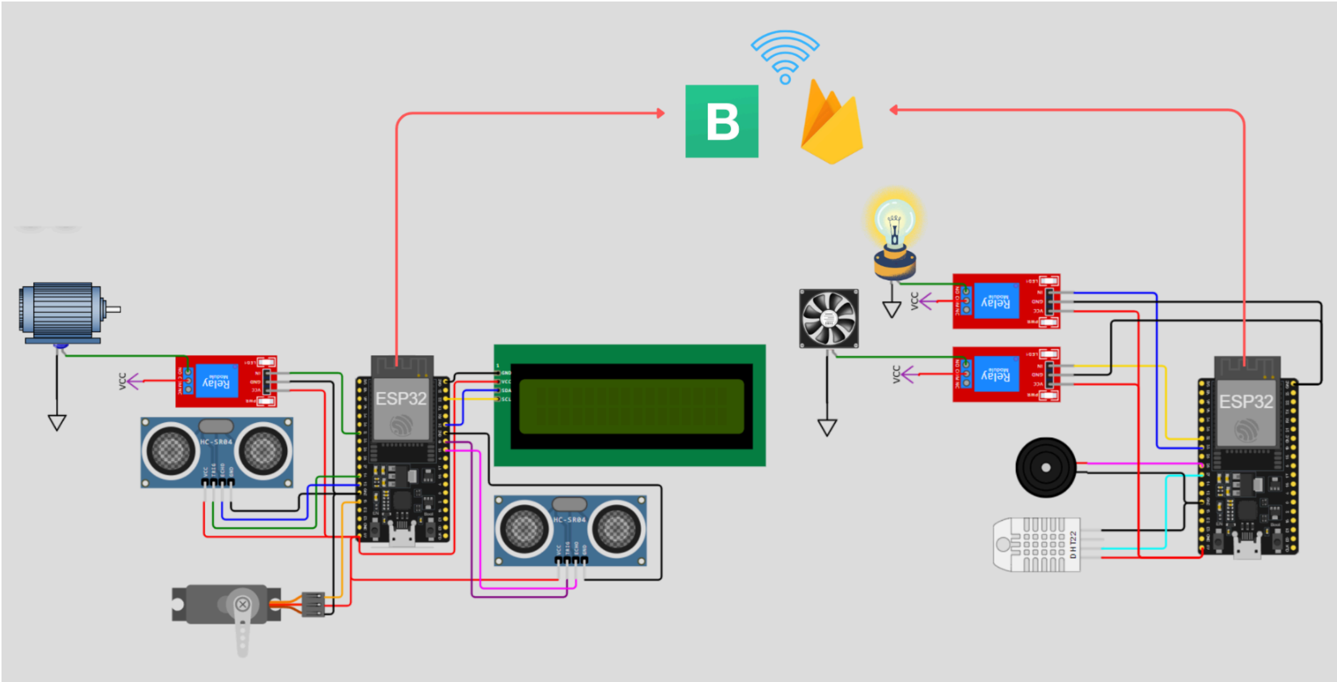


Figure 3: ChickMeUp: An IoT-based project for Smart Poultry Farms Circuit Diagram

Figure 3 shows the overall circuit diagram for ChickMeUp: An IoT-based project for Smart Poultry farms. It is composed of all components from figures 1 and 2. Both ESP32 #1 and #2 are connected to Blynk cloud and firebase for displaying, storing, and passing data through mobile phones.

C. Flowchart

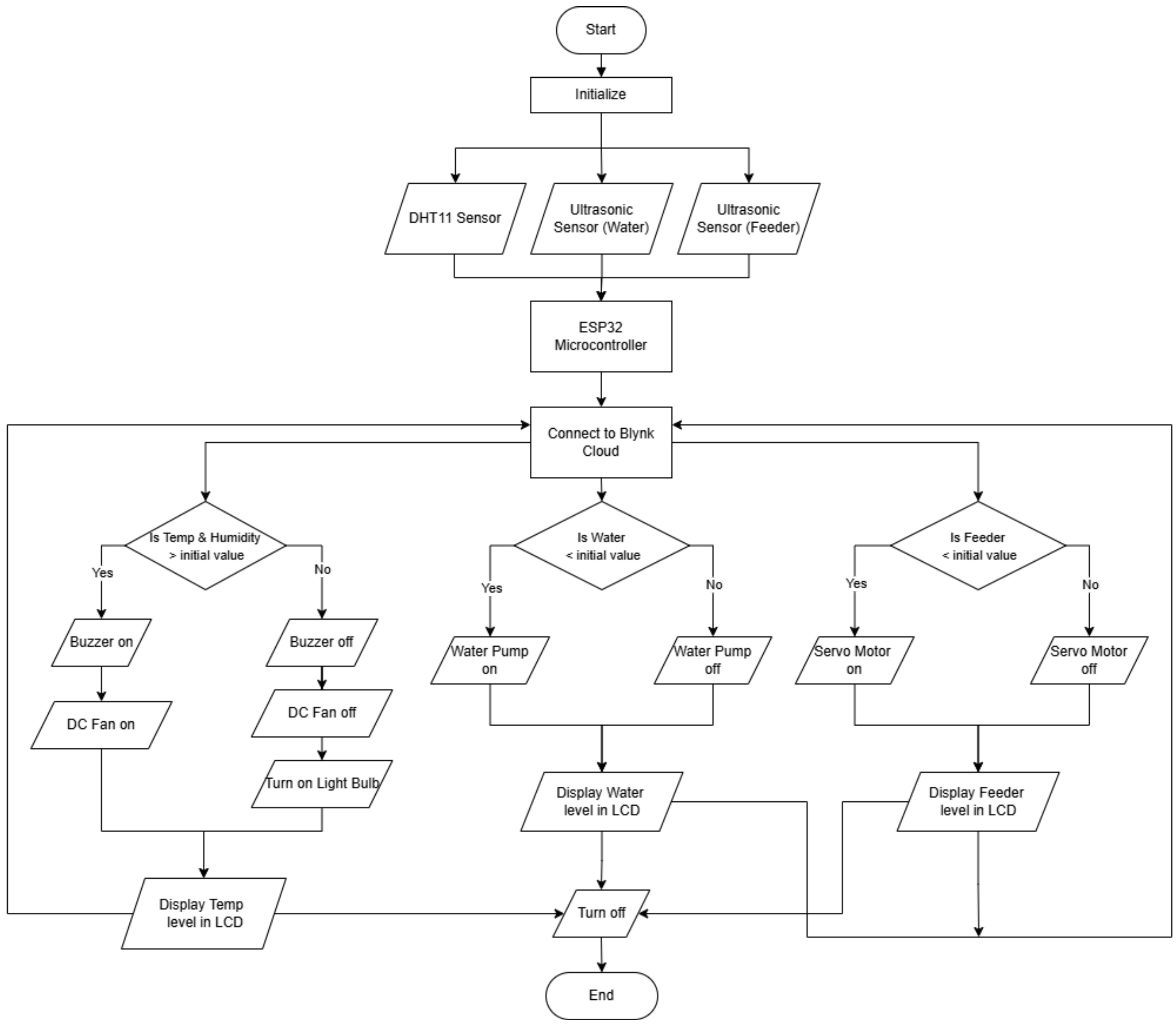


Figure 4. Flowchart of the ChickMeUp: An IoT-based project for Smart Poultry Farms

Figure 4 shows the flowchart of the ChickMeUp system. It outlines the steps and decisions made by the system to automate the processes inside the smart poultry farm. The process starts by initialization. All sensors used in this system are connected to ESP32 for transmission of data. The ESP 32 is then connected to Blynk Cloud for the displaying of data and to remotely control the system using the mobile application. The decision processes of DHT11 and two ultrasonic sensors are parallel, which means that the processing of data for all sensors are simultaneous. Once the conditions are satisfied (temperature, water and food level), the status will be displayed in both the LCD and in Blynk cloud mobile applications for users to monitor the smart poultry farm system.

D. Schematic Diagram

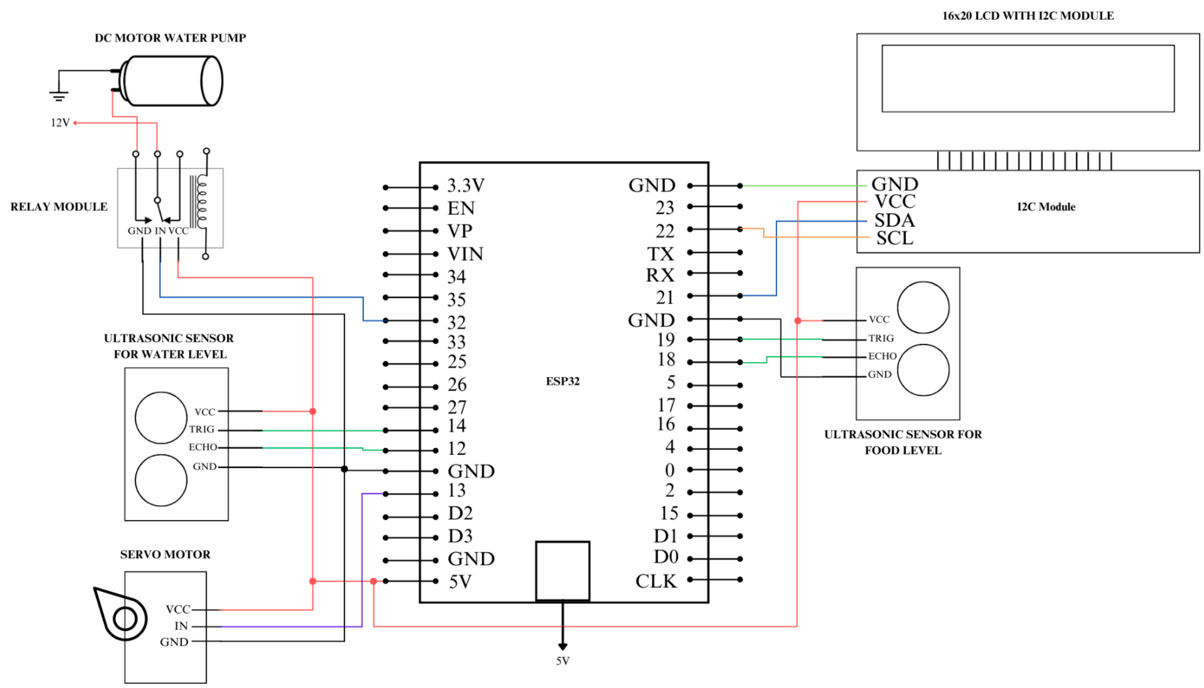


Figure 5: Schematic Diagram for ESP32 - 1

Figure 5 shows the schematic diagram of the feeder system for smart poultry farms. It consists of the same components mentioned in Figure 1. Figure 5 outlines the process of communication between input and output devices.

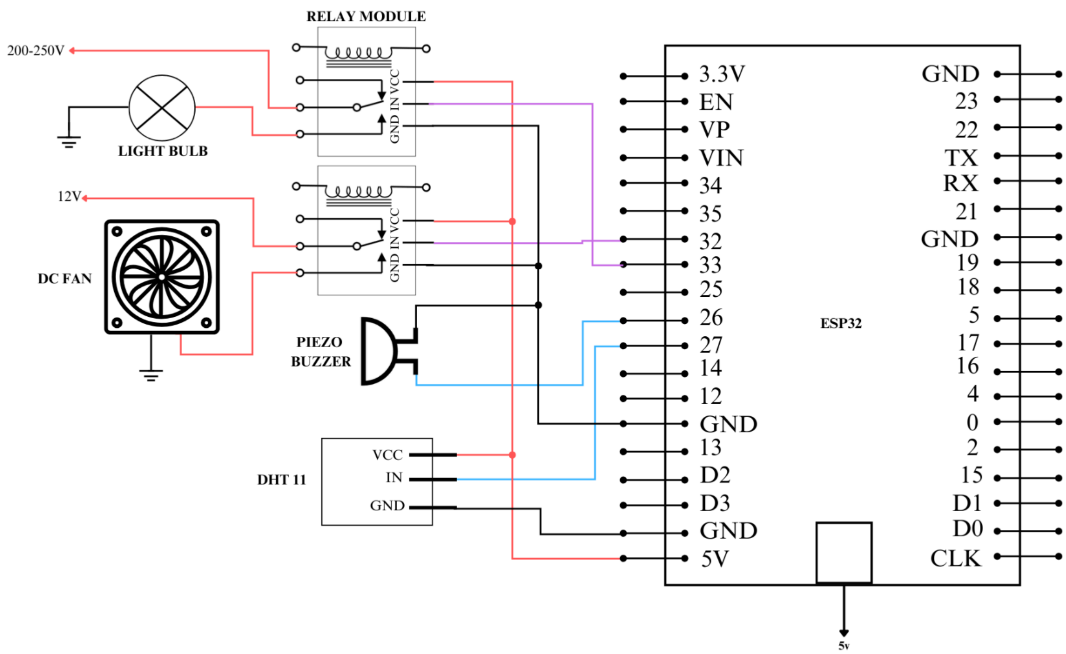


Figure 6: Schematic Diagram for ESP32 - 2

Figure 6 illustrates the schematic diagram for ESP32-2 which is used for the temperature system inside the poultry farm. It consists of the same components mentioned in figure 3. This outlines the communication between the input and output devices and the microprocessors.

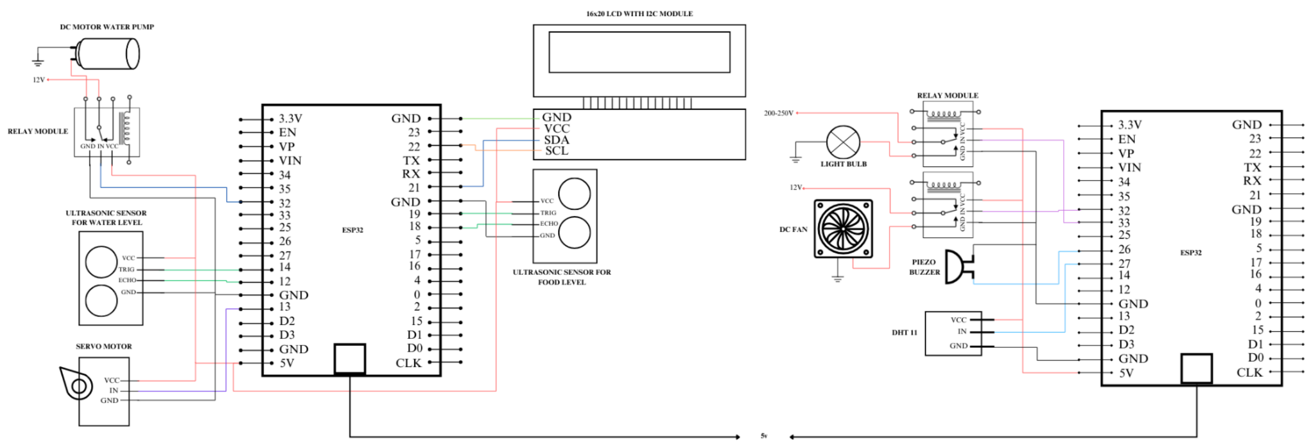


Figure 7: ChickMeUp: An IoT-based project for Smart Poultry Farms Schematic Diagram

Figure 7 shows the overall schematic diagram for ChickMeUp: An IoT-based project for Smart Poultry Farms. It is the combination of figures 5 and 6. Figure 7 shows the communication of input and output devices to its respective microcontrollers and how the two ESP32s are connected. All data from both microcontrollers are displayed on the LCD in ESP32-1 or figure 5.

E. Prototype

This section presents the finished product for *ChickMeUp: An IoT-based project for Smart Poultry Farms.*

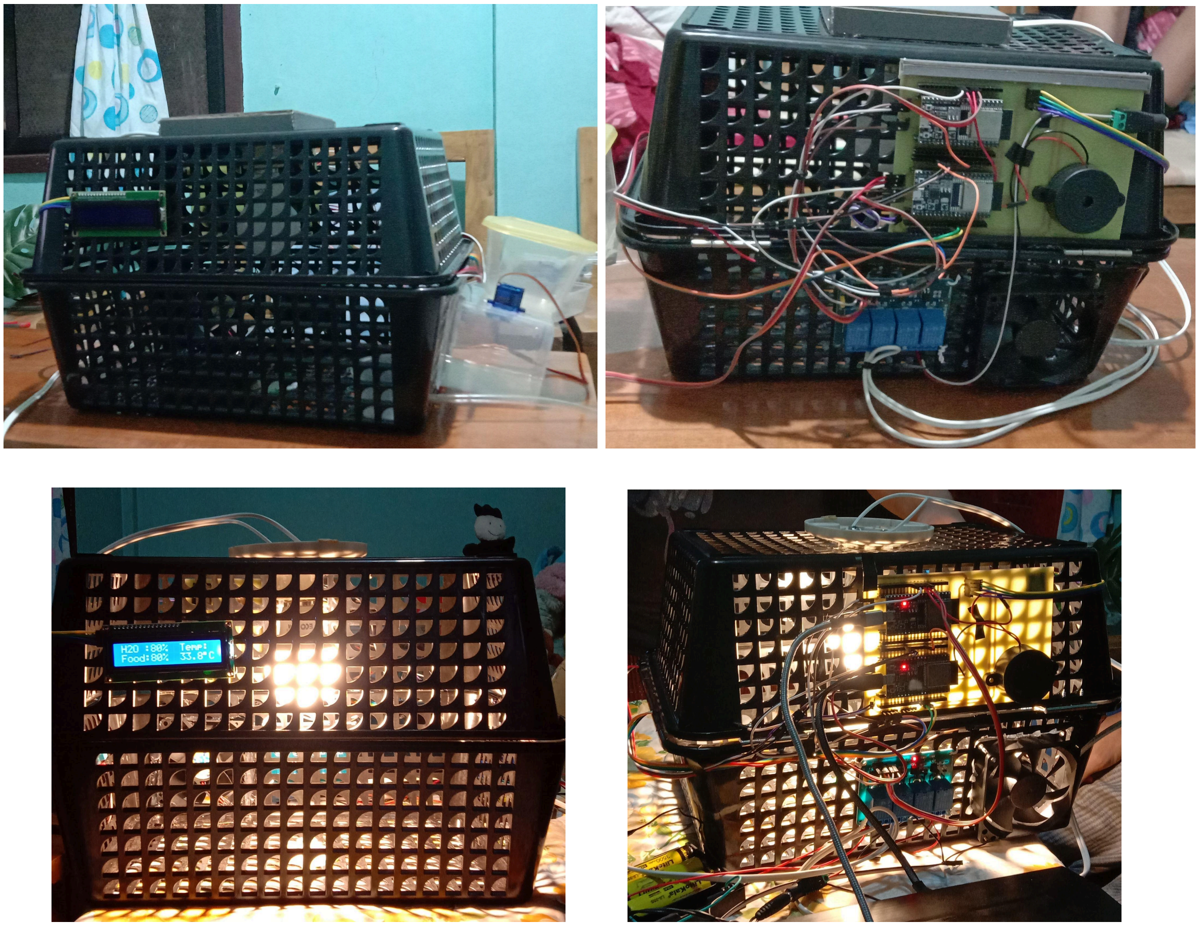


Figure 8: ChickMeUp: An IoT-based project for Smart Poultry Farms

Figure 8 shows the final prototype for ChickMeUp: An IoT-based project for Smart Poultry Farms. All necessary system components have been installed in the poultry house, and the integrated components are functioning as expected.

CHAPTER IV

This section presents the tests that were used by the project proponents and provides a comprehensive analysis of the results based on the specific requirements and objectives during testing.

A. Tests

In order to verify that the system met the requirements, the system was tested and evaluated by the project proponents. The system underwent three tests: functional test, temperature test, and water and food level test. This process aims to identify if all objectives mentioned above were achieved and to identify all the obstructions, defects, and issues existing in the system.

1. Functionality Test

Functional testing includes testing the system against the functional requirements by giving inputs and analyzing outputs. All of the components integrated in this system were tested according to its functional requirements. This includes the reading of temperature and automation of the cooling system once the temperature meets a certain condition. Automation of the water refilling system was also tested based on the response of the system once a certain condition is achieved. Furthermore, the feeder system of the smart poultry farm was also tested based on the system's response once an input is processed by the system.

1.1 Temperature Test

The system underwent a temperature test. This includes the monitoring of readings from the DHT11 sensor. The system first reads the temperature from the environment and sends data to the microprocessor. All of the data gathered is displayed in the LCD and Blynk Cloud mobile application. If the temperature reaches more than 35 ° C, the fan automatically turns on and cools the environment to decrease the temperature inside the poultry farm. Once the system automatically responds to this condition, this means that it satisfies the functional requirement for this project and passes the temperature test.

1.2 Water and Food Level Test

The system underwent water and food level tests. This includes the accurate reading of the sensor used for water level and food level. The feeder system is remotely controlled using Blynk. All of the readings for both water and food level are displayed in the Blynk cloud and LCD. For refilling of water inside the poultry house, the sensor first reads the water level through an ultrasonic sensor. If the water level reaches 20% or less, the dc motor water pump turns on. Once all of these functional requirements are satisfied, the smart system passed the water and food level test.

B. Results

This section presents all of the results from the conducted tests. This includes the results of the functional test, temperature test and water and food level test.

Functional Test

No.	Test Scenarios	Expected Result	Actual Result	Test Result
1	Light bulb is turned ON from Blynk Cloud	Light bulb is ON directly	Light bulb is ON with one second delay	Pass
2	Light bulb is turned OFF from Blynk Cloud	Light bulb is OFF directly	Light bulb is ON with one second delay	Pass
3	Temperature is above 35 ℃	Temperature is displayed on LCD	Temperature is displayed on LCD with one second delay	Pass
		Temperature is	Temperature is	Pass

		displayed on Blynk Cloud Application	displayed on Blynk Cloud Application with one second delay	
		Piezo Buzzer is ON	Piezo buzzer is ON	Pass
		Fan is ON	Fan is ON	Pass
4	Temperature is equal of below 35 °C	Temperature is displayed on LCD	Temperature is displayed on LCD with one second delay	Pass
		Temperature is displayed on Blynk Cloud Application	Temperature is displayed on Blynk Cloud Application with one second delay	Pass
		Piezo Buzzer is OFF	Piezo Buzzer is OFF	Pass
		Fan is OFF	Fan is OFF	Pass
5	Water Level is above 20%	Water Level is displayed on LCD	Water Level is displayed on LCD with one second delay	Pass
		Water Level is displayed on Blynk Cloud Application	Water Level is displayed on Blynk Cloud Application with one second delay	Pass
		Dc motor Water Pump is OFF	Dc motor Water Pump is OFF	Pass
6	Water Level is equal or below 20%	Water Level is displayed on LCD	Water Level is displayed on LCD with one second delay	Pass
		Water Level is displayed on Blynk Cloud Application	Water Level is displayed on Blynk Cloud	Pass

			Application with one second delay	
		Dc motor Water Pump is ON	Dc motor Water Pump is ON	Pass
7	Sensor for Food level reads Data.	Food level is displayed on LCD	Food level is displayed on LCD with one second delay	Pass
		Food Level is displayed on Blynk Cloud Application	Food Level is displayed on Blynk Cloud Application with one second delay	Pass
8	Feeder is turned ON from Blynk	Servo motor is ON.	Servo motor is ON with one second delay	Pass
		Feeder is OPEN	Feeder is OPEN with one second delay	Pass
9	Feeder is turned OFF from Blynk	Servo motor is OFF	Servo motor is OFF with one second delay	Pass
		Feeder is Closed	Feeder is Closed with one second delay.	Pass

Table 3: Functional Test Results

Table 3 shows the functional testing of the ChickMeUp: An IoT-based project for Smart Poultry Farms system which includes several test scenarios to verify the correct operation of the components. Each test confirmed that the expected results such as turning devices on and off and displaying data on the LCD and Blynk Cloud app occurred correctly. Despite having one second delay from the expected response time, the system's functionality was deemed acceptable and all tests passed successfully. This indicates that the system operates within the acceptable delay tolerance.

Temperature Test

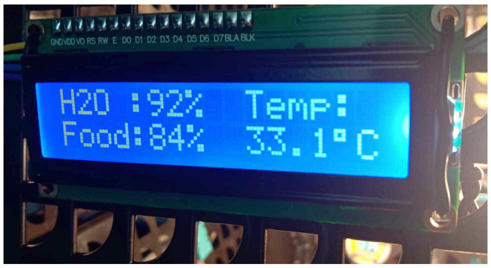
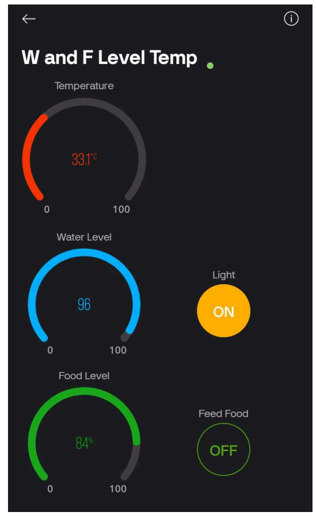
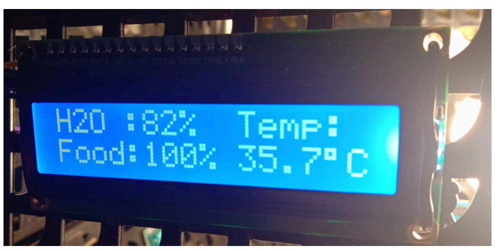
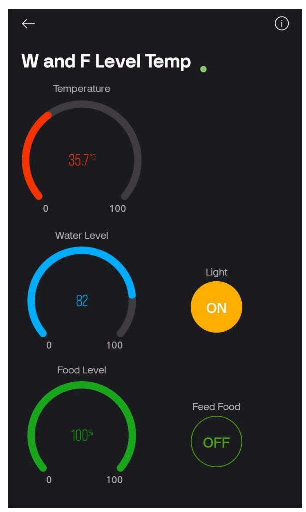
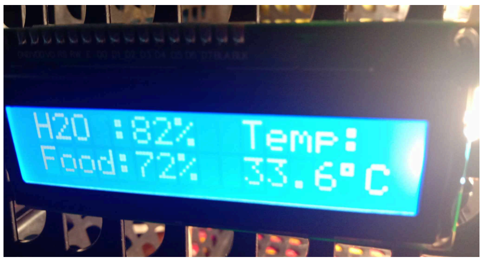
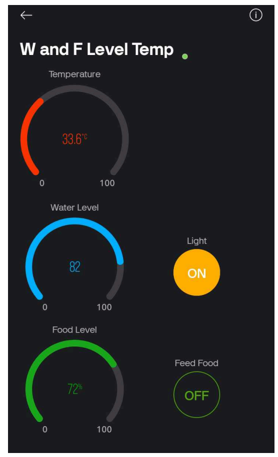
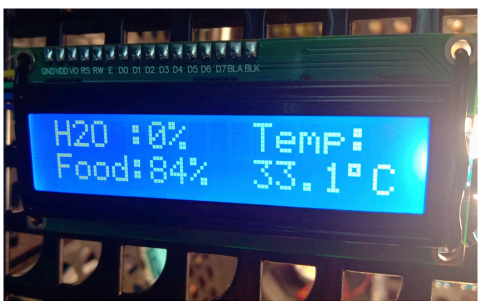
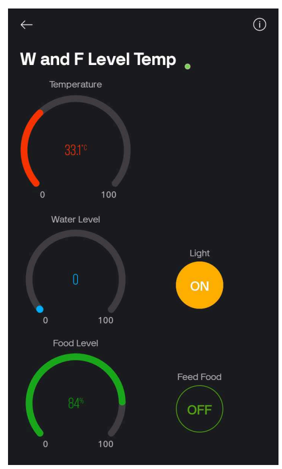
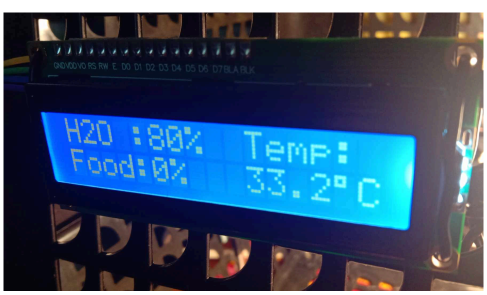
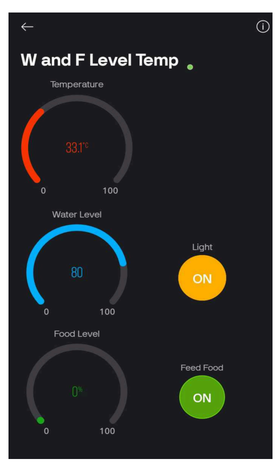
LCD Display	Blynk Cloud Display	Fan
		OFF
		ON

Table 4: Temperature Test Results

Table 4 shows the temperature test results of ChickMeUp: An IoT-based project for Smart Poultry Farms. Temperature is read and sent to Blynk and LCD for display, automatically turning on the fans when the temperature is greater than 35°C.

Water and Food Level Test

LCD Display	Blynk Cloud Display	Water Pump	Servo Motor
		Off	Off
		On	Off
		Off	Remotely On

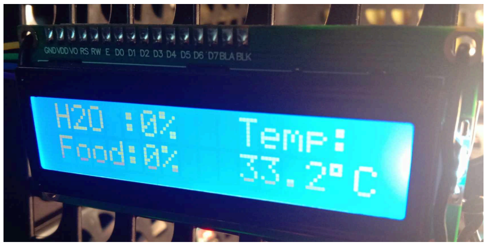
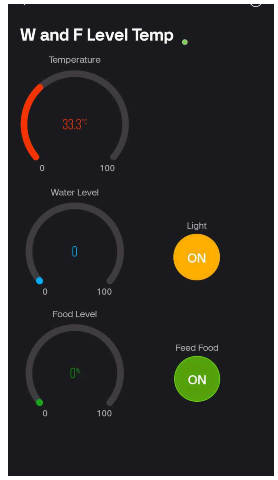
		On	Remotely On

Table 5: Water and Food Level Test Results

Table 5 shows the water and food level test results of ChickMeUp: An IoT-based project for Smart Poultry Farms. The readings for water and food levels are sent to Blynk and LCD for display. If the water level drops to 20% and below, the water pump turns on. It then turns off when the water level reaches 80% and above. The servo motor for the food, on the other hand, is controlled manually. Pressing the button in Blynk toggles it on and off.

C. Discussion

Table 3 shows the detailed examination of the functional test conducted by the project proponents. It shows that all actual outputs passed all the test scenarios. This means that the system works according to its functional requirements.

Table 4 shows the detailed test results conducted by the project proponents for the temperature test. The LCD and Blynk Cloud successfully displayed the real-time temperature inside the poultry house for monitoring purposes. The table also indicates the outcome of the motor's automatic ON/OFF switch, which is activated when the temperature rises above 35°C. This suggests that the system's attempt to turn on the DC fan and regulate the temperature inside the poultry house was a success.

Table 5 shows the detailed explanation for the water and food level test conducted. It successfully displayed the food and water level in both LCD and Blynk Cloud. Furthermore, motors were also activated once a certain condition was satisfied.

Overall, the test conducted for functionality, temperature, and water and food level has shown excellent results. This indicates that the system is efficient and may benefit poultry farmers.

CHAPTER V

A. Conclusion

Poultry Farming plays an integral role in the Philippines' economy. Being the livelihood of millions of Filipinos, together with the continuous expansion of the sector, it is just right to give importance to the health and well-being of poultry farm animals. Given the high mortality rate of poultry chickens due to heat and poor ventilation, poultry farmers may need a solution to this "income-losing" predicament. With the hopes of solving their dilemma, the project proponents created ChickMeUp: An IoT-based project for Smart Poultry Farms.

Following the functionality test conducted, the results affirm that the developed system has met the functionality requirements specified in the objectives with 100% passing rate. The system can efficiently monitor and display status of temp, food and water level using LCD and Blynk cloud. With the temperature test conducted, the system successfully automates its adjustment of temperature when a certain temperature value is read by the sensors. Furthermore, the system effectively feeds the chicken with its feeder system. It can automatically refill water and remotely feed the chicken. Despite some challenges and delays from the test conducted, the project proponents successfully adhere to the project's objectives and can now help poultry farmers.

In conclusion, the design and development of ChickMeUp: An IoT-based project for Smart Poultry Farms is successful.

B. Recommendation

Considering the growth and daily life of poultry farm animals, the project proponents suggest having a larger poultry house. This is to not just accommodate more chicks, but also to suffice the growing size of these creatures. It is also suggested to add a waste management system. This enables the poultry farm owners to easily clean dirt and fecal matter in the poultry house.

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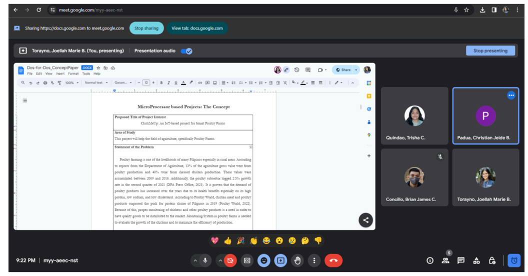
APPENDICES

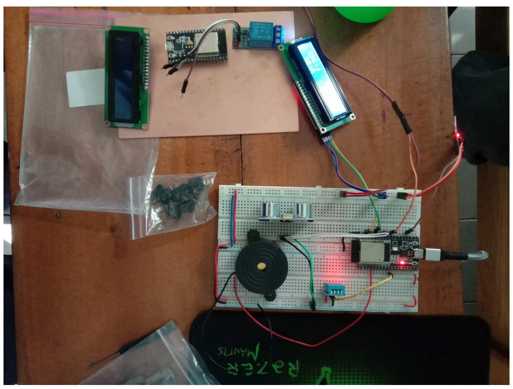
A. Documentations

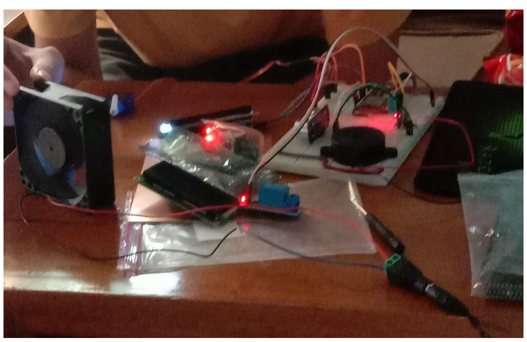
1. Meetings and Brainstorming of Ideas



2. Testing of Components and Coding Process

2.1 First Testing and Coding





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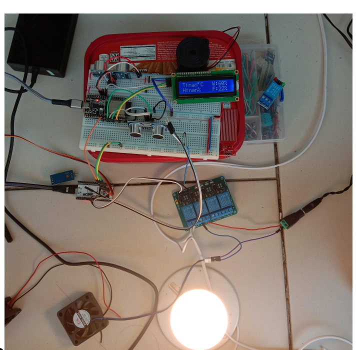
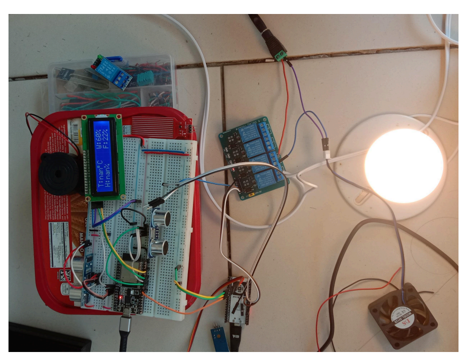
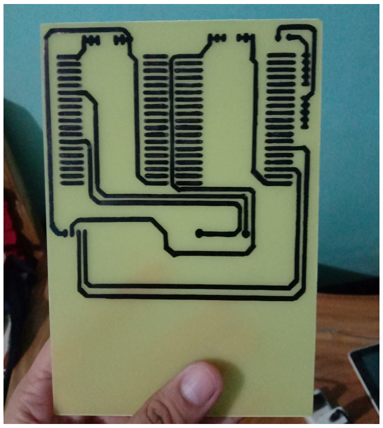
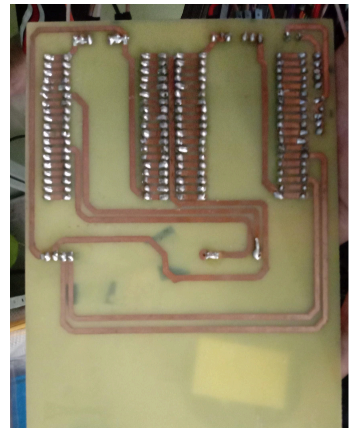




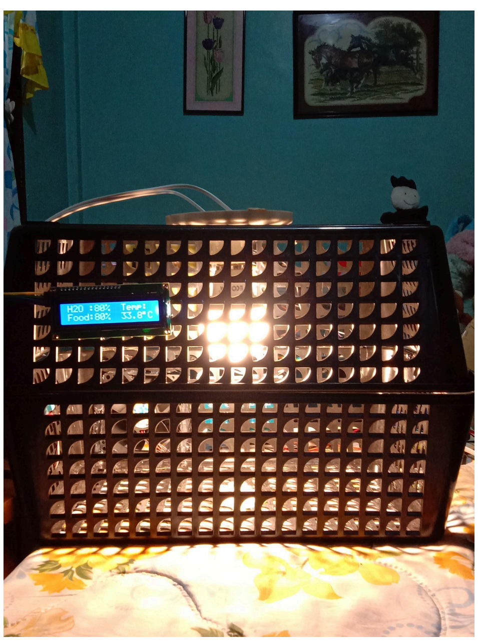
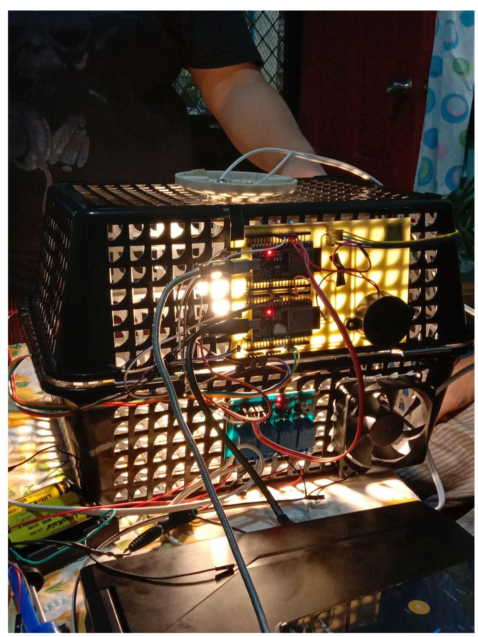
3. Etching, Drilling





4. **Making of Poultry House and Setting up Components**


5. **Finalization of prototype**

B. Codes

Code for ESP 32 # 1 (Feeder System)

```
#define BLYNK_TEMPLATE_ID "TMPL6OAPaE7mU"
#define BLYNK_TEMPLATE_NAME "Soil Moisture Temperature and Humidity
Monitor"
#define BLYNK_AUTH_TOKEN "cEZYyAjp8TVuDl6oBXftLm02g6PBoXA9"

#define BLYNK_PRINT Serial
#include <WiFi.h>
#include <WiFiClient.h>
#include <BlynkSimpleEsp32.h>

char auth[] = BLYNK_AUTH_TOKEN;
char ssid[] = "Parafiber_2.4G_6AD6";  // type your wifi name
char pass[] = "082121018";  // type your wifi password

// char ssid[] = "Infinix SMART 8";  // type your wifi name
// char pass[] = "hello123";  // type your wifi password

BlynkTimer timer;

// Firebase ------------------------------------------------
#include <FirebaseESP32.h>
#define DATABASE_URL
"temperature-ae783-default-rtdb.asia-southeast1.firebasedatabase.app"
#define API_KEY "AIzaSyDHC960NvN6MEZXHbc25fc8_KMziWH_XHg"
#include "addons/TokenHelper.h"
#include "addons/RTDBHelper.h"

FirebaseData fbdo;
FirebaseAuth auth2;
FirebaseConfig config;

bool signupOK = false;

// LCD Display --------------------------------------------
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd (0x27,16,2);
```

```
// ultrasonic sensor -------------------------------------
#include <HCSR04.h>
#define food_trig 19
#define food_echo 18
#define water_trig 14
#define water_echo 12
float food_height = 30;
float water_height = 30;
float food_max = 100;
float water_max = 100;

// Relay -------------------------------------------------
#define waterRelay 32
int lowLimit = 20;
int highLimit = 80;
String pumpState = "OFF";

// Servo Motor-------------------------------------------
#include <ESP32Servo.h>
#define servoPin 13
Servo servo;

// temperature initialization ------------------------------
float temp = 0.0;


// ultrasonic: convertion to percentage --------------------
int ultrasonic(int trig, int echo, float MaxLevel, float Container) {
  digitalWrite(trig, LOW);
  delayMicroseconds(4);
  digitalWrite(trig, HIGH);
  delayMicroseconds(10);
  digitalWrite(trig, LOW);
  long t = pulseIn(echo, HIGH);
  long distance = t / 29 / 2;

  int blynkDistance = ((MaxLevel - distance)/Container)*100;

  if (distance <= MaxLevel) {
```

```
    //Blynk.virtualWrite(V4, blynkDistance);
  } else {
    //Blynk.virtualWrite(V4, 0);
    blynkDistance = 0;
  }
  return(blynkDistance);
}

// sensors doing their magic -------------------------------
void sendSensor(){
  int foodLevel = ultrasonic(food_trig, food_echo, food_max,
food_height);
  int waterLevel = ultrasonic(water_trig, water_echo, water_max,
water_height);

  if(waterLevel <= lowLimit){
    digitalWrite(waterRelay, LOW);
    pumpState = "ON";
  }
  else{
    if(waterLevel >= highLimit){
      digitalWrite(waterRelay, HIGH);
      pumpState = "OFF";
    }
  }

  // Path in Firebase from where data will be read
  String path = "/sensor/temperature";

  // Read data from Firebase
  if(Firebase.ready() && signupOK){
    if(Firebase.getFloat(fbdo, path)){
      temp = fbdo.floatData();
      //Serial.println("Successful READ from " + fbdo.dataPath() + ": "
+ pwmValue + " (" + fbdo.dataType() + ")");
    }
    else{
        Serial.println("FAILED: " + fbdo.errorReason());
    }
```

```
  }

  Blynk.virtualWrite(V1, waterLevel);
  Blynk.virtualWrite(V2, foodLevel);
  Serial.println("Water Pump: " + pumpState);
  Serial.println("Temperature:" + String(temp,2)+ "°C");
  Serial.println("Food Level: "+ String(foodLevel) + "%");
  Serial.println("Water Level: "+ String(waterLevel) + "%");
  Serial.println("---");
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("H2O :");
  lcd.print(waterLevel);
  lcd.print("%");
  lcd.setCursor(10,0);
  lcd.print("Temp:");
  lcd.setCursor(0,1);
  lcd.print("Food:");
  lcd.print(foodLevel);
  lcd.print("%");
  lcd.setCursor(10,1);
  lcd.print(temp,1);
  lcd.print((char)223);
  lcd.print("C");
  delay(1500);
}

void setup() {
  Serial.begin(115200);
  Serial.println("Hello, ESP32!");
  Blynk.begin(auth, ssid, pass);
  servo.attach(servoPin);
  lcd.init();
  lcd.backlight();
  lcd.setCursor(0,0);
  pinMode(food_trig, OUTPUT);
  pinMode(food_echo, INPUT);
  pinMode(water_trig, OUTPUT);
  pinMode(water_echo, INPUT);
```

```
  pinMode(waterRelay, OUTPUT);
  digitalWrite(waterRelay, HIGH);
  timer.setInterval(100L, sendSensor);
  config.api_key = API_KEY;
  config.database_url = DATABASE_URL;
  if(Firebase.signUp(&config, &auth2, "", "")){
    Serial.println("signUp OK");
    signupOK = true;
  }
  else{
    Serial.printf("%s\n", config.signer.signupError.message.c_str());
  }

  config.token_status_callback = tokenStatusCallback;
  Firebase.begin(&config, &auth2);
  Firebase.reconnectWiFi(true);
}

BLYNK_WRITE(V3){
  bool servovalue = param.asInt();
  if (servovalue == 1){
    servo.write(0);
    Serial.println("Feed Food: ON");
  }
  else{
    servo.write(90);
    Serial.println("Feed Food: OFF");
  }
}

void loop() {
  Blynk.run();
  timer.run();
}
```

Code for ESP32 # 2 (Automation for Temperature System)

```
#define BLYNK_TEMPLATE_ID "TMPL6OAPaE7mU"
#define BLYNK_TEMPLATE_NAME "Soil Moisture Temperature and Humidity
Monitor"
```

```
#define BLYNK_AUTH_TOKEN "LlGtXF8fpgjOEWVo75N9MjYT0fOlKR2S"

#define BLYNK_PRINT Serial
#include <WiFi.h>
#include <WiFiClient.h>
#include <BlynkSimpleEsp32.h>

char auth[] = BLYNK_AUTH_TOKEN;
char ssid[] = "Parafiber_2.4G_6AD6";  // type your wifi name
char pass[] = "082121018";  // type your wifi password

// char ssid[] = "Infinix SMART 8";  // type your wifi name
// char pass[] = "hello123";  // type your wifi password

BlynkTimer timer;

// Firebase ---------------------------------------------------
#include <FirebaseESP32.h>
#define DATABASE_URL
"https://temperature-ae783-default-rtdb.asia-southeast1.firebasedatabase
.app/"
#define API_KEY "AIzaSyDHC960NvN6MEZXHbc25fc8_KMziWH_XHg"
#include "addons/TokenHelper.h"
#include "addons/RTDBHelper.h"

FirebaseData fbdo;
FirebaseAuth auth2;
FirebaseConfig config;

bool signupOK = false;

// DHT --------------------------------------------------------
#include <DHT.h>
#define DHTPIN 27 //Connect Out pin to D2 in NODE MCU
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE);

// buzzer -----------------------------------------------------
#define buzzer 26
```

```
// Relay ---------------------------------------------------
#define fanRelay 32
#define lightRelay 33

// Max Temp for fan to activate ----------------------------
float tempMax = 35.0;

// for buzzer sound ----------------------------------------
void myTone(int pin){
  //ledcAttachPin(pin, 0);              // pin, channel
  //ledcWriteNote(0, NOTE_F, 4);     // channel, frequency, octave
  tone(pin, 440);
}

void myNoTone(int pin){
  //ledcDetachPin(pin);
  noTone(pin);
}

// sensors doing their magic -------------------------------
void sendSensor(){
  float t = dht.readTemperature();
  float h = dht.readHumidity();

  String path = "/sensor/temperature";

  // Send data to Firebase
  if(Firebase.ready() && signupOK){
    // --------------------------STORE sensor data to a RTDB
    if(Firebase.setFloat(fbdo, path, t)){
      //Serial.println();
      //Serial.print(t);
      //Serial.print(" - successfully saved to: " + fbdo.dataPath());
      //Serial.println(" (" + fbdo.dataType() + ")");
    }
    else{
      Serial.println("FAILED: " + fbdo.errorReason());
    }
```

```
  }

  if(t > tempMax){
    digitalWrite(fanRelay, LOW);
    myTone(buzzer);
  }
  else{
    digitalWrite(fanRelay, HIGH);
    myNoTone(buzzer);
  }

  Blynk.virtualWrite(V0, t);
  Serial.println("Temperature:" + String(t,2)+ "°C");
  Serial.println("Humidity: "+ String(h,1) + "%");
  Serial.println("---");
  delay(1500);
}

BLYNK_WRITE(V4){
  bool light_value = param.asInt();
  if (light_value == 1){
    digitalWrite(lightRelay, LOW);
    Serial.println("Light: ON");
  }
  else{
    digitalWrite(lightRelay, HIGH);
    Serial.println("Light: OFF");
  }
}

void setup() {
  Serial.begin(115200);
  Serial.println("Hello, ESP32!");
  Blynk.begin(auth, ssid, pass);
  dht.begin();
  pinMode(fanRelay, OUTPUT);
  pinMode(lightRelay, OUTPUT);
  pinMode(buzzer, OUTPUT);
  timer.setInterval(100L, sendSensor);
```

```
  config.api_key = API_KEY;
  config.database_url = DATABASE_URL;
  if(Firebase.signUp(&config, &auth2, "", "")){
    Serial.println("signUp OK");
    signupOK = true;
  }
  else{
    Serial.printf("%s\n", config.signer.signupError.message.c_str());
  }

  config.token_status_callback = tokenStatusCallback;
  Firebase.begin(&config, &auth2);
  Firebase.reconnectWiFi(true);
}

void loop() {
  Blynk.run();
  timer.run();
}
```

GROUP PROFILE

Name: Brian James Concillo

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Email Address: concillo.brian08@gmail.com

Name of Father: Edgar M. Concillo

Name of Mother: Maria Salome C. Concillo

School Attended and Honors

Elementary: Colegio de Sta. Rita de San Carlos Inc. - With Honors

Junior High School: Misamis Oriental General Comprehensive High School - With High Honors

Senior High School: Corpus Christi School - With Highest Honors/Valedictorian

College: University of Science and Technology of Southern Philippines

Membership:

Institute of Computer Engineers of the Philippines – Student Edition

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Email Address: padua.christian143@gmail.com

Name of Father: Dindo E. Padua

Name of Mother: Jessie Isabel B. Padua

School Attended and Honors

Elementary: Cugman Elementary School

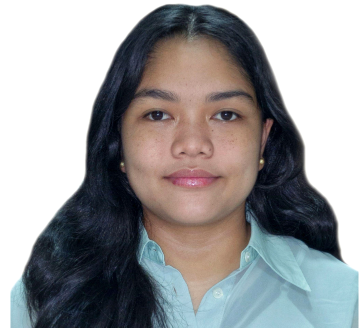
Junior High School: Cugman National High School - With Honors

Senior High School: Capitol University

College: University of Science and Technology of Southern Philippines

Membership:

Institute of Computer Engineers of the Philippines – Student Edition



Name: Trisha C. Quindao

Address: Villa Angela Subdivision, Balulang, Cagayan de Oro City, Misamis Oriental, 9000

Email Address: quindao.trisha1103@gmail.com

Name of Father: Rodel I. Quindao

Name of Mother: Teresita C. Quindao

School Attended and Honors

Elementary: Guinobatan Elementary School - Salutatorian

Junior High School: St. Isidore Academy - With High Honors

Senior High School: Carmen National High School - With Honors

College: University of Science and Technology of Southern Philippines

Membership:

Institute of Computer Engineers of the Philippines – Student Edition

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Email Address: torayno.joellahmariee@gmail.com

Name of Father: Joel G. Torayno

Name of Mother: Delilah B. Torayno

School Attended and Honors

Elementary: West City Central School - With Honors

Junior High School: St. Mary's Academy of Carmen - With Honors

Senior High School: Lourdes College - With Honors

College: University of Science and Technology of Southern Philippines

Membership:

Institute of Computer Engineers of the Philippines – Student Edition