Faculty of Information Technology

IS 1900 – ICT Project

Smart Shrimp Farming

Group No: 31

No	Index No	Name
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04	204171H	Rajapaksha S.S.D
05	204155M	Perera J.K.A.T

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……………………. 23/01/2022

Supervisor's Name: Date of Submission

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1.Introduction

As an island country, Sri Lanka is blessed with a remarkable bounty. Its diverse climes and environments make it possible to grow practically anything within our shores.

However, the shrimp farming industry has come under fire in recent years and months for its potentially adverse impact on the environment, both marine and coastal. Sri Lanka’s shrimp farming industry is powerful because of our natural resources – coastal lagoons, mangrove swamps, tidal flats, and estuaries that are well suited for shrimp farming. Combined with our transport networks and harbors, exporting was easy to accomplish.

Shrimp farming is a valuable source of employment and income for rural communities in the northwest, north, and east of Sri Lanka. It generates income and foreign exchange earnings, and allows Sri Lanka to play in the global marketplace, build exchanges, and grow. Shrimp production mainly belongs to marine aquaculture. Shrimps are the second most traded seafood commodity in the world.

2. Problem in Brief

Although shrimp farming gives a huge amount of progress in the economy, the shrimp farmers face more challenges to achieve their expected goals.

▪ Shrimp Farming is a highly invested aquaculture which needs proper monitoring. Farmers face struggles as they monitor and maintain the whole process and actions manually, as a result they lack with proper record of management.

▪ Shrimp Farming needs more manpower to maintain the cultivation and more time is needed to manage the entire system.

▪ As per the growth of the shrimps in times, their entire Quantity and Quality of food, Time of feeding changes. As a result, it becomes a challenge for the farmers to feed them on time with the right amount of food. As the farmers feed the shrimps manually, they cannot make sure whether every shrimp is fed and even no clarity on the measures of food.

▪ The quality of water also plays a major role in shrimp farming. He has no proper knowledge on the environment the shrimps live in either. Factors like pH, Temperature determine the quality of water. They should be in a specific range and when they exceed or reduce, they affect the life and growth of shrimps. The water level too impacts on shrimp farming.

Figure 1 - Local Shimp Farm

3. Literature Survey

We have identified similar project as ,

Smart Monitoring System

Smart Monitoring System is for testing the temperature and pH manually. They have the system of operating the water paddle wheels through the farmers' phone.

But the system doesn't have the system to record the data and information.

The system cannot function during the absence of farmers.

Through this smart monitoring system, Farmers provide insights into optimizing water quality using ph sensors. They get water samples nearly hour by hour and check the ph value.

In our project, we are also using a ph sensor, but we are not getting samples hour by hour. In addition to that, we are getting an alert to a phone while having an unnecessary ph value.

We are using an automatically feeding system.no need for employees.

Figure 2 - Rain sensor use in modern Shrimp Farming

4. Aim and Objectives

4.1 Aim

Our aim is to assist our local shrimp farmers in easing their work and saving their time with the use of sensors and electronic devices.

4.2 Objectives

- To help the farmer to control and monitor the shrimp ponds from a distance .
- To feed the shrimps automatically with a proper record of time and mass.
- To evaluate consumption of food easily.
- Monitoring the cultivation using the monitor, pH, Temperature, Mass of food, Date and Time schedule of feeding shrimps.
- To operate motors and lamps automatically with a phone.
- To protect his farm from robbery and stray animals.

5. Analysis & Design

5.1 Architectural Diagram

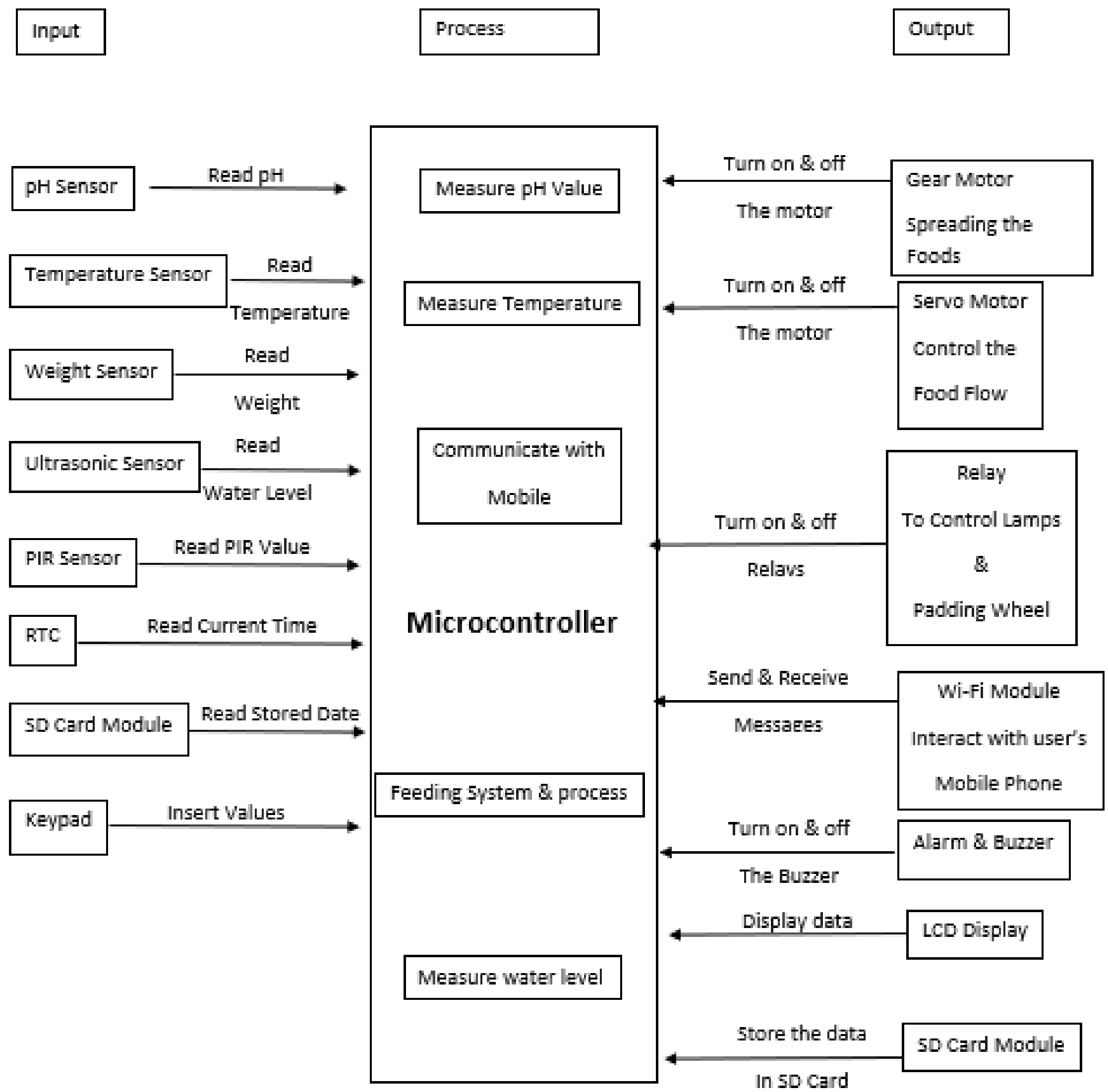

Figure 3. 1 - Architectural Diagram

5.2 Flowcharts

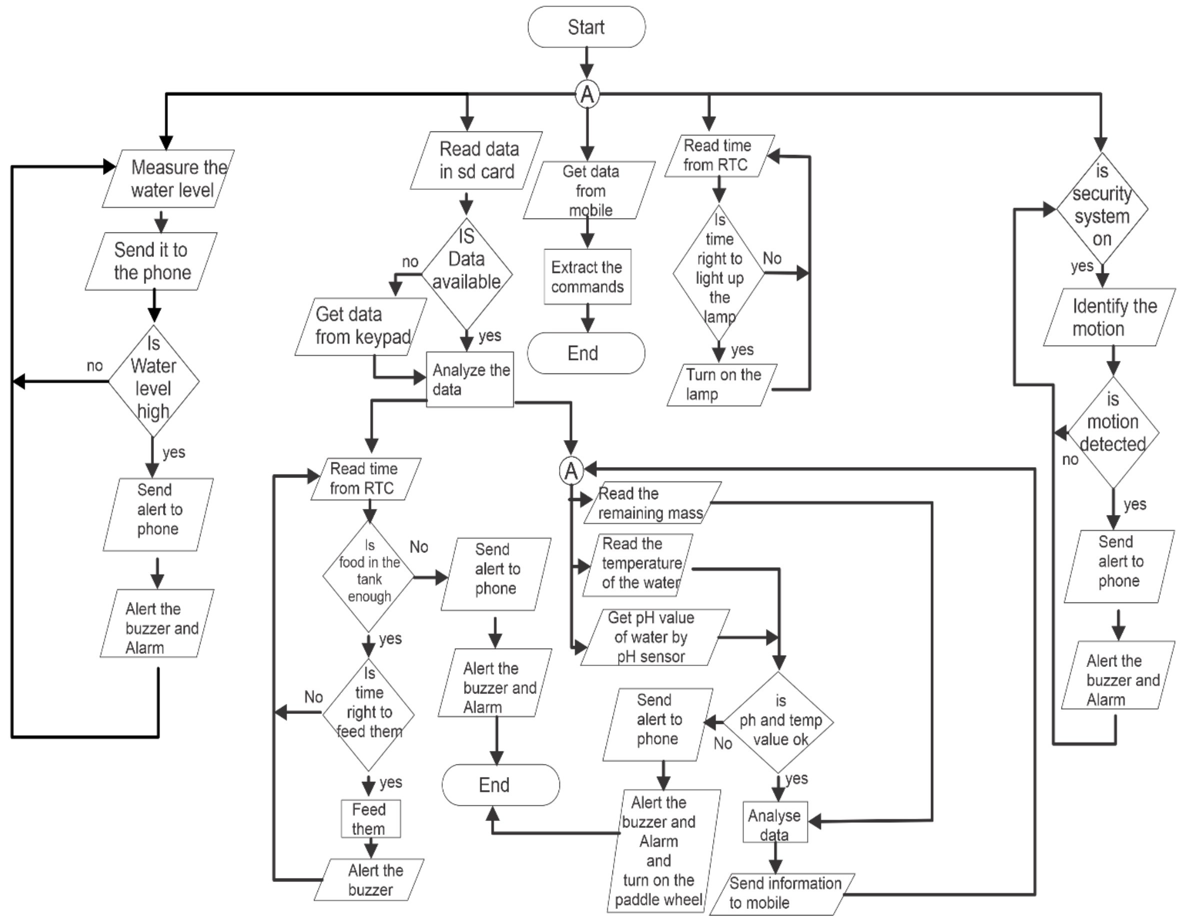

Figure 3. 2 - Flow char of the Shrimp Farming System

5.3 Process Diagram

1.Feeding System

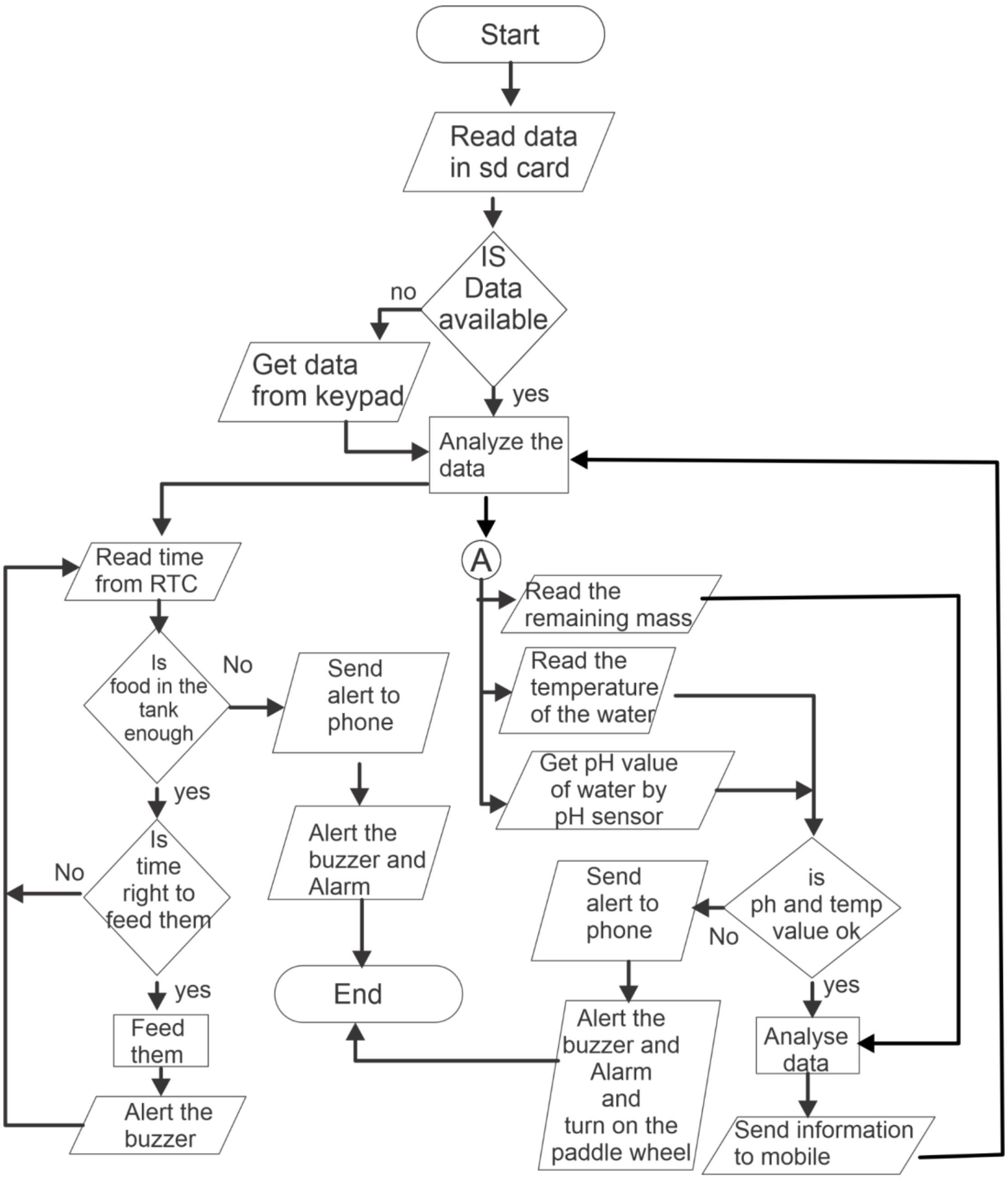

Figure 3. 3 - Feeding System Flow Char

2.Water Management System

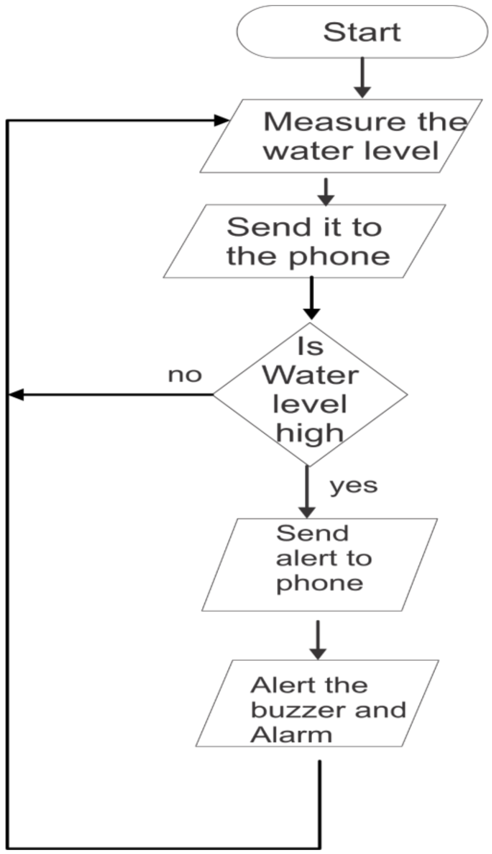

Figure 3. 4 - Water Level Monitoring System Flow Char

3.Real Time Clock

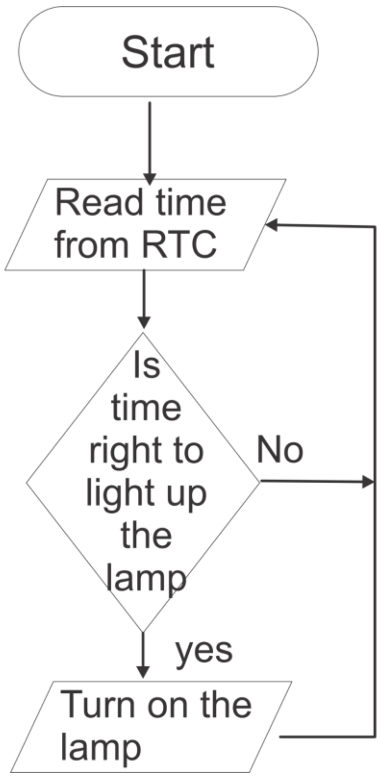

Figure 3. 5 – RTC Flow Char

4.Mobile Operation

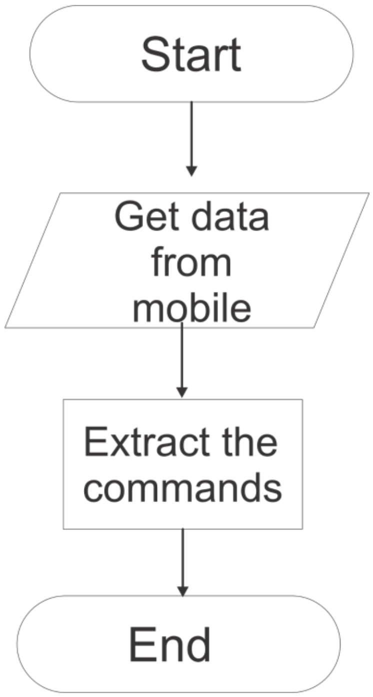

Figure 3. 6 - Mobile Operation Flow Char

5.4 Full Circuit Diagram

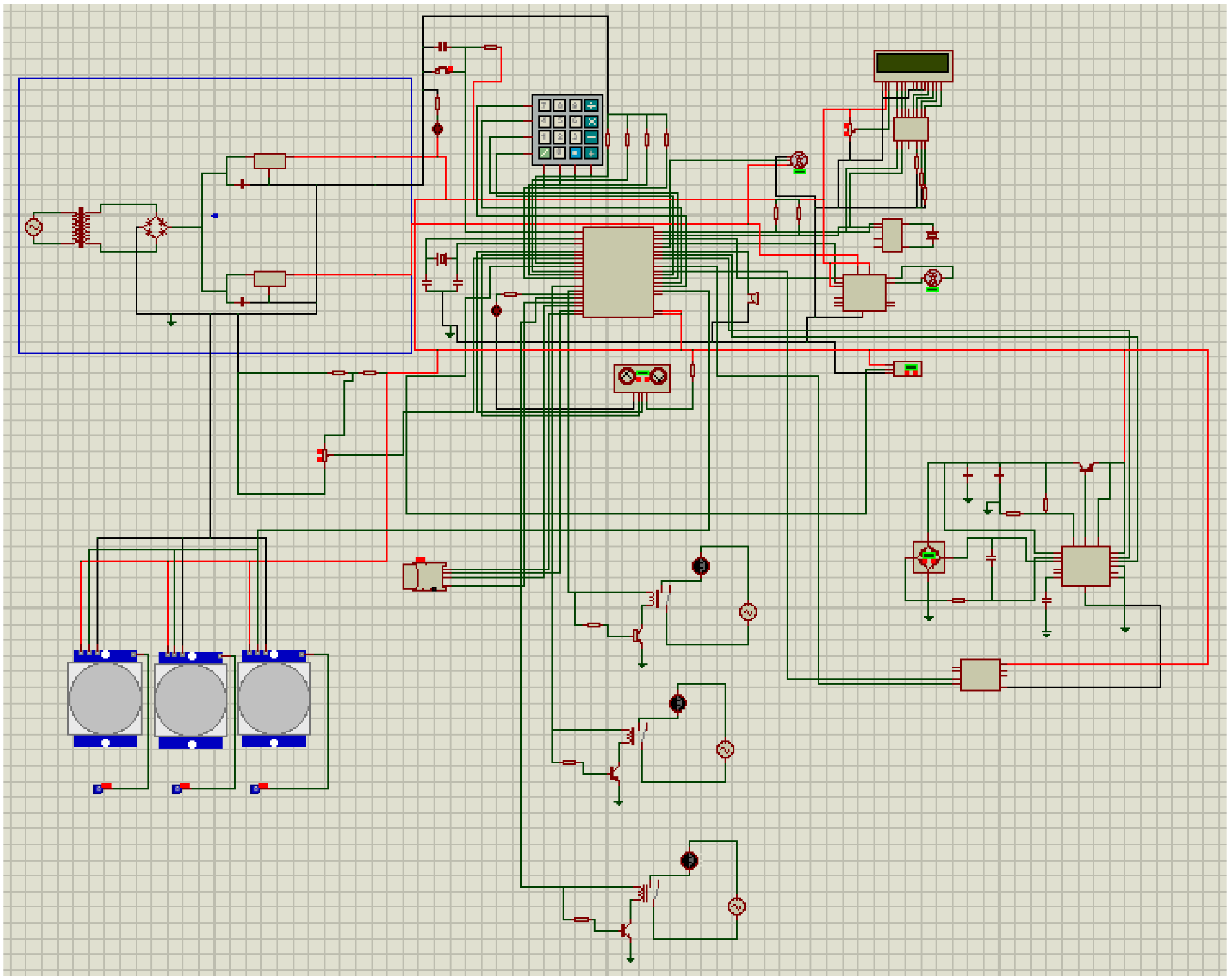

Figure 3. 7 - Full Circuit Diagram

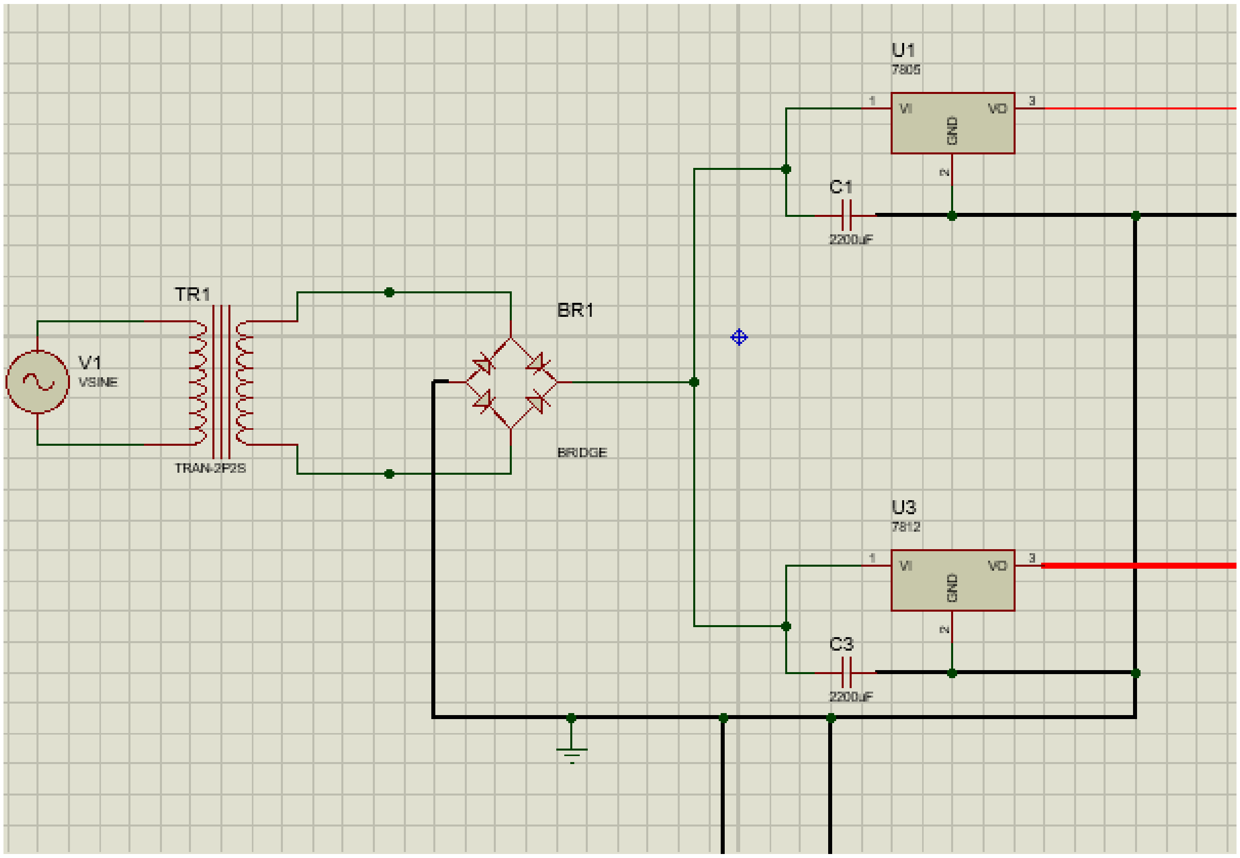

Figure 3. 8 - Power Supply

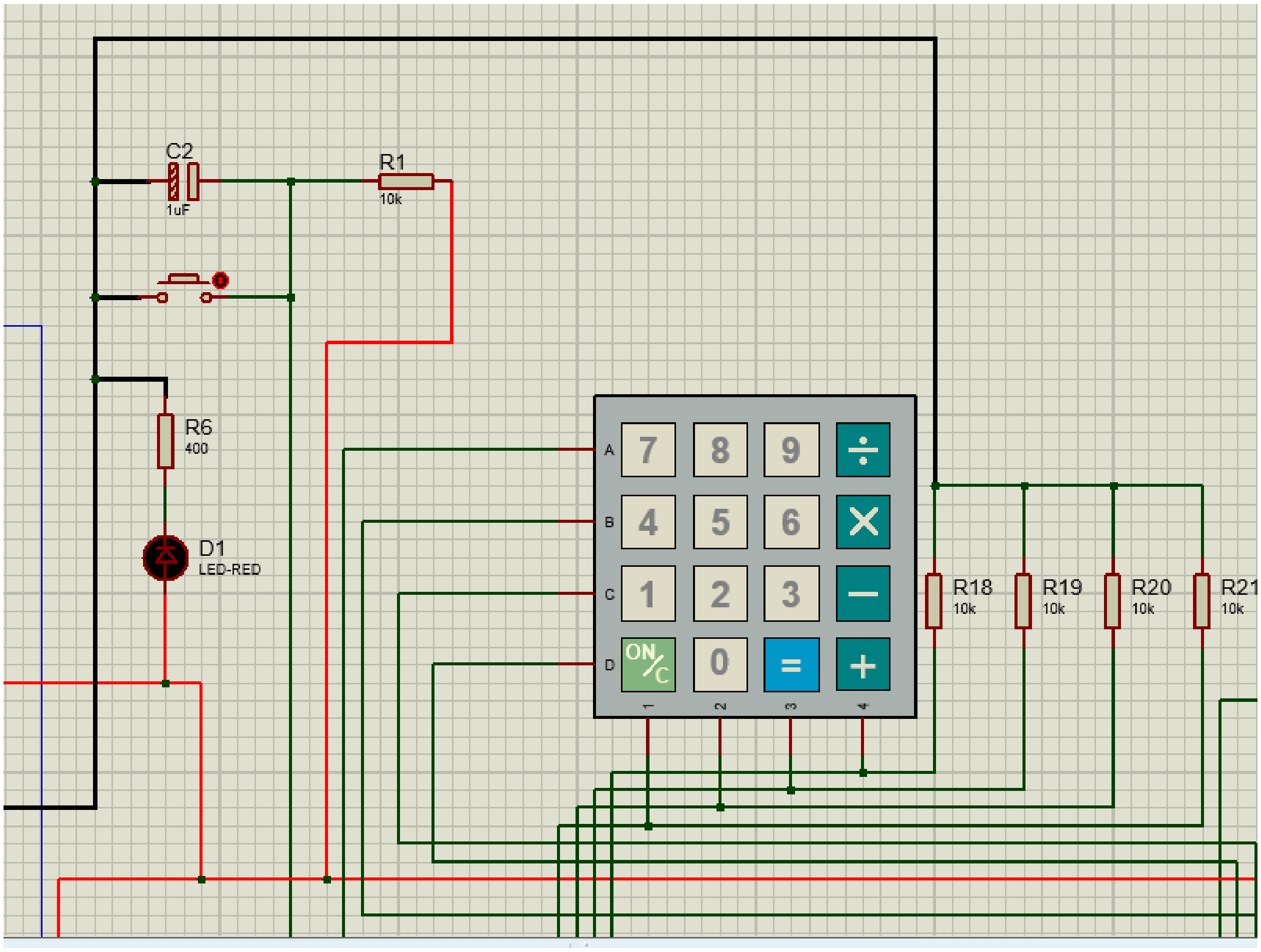

Figure 3. 9 - Keypad

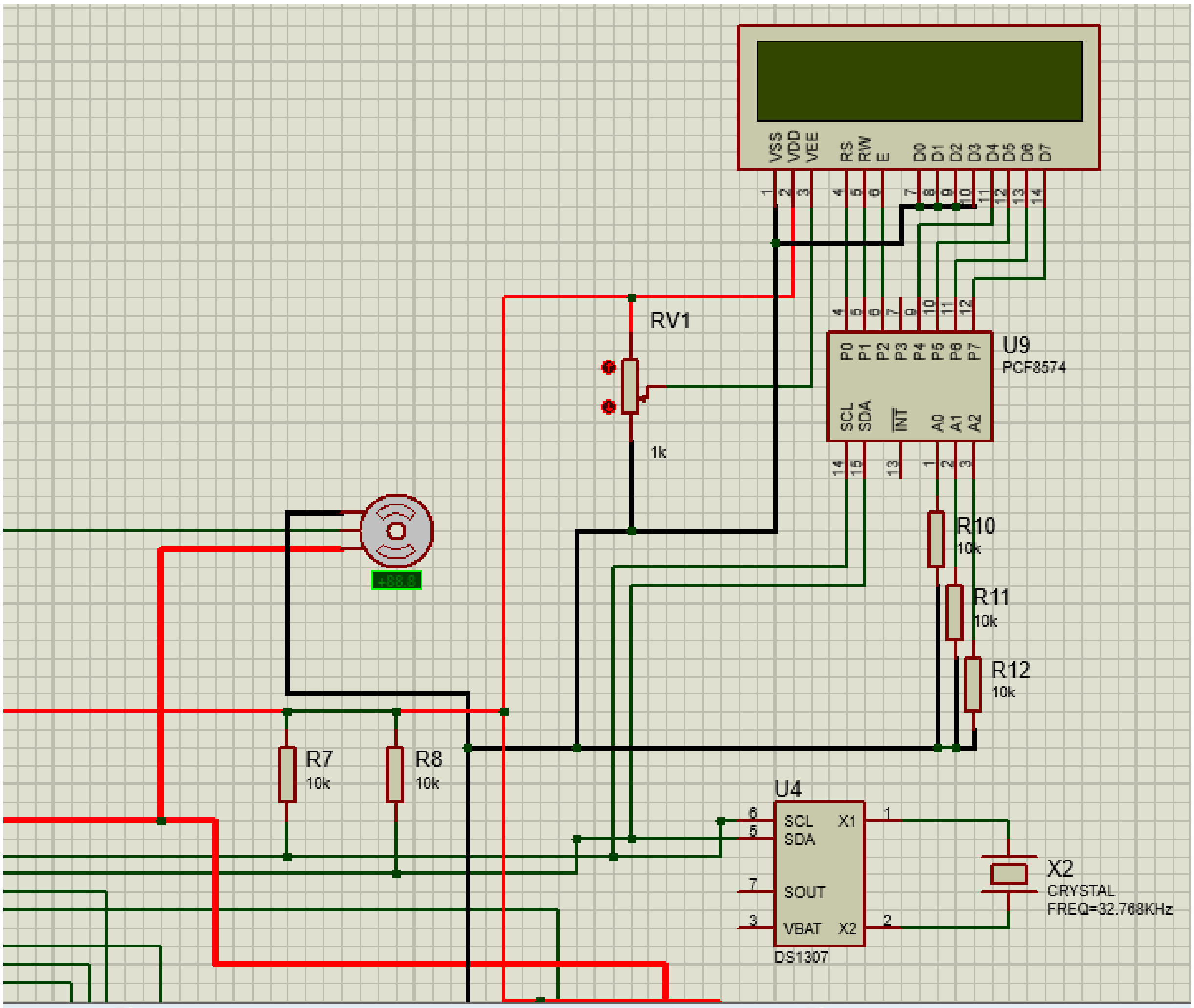

Figure 3. 10 - Display, RTC & Servo Motor

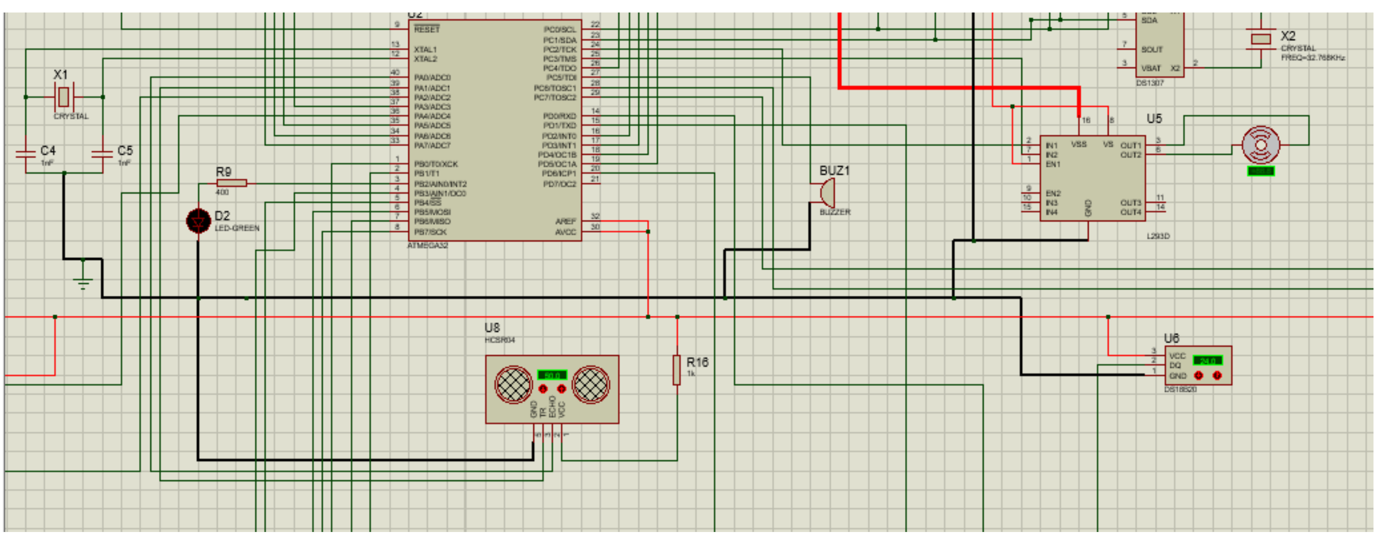

Figure 3. 11Gear Motor, Motor Coltroller, Buffer, Temperature & Ultrasonic sensor

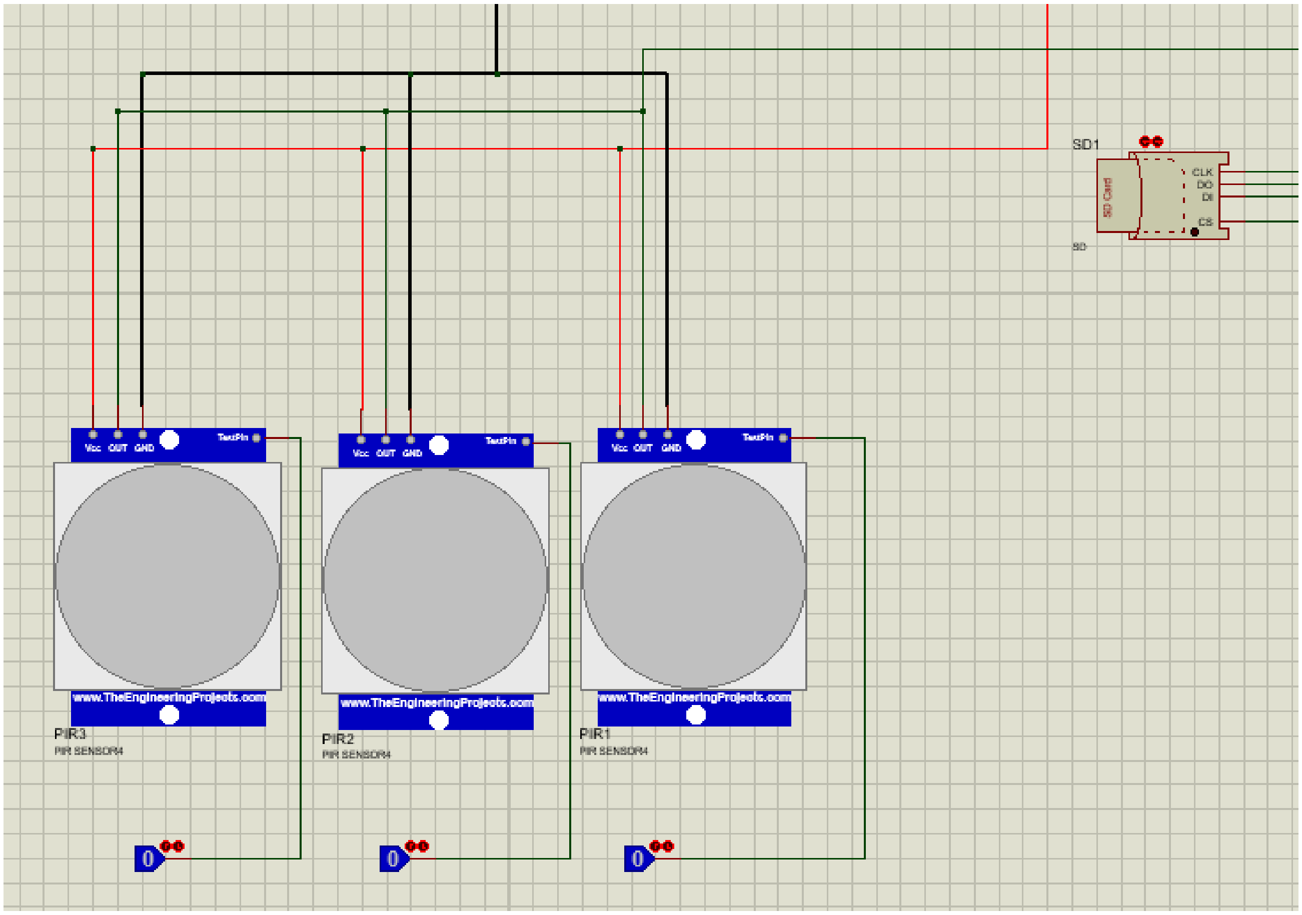

Figure 3. 12 - RTC Sensors & SD Card Module

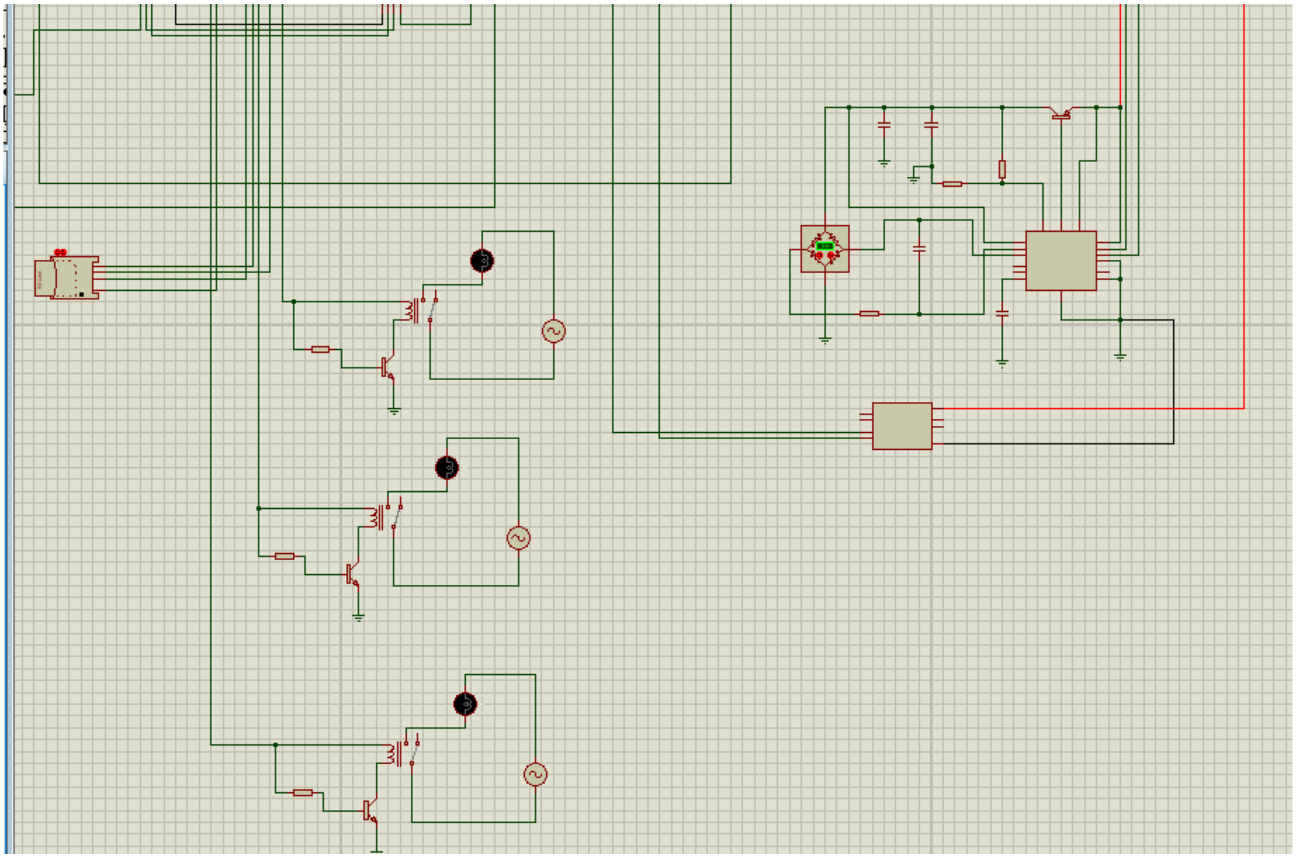

Figure 3. 13 - Relays & Weight Sensor

6. 3D Design

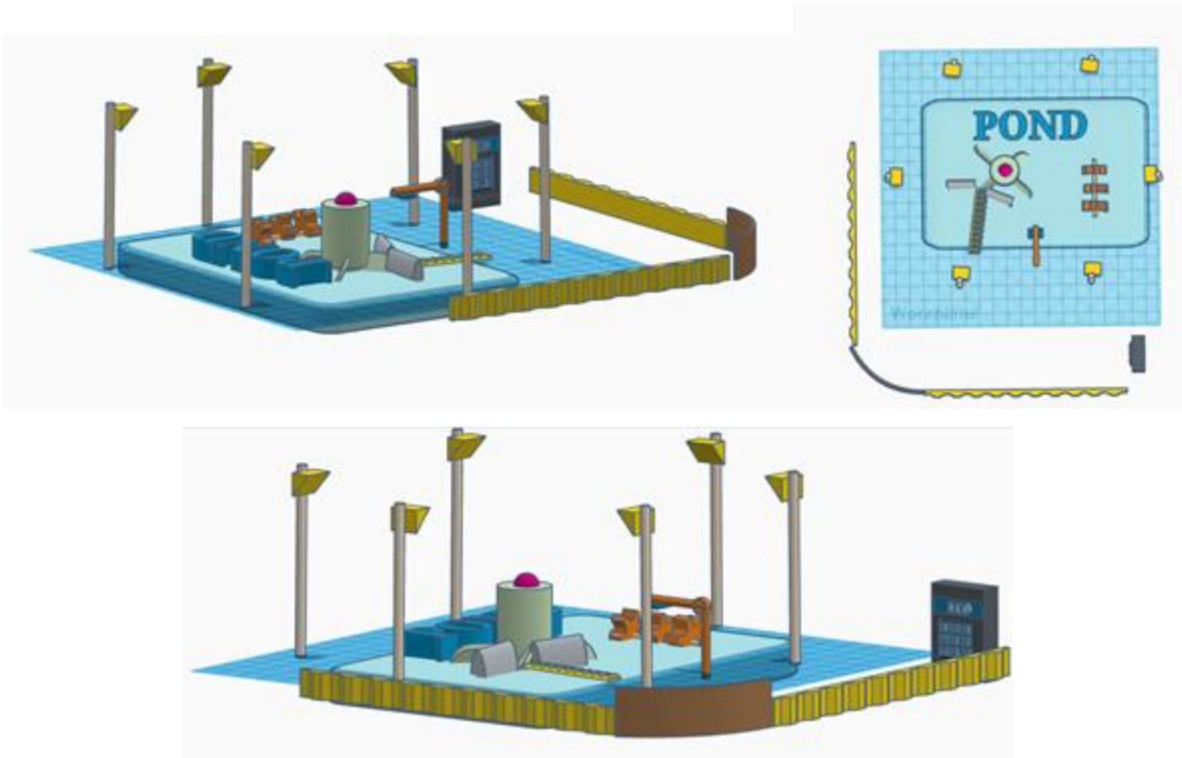

Figure 4. 1 - Shrimp Farming System Complete 3D Diagram

Our system basically consists of 3 parts. First, we introduce an automatic feeding system. Here we use the Weight Sensor, and it is attached to the main tank. Under the main tank we have the spreading motor, following the synchronous motor. Above the main tank a buzzer is placed.

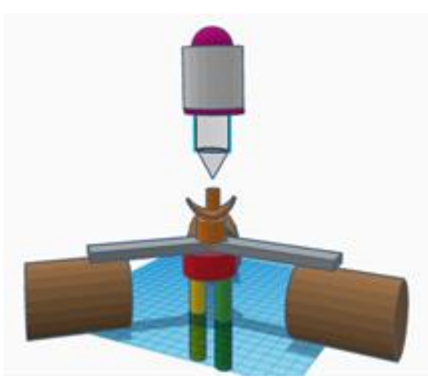

Figure 4. 2 - Feeding System 3D Diagram

Synchronous motor is used to control the flow of food gradually, from the main tank to the Spreading motor. The spreading motor will spread the food in the radius of around 15 meters of the pond.

The farmer needs to input the mass of food and time of feeding using the keypad. Unless the farmer changes the time and mass of food, the feeding system works for the provided data till they are changed. When the farmer puts the specific mass of food needed for particular days, the sensor will send the message regarding the mass of the food to the farmer’s phone. The message regarding the remaining mass of food in the main tank is sent to the farmer’s phone with the date and time all the times the feeding system works. If the food in the main The tank gets finished and the buzzer on the main tank starts to beep. It will be beeped once per second and meanwhile the alarm in the control unit starts to blink in Green colour and an Alert message to be sent to the farmer’s phone. To provide default time and to get the data time to time, we are using the real time clock module here. In order to save the data SD card module is being used. The numbers of feeding systems are dependent on the size of the pond. This system works automatically.

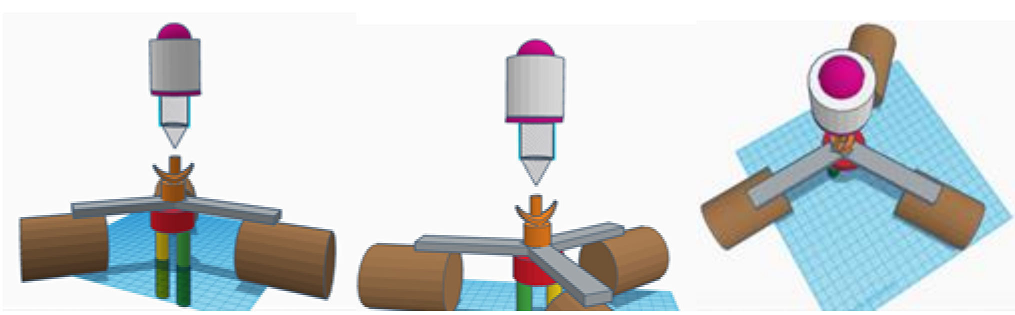

Figure 4. 3 - Feeding System Side Views

Secondly, our system focuses on the quality of water. We are using pH Sensor, Ultrasonic Sensor, and the Temperature sensor here. The readings of these sensors will be sent to the farmer’s phone.

So, when the pH sensor senses some changes in pH values, or changes in Temperature an alarm in the control unit will blink in Yellow colour and the buzzer too starts to work. Buzzer beeps twice per second. It gives the alert regarding replacing water, as a result the alert message will be sent to the farmer’s phone including the readings.

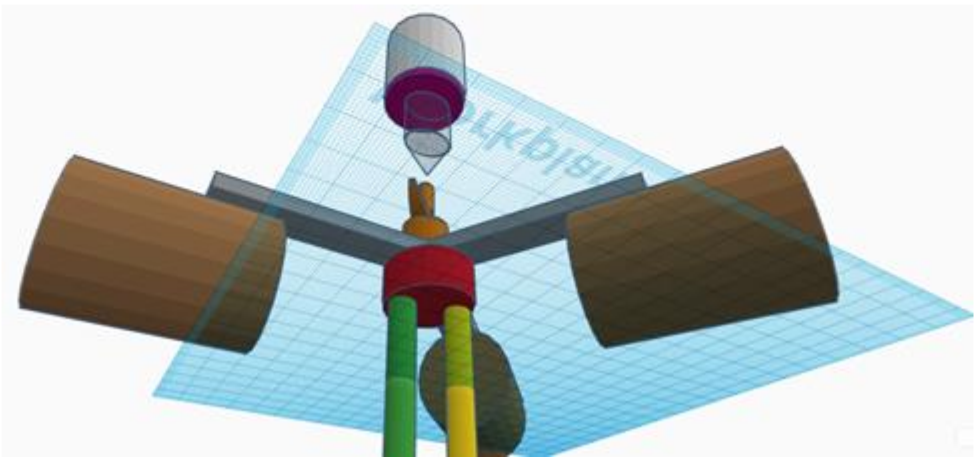

Figure 4. 4 - pH and Temperature Sensor3D Diagram

The ultrasonic sensor we used here detects the water level, when the water level goes down, the alarm works. So, the farmer can automatically operate the water pumps with his phone to get the sufficient water. And when the water level goes up, the alarm works. Meanwhile the alert messages were also sent to the farmer’s phone. And also if some animal came to the pond, then PIR sensor will be triggered and send message to users phone. These PIR sensors are fixed in the lamp posts. Hence they can cover the entrances of the animals.

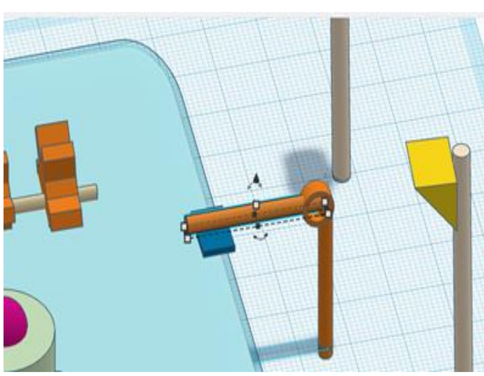

Figure 4. 5– PIR Sensor

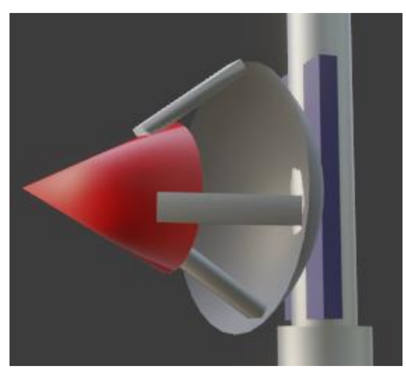

Figure 4. 6– Ultrasonic Sensor

7. Testing & Implementation

Servo Motor (Synchronous Motor)

- This appears between food tank and distribute motor in food distributing pipe
- It helps to control flow of the food
- Basically, its behavior like switch
- Referred the theory part of the motor
- Considered the cost, strength, and rusting of metal
- Discovered a more effective motor for the project
- Referred to a small section of the code [1]

```
int main(void)
{
    DDRC = 0x01; //Makes RC0 output pin
    PORTC = 0x00;
    while(1)
    {
        //Rotate Motor to 0 degree
        PORTC = 0x01;
        _delay_us(1000);
        PORTC = 0x00;

        _delay_ms(2000);

        //Rotate Motor to 90 degree
        PORTC = 0x01;
        _delay_us(1500);
        PORTC = 0x00;
```

Figure 5. 1 – Servo Motor Sample Code

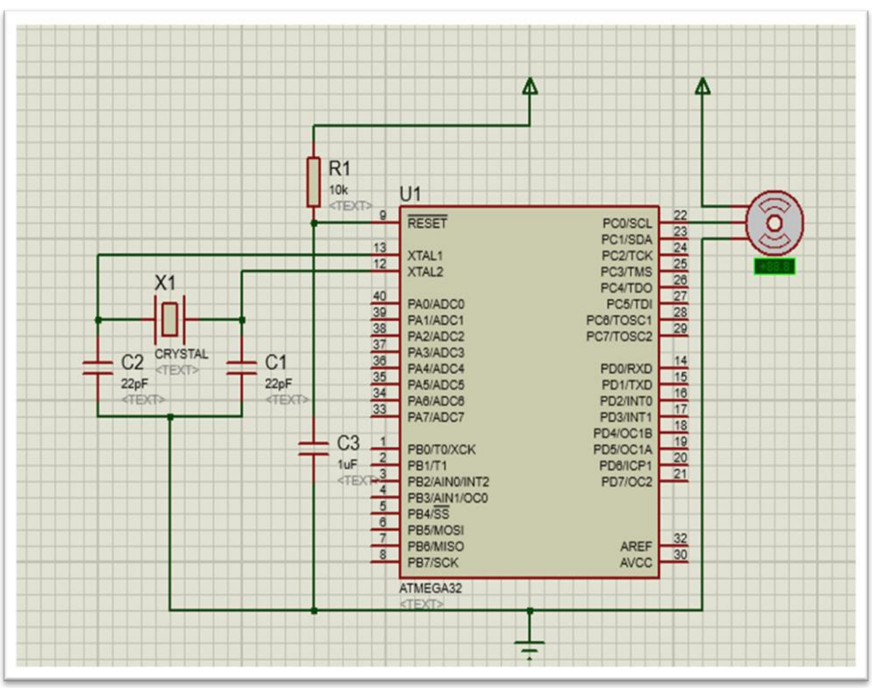

Figure 5. 2 - Servo Motor Circuit Diagram

pH Sensor

- Referred the theory part of the pH sensor
- Discovered a better pH module for the project
- Referred to a small section of the code
- We can measure pH value of the water using this sensor

```
void loop() {
 for(int i=0;i<10;i++)
 {
 buffer_arr[i]=analogRead(A0);
 delay(30);
 }
 for(int i=0;i<9;i++)
 {
 for(int j=i+1;j<10;j++)
 {
 if(buffer_arr[i]>buffer_arr[j])
 {
 temp=buffer_arr[i];
 buffer_arr[i]=buffer_arr[j];
 buffer_arr[j]=temp;
 }
 }
 }
 avgval=0;
 for(int i=2;i<8;i++)
 avgval+=buffer_arr[i];
 float volt=(float)avgval*5.0/1024/6;
 float ph_act = -5.70 * volt + calibration_value;
 lcd.setCursor(0, 0);
```

Figure 5. 3 - pH Sensor Sample Code

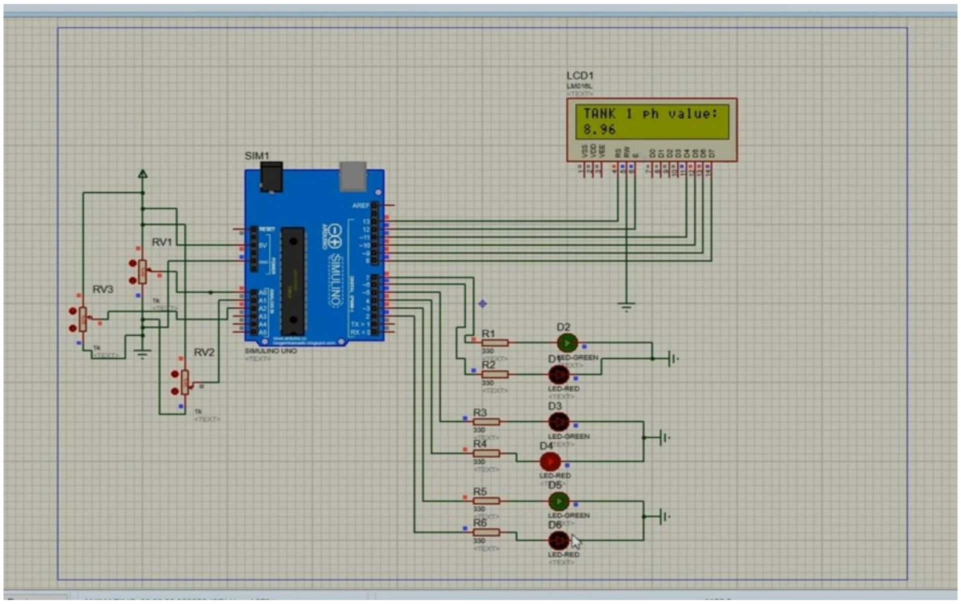

Figure 5. 4 - pH Sensor Circuit Diagram

Relay

- Considered theory part of the relay
- Referred small part of the code
- Proteus was used to test our unit
- Discovered better relay module for the project

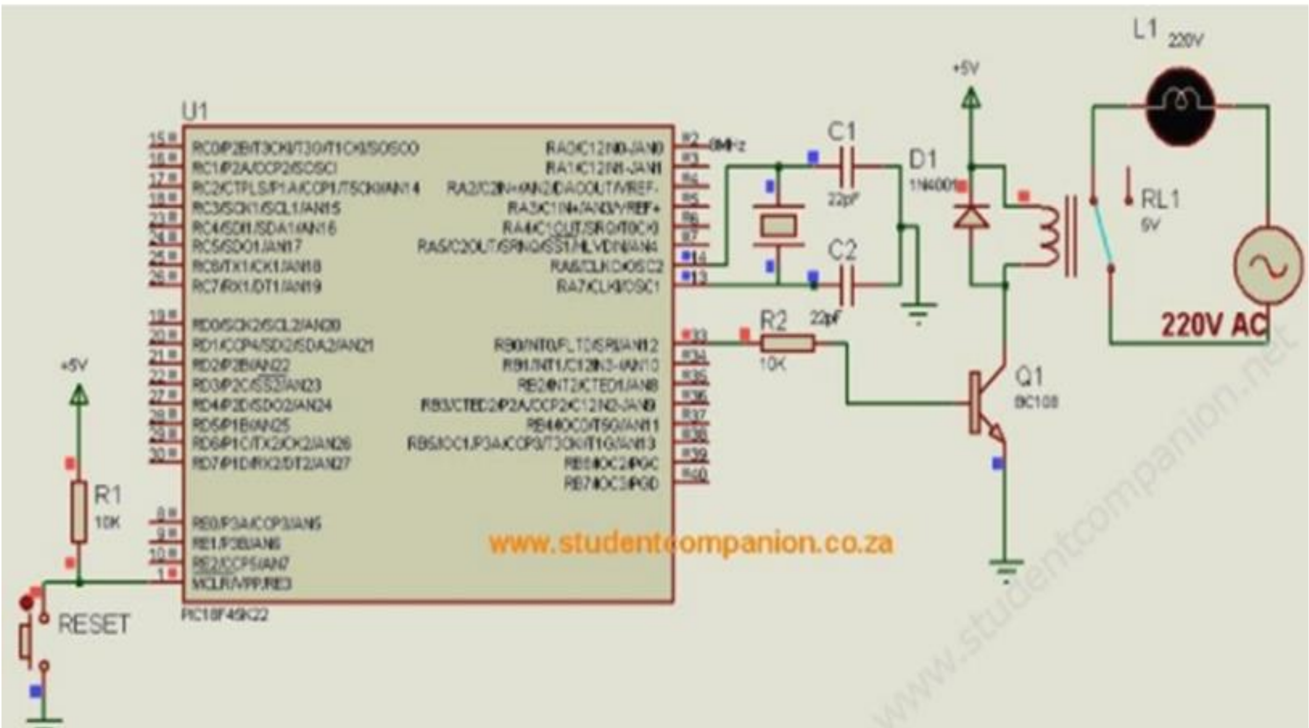

Figure 5. 5 - Relay Circuit Diagram

```
void main()
{
   TRISB.F7 = 0; //Makes RB7 a output pin

   do
   {
      PORTB.F7 = 1;   //Turns ON relay
      Delay_ms(1000); // 1000 mS delay
      PORTB.F7 = 0;   //Turns OFF realy
      Delay_ms(1000); //1000mS delay
   }while(1);
```

Figure 5. 6 - Relay Sample Code

Keypad

- Considered theory part of the keyboard
- Referred small part of the code
- Proteus was used to test our unit
- Discovered better keyboard for the project [2]

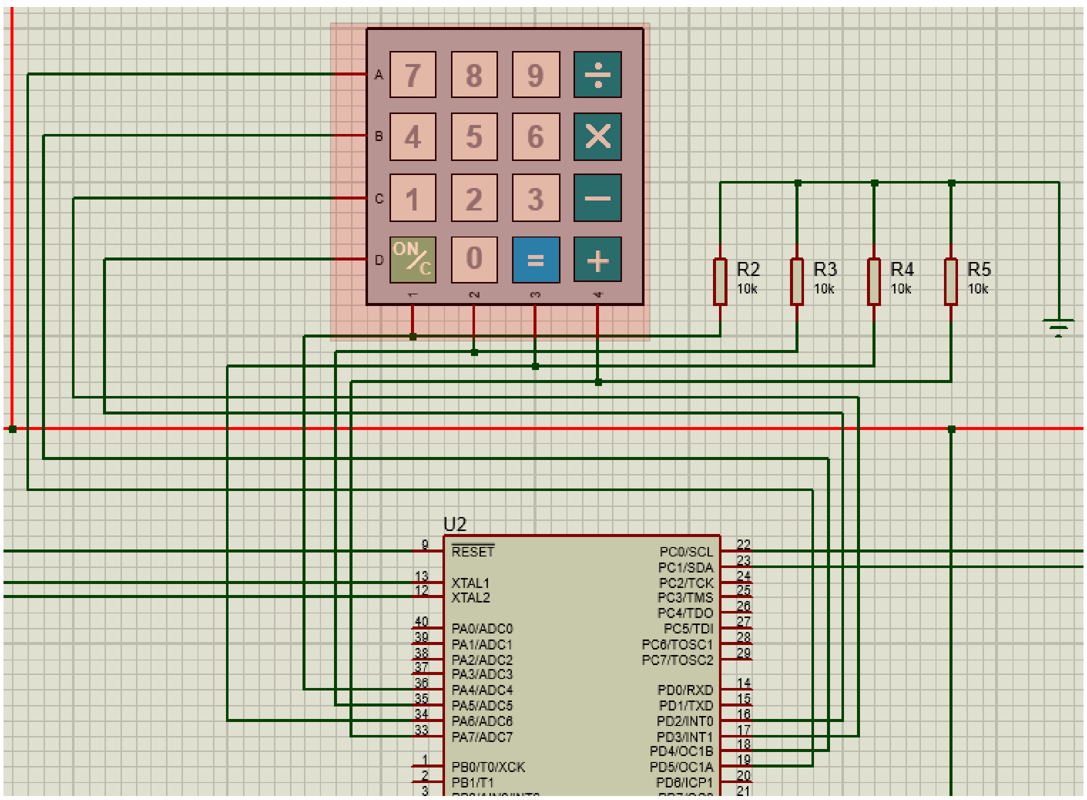

Figure 5. 7 - Keypad Circuit Diagram

```
DDRB = 0xFF;
    //putting portB and portD as output pins
DDRD = 0xFF;
_delay_ms(50);//giving delay of 50ms
int key=0;//allocating integer to reset the LCD once it reaches its display limit
int keypressed=0;//integer for storing matrix value
send_a_command(0x01); //Clear Screen 0x01 = 00000001
_delay_ms(50);
```

Figure 5. 8 - Keypad Sample Code

RTC

- Considered theory part of the keyboard
- Referred small part of the code
- Proteus was used to test our unit
- Discovered better RTC for the project [3]

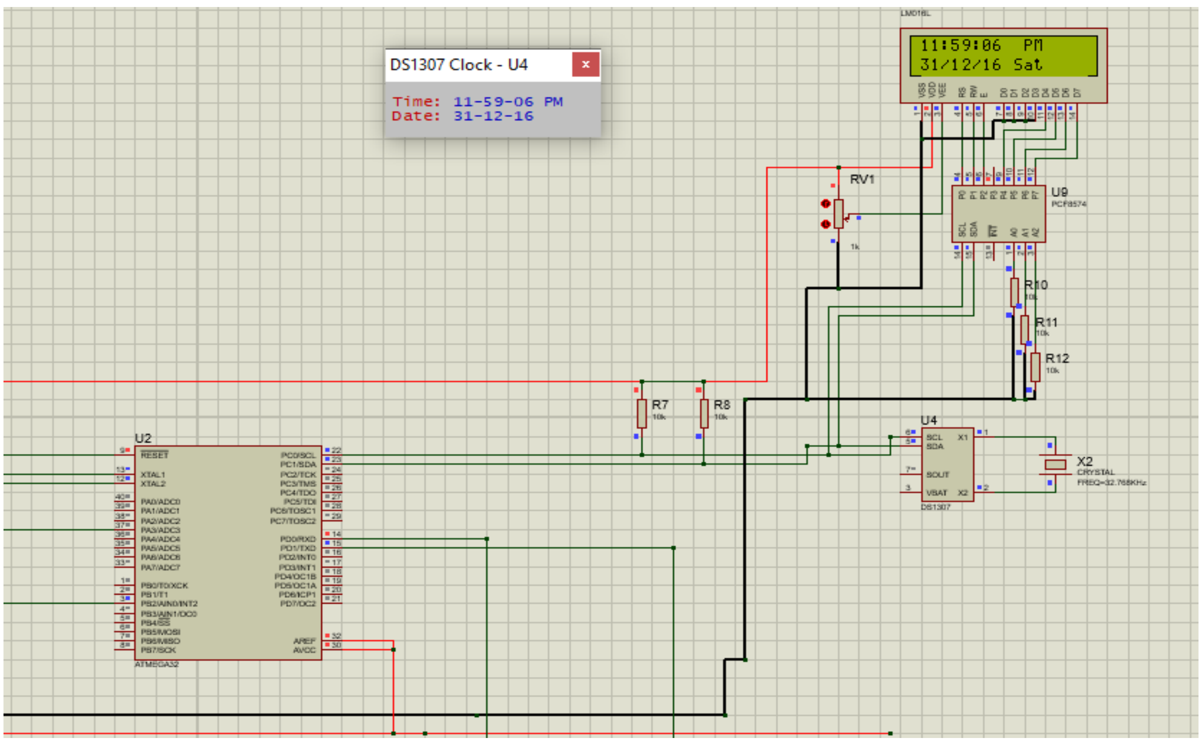

Figure 5. 9 - RTC Circuit Diagram

```c
void RTC_Clock_Write(char _hour, char _minute, char _second, char AMPM)
{
    _hour |= AMPM;
    I2C_Start(Device_Write_address);            /* Start I2C communication with RTC */
    I2C_Write(0);                               /* Write on 0 location for second value */
    I2C_Write(_second);                         /* Write second value on 00 location */
    I2C_Write(_minute);                         /* Write minute value on 01 location */
    I2C_Write(_hour);                           /* Write hour value on 02 location */
    I2C_Stop();                                 /* Stop I2C communication */
}

void RTC_Calendar_Write(char _day, char _date, char _month, char _year) /* function for calendar */
{
    I2C_Start(Device_Write_address);            /* Start I2C communication with RTC */
    I2C_Write(3);                               /* Write on 3 location for day value */
    I2C_Write(_day);                            /* Write day value on 03 location */
    I2C_Write(_date);                           /* Write date value on 04 location */
    I2C_Write(_month);                          /* Write month value on 05 location */
    I2C_Write(_year);                           /* Write year value on 06 location */
    I2C_Stop();                                 /* Stop I2C communication */
}

/*
RTC READ
*/
```

```c
bool IsItPM(char hour_)
{
    if(hour_ & (AMPMR))
    return 1;
    else
    return 0;
}

void RTC_Read_Clock(char read_clock_address)
{
    I2C_Start(Device_Write_address);            /* Start I2C communication with RTC */
    I2C_Write(read_clock_address);              /* Write address to read */
    I2C_Repeated_Start(Device_Read_address);    /* Repeated start with device read address */

    second = I2C_Read_Ack();                    /* Read second */
    minute = I2C_Read_Ack();                    /* Read minute */
    hour = I2C_Read_Nack();                     /* Read hour with Nack */
    I2C_Stop();                                 /* Stop i2C communication */
}

void RTC_Read_Calendar(char read_calendar_address)
{
    I2C_Start(Device_Write_address);
    I2C_Write(read_calendar_address);
    I2C_Repeated_Start(Device_Read_address);

    day = I2C_Read_Ack();                       /* Read day */
    date = I2C_Read_Ack();                      /* Read date */
    month = I2C_Read_Ack();                     /* Read month */
    year = I2C_Read_Nack();                     /* Read the year with Nack */
    I2C_Stop();                                 /* Stop i2C communication */
```

Figure 5. 10 - RTC Sample Code

Gear Motor (Spreading Motor)

- Distributes food in a 360-degree circle and toss away
- Referred to the motor's theory section
- Taking into account the cost, strength, and rusting of metal
- Took a look at a example section of the code
- Discovered a more useful motor for the project

```c
int main(void)
{
    DDRC = 0xFF; //PORTB as Output
    while(1)
    {
        //Rotates Motor in Antilockwise
        PORTC = 0x01; //00000001
        _delay_ms(4000);

        //Stops Motor
        PORTC = 0x00; //00000000
        _delay_ms(4000);

        //Rotates Motor in Clockwise
        PORTC = 0x02; //00000010
        _delay_ms(4000);
```

Figure 5. 11 - Gear Motor Sample Code

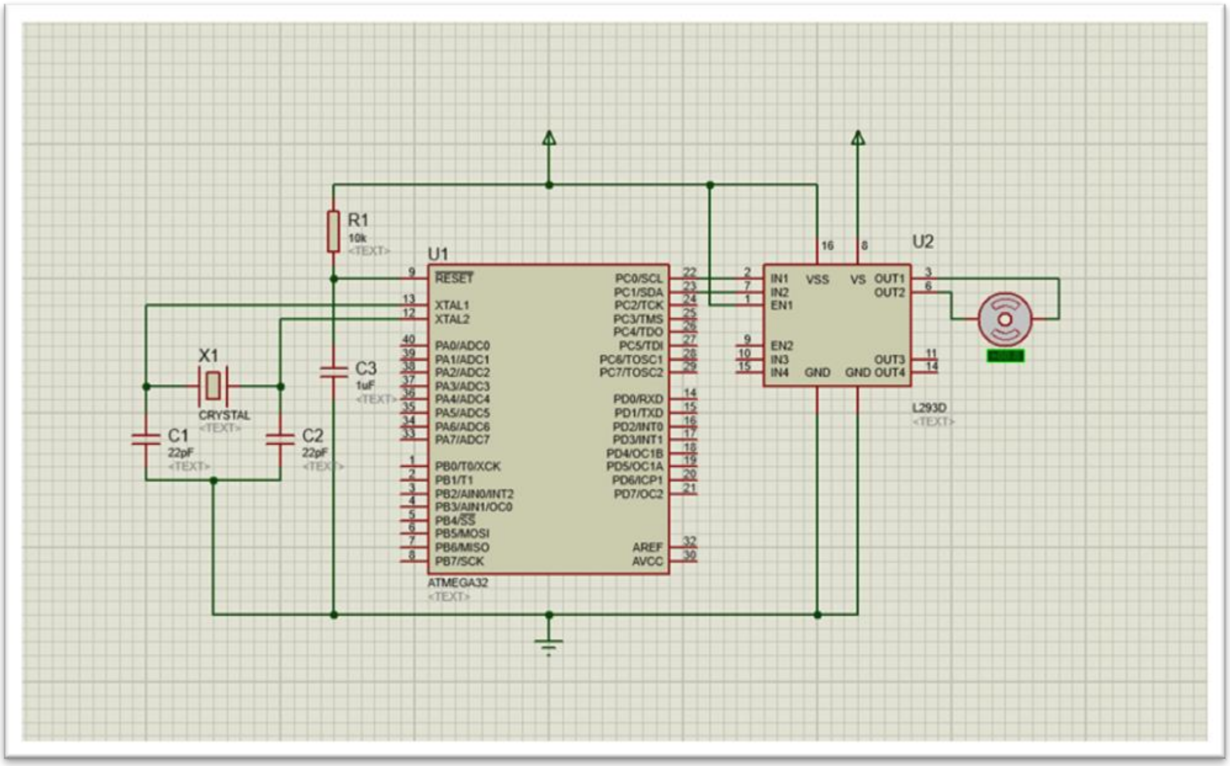

Figure 5. 12 - Gear Motor Circuit Diagram

Weight Sensor

- Referred to the weight sensor's theory section

Wi-Fi module

- Rx and Tx pin test
- Checked USRT protocol

8. Resources required

8.1 Software and Hardware

Software:

- Atmel Studio
- Proteus
- Blender

Hardware:

1. Sensors
    - pH sensor
    - Temperature sensor
    - Weight sensor
    - Ultrasonic sensor
2. Relay
3. Atmega 32 Controller
4. Real Time Clock Module
5. SD card Module
6. Buzzer
7. Spreading Motor
8. Synchronous Motor
9. Keypad
10. LCD Display
11. Wi-Fi adapter

8.2 Estimated Cost

Hardware Specifications	**Qty**	**Prince (LKR)**
pH sensor	1	1840.00
Temperature sensor	1	130.00
Weight sensor	1	500.00
Ultra-sonic sensor	1	280.00
PIR sensor	3	250.00
Real Time Clock (RTC)	1	320.00
SD card module	1	200.00
Atmega32 micro controller	1	400.00
Relay	1	240.00
Gear motor	1	650.00
Servo motor	1	750.00
Keypad	1	520.00
LCD display	1	440.00
Wi- Fi Adapter	1	390.00
Other (Alarm, Buzzer, Lamps, Metal, legs, Wires)	1	5000.00
Total		12416.00

Table 1 - Estimated Cost

Appendixes A

Individual Contribution

Student Name: Sara A.N.Z
204192X

Our hardware project will be to construct a shrimp feeding system. I discovered what needed to be done by communicating with my project partners, attending hardware project meetings, and conducting research. First, we drafted the proposal by explaining our problem and the suggested solution. Throughout those days, I learned about the technologies that we want to use to develop the system.

- Learning about synchronous motor
- Learning to simulate using Proteus
- Learning to do 3D animation

I have learnt to develop interfacing synchronous motors, the structure of it and how it could be used in our project and to design and code a synchronous motor. I too learnt to use Proteus software to simulate the circuit. I too learnt to make 3D animations using Blender

Student Name: Megasuriya M.M.A.M.J
204130H

Our hardware project will be to manufacture a shrimp feeding mechanism. I recognized what needed to be done by engaging with my project teammates, attending hardware project meetings, and conducting research. First, we drafted the proposal by explaining our problem and the suggested solution. Throughout those days, I learned about the technologies that we want to use to develop the system.

- Learning about relay and pH sensor
- Learning to simulate using Proteus
- Learning to do 3D animation

I have learnt about designing and coding a relay and a pH sensor.learnt to use Proteus software to simulate the circuit. I too learnt to make 3D animations using Blender

Student Name: Appuhamy H.D.S.A.N

204006J

Manufacturing a shrimp feeding device will be our hardware project. By interacting with my project partners, attending hardware project meetings, and completing research, I was able to identify what needed to be done. We begin by drafting the proposal by describing our problem and the proposed remedy. I learnt about the technology we intend to employ to construct the system during the course of those days.

- Learning about real time clock module(RTC)
- Learning to simulate using Proteus
- Learning to do 3D animation

I have learnt about designing and coding an alarm system used with RTC module. I mention that I have learnt to use Proteus to design the circuits and learned to create 3D animations using Blender.

I'm also working on a WIFI module. At the time, I was mainly concerned with the theoretical aspects of this Wi-Fi module, as well as figuring out how to connect to the atmega32.

Student Name: Rajapaksha S.S.D

204171H

Our hardware project will be to build a shrimp food mechanism. I had no idea what I had to accomplish at first. However, after interacting with my project teammates and engaging in hardware project meetings, as well as reading research, I realized what needed to be done. First, we draft the proposal by stating our problem and the recommended remedy. I learnt about the technology that we aim to employ to build the system throughout those days.

I am in charge of determining the weight of the food tank. To distribute food to the pond, use a gear motor. So far, I've assisted my team members in designing the entire system, reading and comprehending the atmega32 microcontroller, DC motor, and using sample code for working motor and weight sensor theories. However, I was unable to connect the weight sensor to the microcontroller. So I'm continuing conducting research and working on it.

I've learnt a lot of new things. Not only the study-related things, but also how to operate in a team and interact with team members.

Student Name: Perera J.K.A.T

204155M

- Learning about SD card module
- Learning to simulate using Proteus
- Learning to do 3D animation

Our hardware project will be to manufacture a shrimp feeding mechanism. I recognized what needed to be done by engaging with my project teammates, attending hardware project meetings, and conducting research. First, we draft the proposal by stating our problem and the recommended remedy. I learnt about the technology that we aim to employ to build the system throughout those days. I gathered theoretical knowledge on SD card modules

Action Plan

Action Plan											
No	Tasks/Date	12/25/2021	01/02/2022	01/02/2022	01/09/2022	01/16/2022	01/23/2022	01/31/2022	02/07/2022	02/14/2022	02/21/2022
1	Student Name:204192X Sara A.N. Z										
	Synchronous Motor										
	Ultrasonic Sensor										
	Keypad										
	PCB design										
	Total Codings (Combine)										
2	Student Name:204130H Megasuriya M.M.A.M.J										
	pH sensor										
	Relay										
	Keypad										
	PCB design										
	Coding(Components)										
3	Student Name:204006J Appuhamy H.D.S.A.N										
	WIFI adapter										
	RTC										
	LCD Display										
	PCB Design										
	Total Simulation										
4	Student Name204171H Rajapaksha S.S.D										
	Spreading motor/motor controller										
	Weight sensor										
	LCD display										
	PCB design										

Action Plan Cont.

	Simulation(Components)										
5	Student Name:204155M Perera J.K.A.T										
	SD card module										
	Temperature sensor										
	LCD display										
	PCB design										

Table 2 – Action Plan

References

[1] Electrical4U, "Synchronous Motors: Applications, Starting Methods & Working Principle," Electrical4U, [Online]. Available: https://www.electrical4u.com/synchronous-motor-working-principle/.

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