CHAPTER I

THE PROBLEM AND ITS BACKGROUND

This chapter covers the first phase of the study. It includes an introduction, thestudy's background and objectives, the significance of the study, its scope, and its delimitations.

Introduction

No one is prepared for the Coronavirus (COVID-19) pandemic outbreak. There are many things changed ever since it began. People face the realities of physically disconnecting or isolating themselves from their friends or social ties and remaining home 24/7 with nothing else to do. Then comes the trends such as online selling, TikTok application, planta/tito, or petting different animals.

This research developed adevic eto help fishowners care for their pets, especially goldfish. Any home would benefit from having a goldfish aquarium or tank. Because goldfish require much space to roam, their number must be considered. A larger tank is needed for a single-tailed goldfish or more than one beautiful goldfish. Pet owners should be able to keep their goldfish healthy and strong. They should be knowledgeable about growing beneficial bacteria in their tank and setup the correct filtration and lighting (Ludemann,2022).

Having a fish at home is great because it can be a person's companion although they do not talk, their presence at home is enough .They can make an owner happy and be friends who cheer them up when they are down.

They have a good personality because they are just peaceful and swim around. They

do not make a fuss or a mess that would cause stress. Having a fish as a pet can make an owner more responsible and reliable to become a good pet owner.

This project designed a low-cost device that allows goldfish enthusiasts to care for their fish more effectively without as much work and exertion. The owner can trust the device to look after their goldfish in a manner that ensures its care.

Background of the Study

Slow fish growth and fish deaths in fisheries are two significant issues every fisherman encounters in the aquaculture industry, especially the goldfish. Water quality is a vital aspect that must be monitored while growing a goldfish. However, most fisherfolks need to pay more attention to it since water tests and sensors are expensive and impractical. Also, when it comes to the goldfishfeeder, fish owners cannot leave additional food in their fish tanks before leaving for an extended period.

Overfeeding is one of the most common causes of goldfish death. When the food in the tank decomposes, the proteins release ammonia and nitrites, reducing the tank's oxygen quantity. Lack of oxygen in the water harms the fish, especially the goldfish. This can be difficult for fish owners who need to leave the house but need a reliable petsitter.

While there are several alternatives for feeding cats and dogs while away fromhome, there are fewer options for fish owners.

Goldfish have a daily feeding schedule, which makes it difficult for the fish owner to

be away from home, whether for school, business, or pleasure. This necessitates the development of an automated device capable of feeding a goldfish reliably.

This research details the group's process to design, build, and test an Automatic Goldfish Feeder with Water Changing Mechanism. The researchers came up with the idea to develop an automated device with a water changing device to ensure the cleanliness of the water in the aquarium even without the owner and a goldfish feeder to dispense the accurate amount of food into the aquarium at a particular time each day. This project may help lessen the owner's worries for their goldfish if they are not home because they can rely on the device to perform its function.

The purpose ofthis device is to maintain the cleanliness of the water by preventing contamination, plus it can feed the goldfish reliably even when the owners are not at home.Additionally, it can maximize the benefits of providing care to the goldfish without putting too much effort in to it.

Objectives

General Objective

This research aimed to develop adevic eentitled “Automatic Carassius Auratus Feeder with water changer Mechanism" that can automatically dispense an accurate amount of food for the goldfish at a particular time each day.This device also has a water-changing mechanism that ensures the water quality needed by the goldfish inside the aquarium.

Specific Objectives

The following are the specific objectives the researchers plan to use to accomplish their goals:

1. Incorporate a program that can run a microcontroller to automatically feed and filter the pump based on its designated time or schedule.
2. Design a manual control from a program for both the feeder and filter that the user could interact with.
3. Develop an aquarium with a programmable turbidity sensor to measure and maintain the water quality in a range of 10 to 25 NTU, using a standard water quality for fisheries as areference.
4. Construct a water changer mechanism that uses a circulating system to preserve water.

5. To design a fish feeder with a measured container limited only to a maximum of 0.4 grams of feeds to specify the number of fish pellets mobilized by a servo motor per interval time to fill up and be tossed inside the aquarium.
6. Assessing the effectiveness based on its operation according to the prescribed schedule.

Significance of the Study

Briefing the study are the following sectors as follows:

Goldfish Owners and Aquarist Community

The direct recipients of this research's output are those who care for goldfish in their homes or shops. The innovation of the aquarium having additional features can assist and convince them to facilitate and raise more goldfish in their residence. Through this study, they can simultaneously have a mechanism with an automatic fish feeder and water changer.

The Researchers

This study can help the researchers because it serves as a tool to enhance and develop their research, critical reasoning, and problem-solving abilities. This research's ideas and information can be a starting point for new and enhanced research.

The Future Researchers

The study's findings can benefit both current and future researchers. The concepts offered might be utilized as a starting point for future study that will also serve as a cross-reference for them, providing a background or summary related to the fish specification. This research could be one of the foundations for a new learning theory.

Scope and Delimitations

This research primarily used goldfish. Since it is the most popular and common pet fish, it became the specific fish that the researchers considered in the study. All the parameters and criteria used were based only on goldfish, such as the amount of food, time of feeding, and water changes due to the specific feeding requirements outlined by expert goldfish breeder John Parker. Parker's research suggests that the standard fancy goldfish should consume approximately 2% of their body weight daily. For instance, a small 20-gram goldfish would require 0.4 grams of daily feed pellets to meet its daily nutritional requirements.

This project focused on integrating manyfeatures into a single aquarium serving as the device's primary base. The fish feeder system is the device that functions as a source of food inside the aquarium. It schedules automatically and manually that will be thrown inside the aquarium. Next is a filtering device for the water inside the aquarium. It activates whenever the turbidity sensor reads that the water is cloudy and has increased to a level of 25 NTU or higher.

Another feature is the water changer mechanism, which recirculates water from a reserved container and the aquarium. This feature recirculates in 25 minutes to clean the water while adding a delay of one minute to prevent water overflow time takes 50 minutes to shift the water from the container into the aquarium; this feature activates when the sensor reads that the water reaches above 50 NTU level.

There were constraints to the proposed project. The device is not battery-based and does not have a backup power supply. It is made with a connector called Universal Serial Bus-A (USB-A) and two 2-pole power supplies connected to the two relays to provide electricity. The system's equipment should track the tank's temperature. Because the device is programmable, its capabilities are entirely dependent on what is on the preset program.

Definition of Terms

1. **Aquaculture** produces seafood, similar to farming, but with fish, crustaceans, and shellfish. Aquaculture enterprises raise plants and animals in water, either fresh or salt, and prepare them for human consumption. Aquaculture now provides more than half of all fish consumed worldwide. It is the world's fastest-growing food-producing sector and will be critical in feeding a world with an ever-increasing population.

2. **Aquaristis** an aquarist who looks after the fish and aquatic animals in a Zoo's aquatic section or a public aquarium. They are responsible for feeding the fish and animals, preparing the food, and making necessary dietary modifications. They also keep the aquarium, tanks, and exhibits clean and clear of algae, ensuring the water quality is maintained.
3. **Automation** developing and using technologies to manufacture and provide goods and services with the least human involvement.
4. **Device (refers to automatic CarassiusAuratus Feeder with Water Changer Mechanism)** – is the term used to describe the system that will be built, developed, and designed during this investigation.
5. **CarassiusAuratus** is a small golden or orange-red fresh water fish of Eurasia used as a pond or aquarium fish or mainly called goldfish.
6. **NTU –** or Nephelometric Turbidity Unit is used to measure the turbidity of a fluid or the presence of suspended particles in water.
7. **Turbidity** (of a liquid) is the quality or state of being cloudy due to smallpiecesof matter.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter offers national and international literature that discusses characteristics, aptitudes, and technological advancements related to the prototype. Researchers with both direct and in direct relations to the project are also included.

Related Literature

Benefits of Fish Feeder

In many bodies of water, there are either insufficient natural food sources or insufficient natural food production to support the necessary predator population. All the fish in the lake or pond will benefit from an additional food supply, even though not all species use fish food (Sunwit, 2020).

To precisely match the requirements of the aquatic habitat, fish feeders areadaptable, dependable, and available in a range of sizes. They may be put practically anywhere on the property because they operate on timers. Regularly using automatic feeders to feed fish in ponds or lakes can be advantageous for several reasons.

This automatic fish feeder can be set up as often throughout the day as the fish require. These are basic machines that only require providing food and setting a timer.

According to the article of Mr. Saltwater Tank, the fact that owners do not need to be there to feed their fish is the main advantage of an automatic fish feeder.

Fish should receive food from the automatic fish feeder. If the fish is fed multiple times a day and cannot or does not want to feed them by hand, this automated feeding is helpful for several days (Saltwater, 2015).

The pet fish owners are usually distressed when they are away from the home environment because they cannot feed the fish on time. When away from home, pet fish owners are frequently upset because they cannot feed the fish on time. Food deprivation and overfeeding put fish health atrisk and lower the water quality in indoor fish tanks. Therefore, keeping an eye on thefish feeder is crucial and can benefit owners (Hasim, Ramalingam, Ernawan, &R., 2017).

Goldfish will never stop eating. Based in Millie Sheppard's article, if the owner wants to take proper care of the goldfish, they should be aware of how frequently they should feed them. There are many issues the owners want to avoid dealing with if they give them too much or too little food (or at the wrong times). Goldfish should be fed twice or thrice daily as a general rule. This is a condensed average that will be suitable in the majority of circumstances.

Additionally, it ought to have a regular feed schedule. This will facilitate the goldfish's digestive cycle and help them establish a regular pattern. If it is fed throughout the day at unpredictable intervals,there is a greater likelihood that they will become ill or receive varying amounts of food.

A two-minute rule. Follow the two-minute rule to determine how much to feed them. However, goldfish should be fed at most they can consume in two minutes. This rule applies particularly well to flake food because the goldfish can find it and swiftly consume it. It might need to prolong thiswindow of time slightly if giving them pellets instead. Goldfish typically take longer to locate the pellets (Sheppard, 2020).

Pellets are an excellent goldfish food. For fishy buddies, they are not only delicious and nutrient-dense but also reasonably simple on their digestive systems and, when soaked, do not interfere with swim bladder function.

Because goldfish never stop eating, the typical rule of thumb is to give them as much food as possible in 2 to 3 minutes (Jones, 2023). Less nutrition can evaporate from the food's surface because pellets have a lower surface-to-mass ratio. Water-soluble vitamins like Vitamin C will last longer in a pellet rather than a flake. The amount of food for fish will depend on their lifestyle since the "5-minute" guideline does not work well for goldfish.

Goldfish kept in outdoor ponds will need a lot more energy than those kept in aquariums indoors. Fish that are bigger will require more resources. Start slowly and only give 3–4 size-appropriate pellets to pet fish for the best results (Sanders, 2020).

According to expert goldfish breeder John Parker, a standard fancy goldfish should consume around 2% of its body weight daily. A small 20-gram fish would need 2% of its weight, or 0.4grams, through out the day.

Pick an average-sized fish as the base for larger tanks with varying sizes of goldfish to calculate the rest. The goldfish's health and well-being depend on a balanced diet. Overfeeding will quickly dirt the tank and expose the goldfish to several ailments, while underfeeding will likely result in small, unhealthy fish. The fish remain vibrant and healthy by measuring the perfect amount of food.

The researchers developed a fish feeder for fish pellets; the amount of food stored inside the fish feeder container is small.

Automatic Water Changer

Water replacement is one of the most crucial aspects of aquarium maintenance. Regular aquarium water changes are necessary to maintain fish health and avoid unpleasant, darkwater. Owners can eliminate extra nutrients that can adversely affect their fish tank environment when they remove filthy aquarium water from their fish tank and replace it with clean, freshwater. Constantly replenish trace elements supporting the tank's residents' well-being and enjoying a stunning underwater environment.

The aquarium must have regular water changes for the fish and other aquatic species to thrive. Maintaining clean, fresh water in the aquarium is crucial for the well-being of coral, fish, and other invertebrates and creating a stunning habitat.

In Aquarium Illusions, it is stated that the aquarium may experience a wide range of problems due to in frequent water changes.

Skipping water changes can cause problems for the fish and other marine inhabitants, creating an unattractive, uncomfortable, andsmelly aquarium. It is crucial to be aware that changing the water in the aquarium can affect its chemistry and nutrient potential.

When doing an aquarium water change, owners also add helpful elements to the aquarium. For example, a coral reef aquarium will require calcium, magnesium, and alkalinity to be within a specific range to maintain proper growth and coloration.

Meanwhile, corals are constantly utilizing and depleting these resources to stay alive. Use clean seawater or a quality saltwater aquarium mix to replenish any vital components removed to the appropriate levels (Illusions, 2018).

Some nutrients and organics, such as phosphates and nitrate, irritating the aquarium residents, are also removed when draining some aquarium water.

The interior of the tank will be vulnerable to algae grow that high phosphate and nitrate concentrations, and the health and development of the fish will also be impacted.

Importance of Water Quality

According to Monitoring the Water Quality of Aquariums using IOT technology, the constant production of harmful proteins and impurities by marine life must be constantly removed is a significant issue in modern aquariums.

Water is essential for maintaining life. Marine life requires equal attention for aclean environment. The impurities in an existing aquarium threaten the life of the marines. As a result, fish could not survive and could die as well, and also, for existing aquariums removing impurities from water in the aquarium is a crucial issue. They regularly test water quality parameters, such as turbidity sensors, to measure the number of suspended particles in the water (Mariam, Ali, Memon, & Shakoor, 2020)**.**

Turbidity; Consider drinking water as an example. Because it is clear and colorless, the turbidity level is low. However, turbidity would be considered to take water samples from a river with significant discharge rates because the water is typically brown and opaque.

Water turbidity is a vital sign of suspended sediments, which can harm aquatic life. Sediments suspended in water can obstruct sunlight, slowing the growth of aquatic plants and suffocating aquatic life. Turbidity is a great indicator of water quality, even if variables other than clarity can alter the turbidity of the water. Since turbidity is water's optical characteristic, it is a challenging parameter to measure.

The total suspended solids (TSS), which have an impact on water purity, should also be taken into account. Turbidity only gauges the clarity of a liquid; therefore, evaluating the TSS or total dissolved solids (TDS) will show whether inorganic sediment, bacteria, or other precipitates have had an impact on the sample's clarity. Turbidity is a great indicator of water quality, even if variables other than clarity can alter the turbidity of the water (Scientific, 2022).

Turbidity in water. It is brought on by suspended colored material and particles. Using a Secchi disk, a turbidity meter, or a portable sensor, turbidity is frequently assessed about the clarity of the water. The amount of turbidity in water can be used to determine how transparent or opaque the water is. Various units have been developed to standardize turbidity data and enable comparison between them, depending on the technique used to detect turbidity.

Turbidity is a measurement of how cloudy or murky water is. Turbidity increases with water cloudiness. Submerged Aquatic Vegetation (SAV), receive less sunlight when there is a high turbidity level. Because plants create oxygen, fewer plants grow, which limits the amount of oxygen available to aquatic life. Low sunlight penetration is caused by high turbidity.

Submerged Aquatic Vegetation (SAV) is a term for underwater vegetation. Less sunlight inhibits plant growth because plants generate. This lowers the amount of oxygen that aquatic life has access to.

High turbidity damages fish habitat, jams fish gills, and makes water unfit for drinking. Significant amounts for aquatic animals and plants: (a) a turbidity meter is used to measure turbidity. Aquatic life is harmed by turbidity levels above 150 NTUs at any given time or 50 NTUs monthly. (b) A Secchi disk is used to gauge the clarity of the water. Turbidity can block gills and prevent fish from seeking food when the disk cannot be seen below 1 meter (Basin, 2017).

For instance, a Formazin Nephelometric Unit (FNU) and a Nephelometric Turbidity Unit (NTU) measure scattered light at a 90-degree angle from the incident light beam. Still, the FNU uses an infrared light source to comply with ISO 7027, where as the NTU uses white light to comply with EPA method 180.1. Several submersible multi parameter turbid meters use an infrared light source (Scientific, 2022).

Related Studies

Fish feeder in a stepper motor. This automatic fish feeder is a solution for aquarists' to ensure their pet fishes are fed healthily and on schedule. The project implements the integration of mechanical and electrical/electronic systems to control fish-feeding operations. The controller used for this device is an Arduino Uno microcontroller board. The controller controls the feeding mechanism and feedback system. This device uses a vertical screw conveyor mechanism to dispense the fish food into the water. The mechanism is actuated by a unipolar stepper motor where the amount of dispensed food is controlled by the motor steps input when coupled to the screw conveyor. On the other hand, the feedback system consists of a user interface feature using a keypad button for the aquarist to choose the amount of dispensed food and an infrared sensor as a warning system to warn the aquarist when the fish food level is low (Nirwan, Swarnakar, Jayarajan, & Shah,2017).

Unlike the current study's prototype, this fish feeder uses a stepper motor to feed the fish inside the aquarium. The researchers used a servo motor to fill the feeder container that will be thrown inside the aquarium. The mechanism is also set at a specific time for the goldfish using the RTC or real-time clock. It is also programmed and cannot register the time.

Synthesis

Recent studies and articles have thought about additional automatic fish feeder uses. Hasim, Ramalingam, and Ernawan (2017) mentioned that pet fish owners frequently become irritated when they cannot feed the fish on time. Both underfeeding and overfeeding fish compromise their health and degrade the water quality in indoor fish tanks. Fish feeders are adaptable, dependable, and offered in various sizes to appropriately match the aquatic ecosystems needs. Simple machines like automatic fish feeders only need food and a timer. The most significant benefit of an automatic fish feeder, according to Mr. Saltwater Tank's article, is the fact that owners do not need to be there to feed their fish.

Mariam, Ali, Memon, and Shakoor (2020) assert that water is necessary to continue life. Turbidity levels above 150 NTUs at any particular time or 50 NTUs on a monthly average, following Basin (2017), harm aquatic life because high turbidity damages fish habitat, jams fish gills, and makes water unfit for drinking. Even if factors other than water clarity can change the turbidity of the water, turbidity is still a valuable indicator of water quality. Turbidity is challenging to measure because it is an optical property of water. Scientific (2022) stated that measuring turbidity is crucial for maintaining healthy aquatic ecosystems and guaranteeing drinking water safety.

In conclusion, preserving high water quality and ensuring that aquatic life is healthy are crucial to sustainable development. Though, technology can assist in achieving these objectives, two examples being turbidity monitoring and automatic fish feeder development.

Conceptual Framework

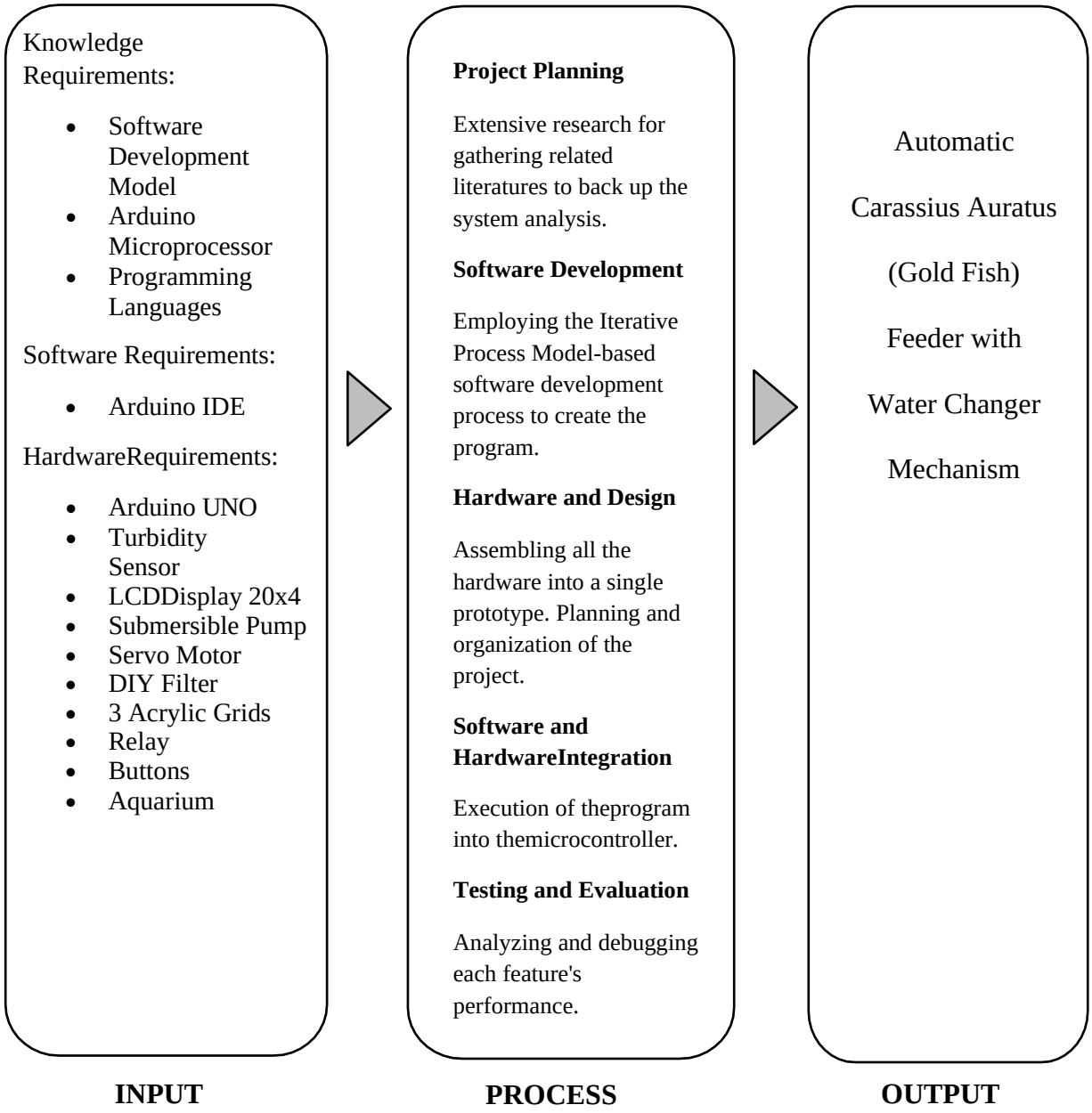


Figure 2.1 *Conceptual Framework*

Figure 2.1 portrays the conceptual framework of the study. For the input, knowledge requirements contain the Arduino Microprocessor, Software Development Model, and the Programming Languages. Software requirements consist of the programming languages that will be used in creating the program, the researchers will use the C++ language for the Arduino IDE.

The hardware requirements include Arduino Uno R3 as a microprocessor of the device. The researchers used a Turbidity Sensor to maintain the cleanliness of the water, an LCD Display for visuals, Buttons for manual pumps, a filtering system for recirculation of water, a Servo Motor for feeding, a Relay, and other infrastructures. During the process, the steps were followed from the project planning by gathering data to developing the hardware components and software, designing and developing the prototype, testing its functions, and debugging.

The final output of this process is the complete prototype with its components in a single aquarium called Automatic Carassius Auratus (Goldfish) Feeder with Water Changer Mechanism.

CHAPTER III

RESEARCH METHODOLOGY

This chapter describes the research methodology employed in the study. It also includes illustrations that help to visualize the prototype's process. The project design, development, instruments, and procedures will be described.

Project Design and Development

The researchers used the project development and design technique as the step-by-step framework to appropriately guide the study from beginning to end. It is the process of initiating, planning, carrying out, and wrapping up a project to achieve predefined objectives and intended results. Building a straightforward foundation for strategic planning is the aim of project development.

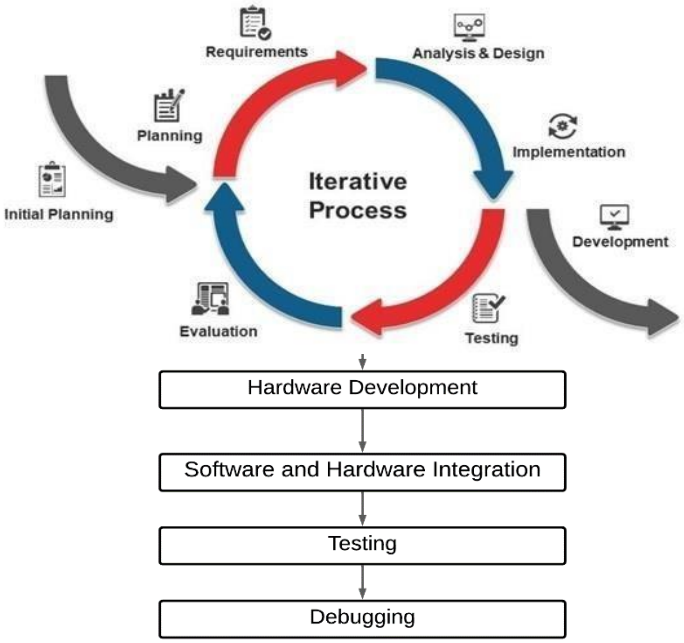


Figure 3.1 *Project Development Methodology*

Project Planning

The researchers brainstormed all possible ideas that would help conceptualize what the project would be. After considering every suggestion, they chose to innovate an aquarium with two functions, a fish feeder and a water-changing.

Software Development

The Iterative Process Model was employed to design the device's software. The researchers created a C++ program that laid the framework of the Arduino and acted as the system's controller.

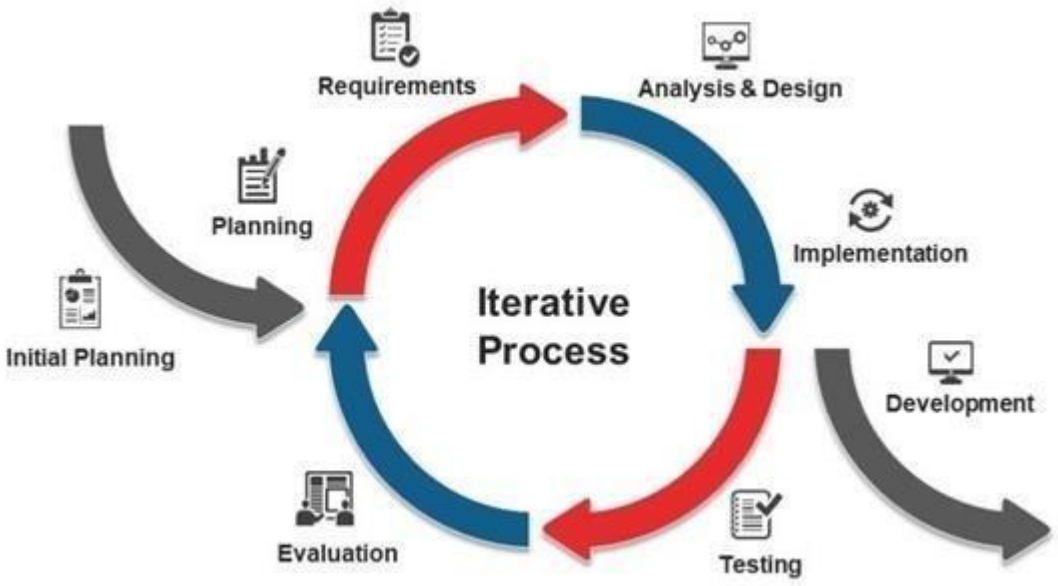


Figure 3.2. *Iterative Process*

Analysis and Design

The primary focus of this phase is the potential software requirements for the development of the application. Before beginning the actual coding, it is essential to understand the tasks that must be completed and how they should appear. Researchers under took walkthroughs and brainstorming meetings to understand the specifications thoroughly. In addition, they carefully reviewed the needed specs and became ready. The model implementation and unit testing phases were created according to the design requirements.

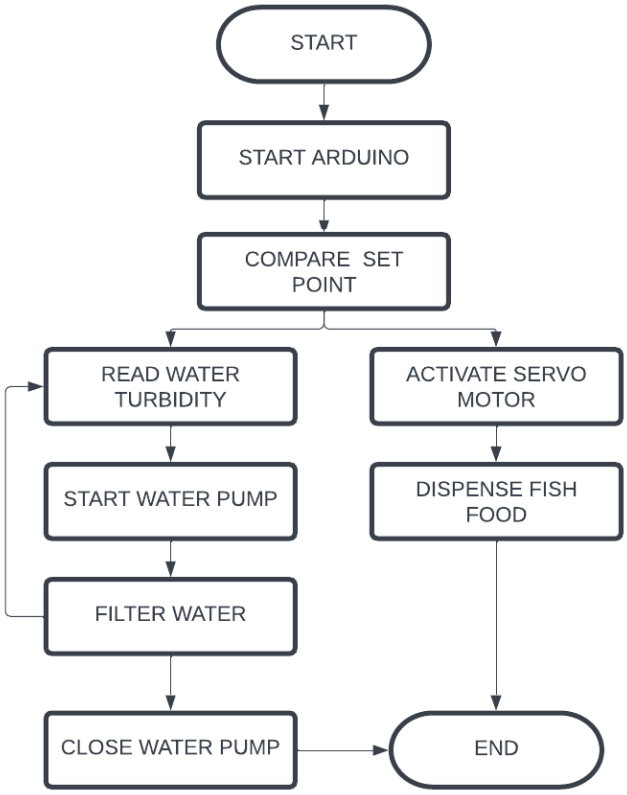
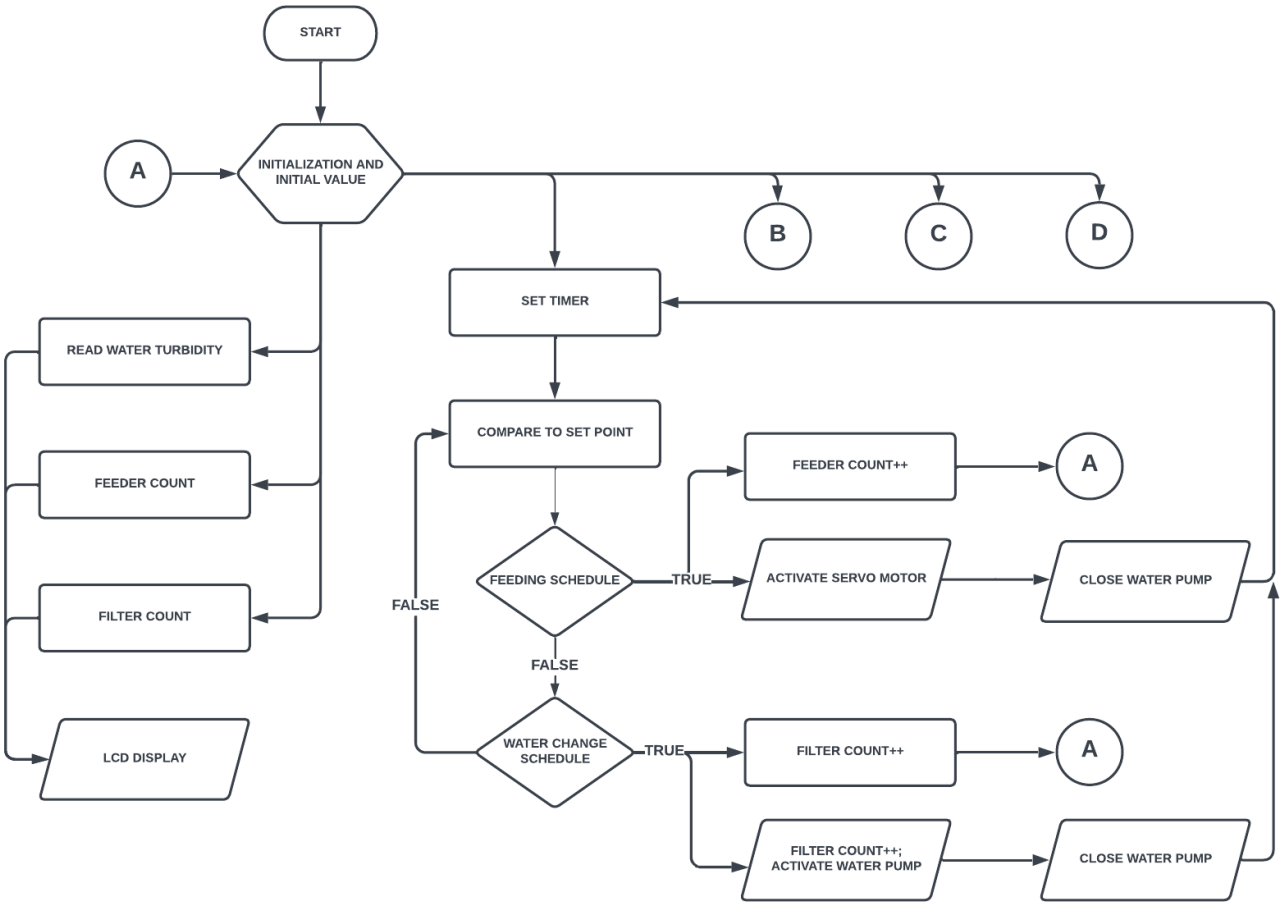


Figure 3.3 *System Flow – Summary of overall Process of the System*

Figure 3.3 shows the system's overview and step-by-step process. The Arduino board is the microcontroller of the system and the one responsible for sending and getting data from the other components and storing all the commands that will perform by the device. The device is activated when power from an outlet through the Arduino is supplied. It will automatically read the set time at the predetermined periods for feeding the goldfish and changing the water. Then it will compare the predetermined feeding and water-changing times for the goldfish.

If the device is powered on, the program will begin running; it will use the LCD to show the programmed designs and visuals on the screen. The fish feeder will produce a goldfish meal if the set time is met. Another feature is the turbidity sensor. It will run if the sensor detects the murky and unclear water and automatically filters it using the pump. The manual feeder and water changer mechanism buttons are an additional benefit. These benefits allow the user to engage and manually operate the device. The water changer mechanism is utilized if the sensor determines that the water is dirty or if the button for the changer is pressed. Two water pumps will start pumping the water into the aquarium from a reserve water container when activated.

System Flowchart



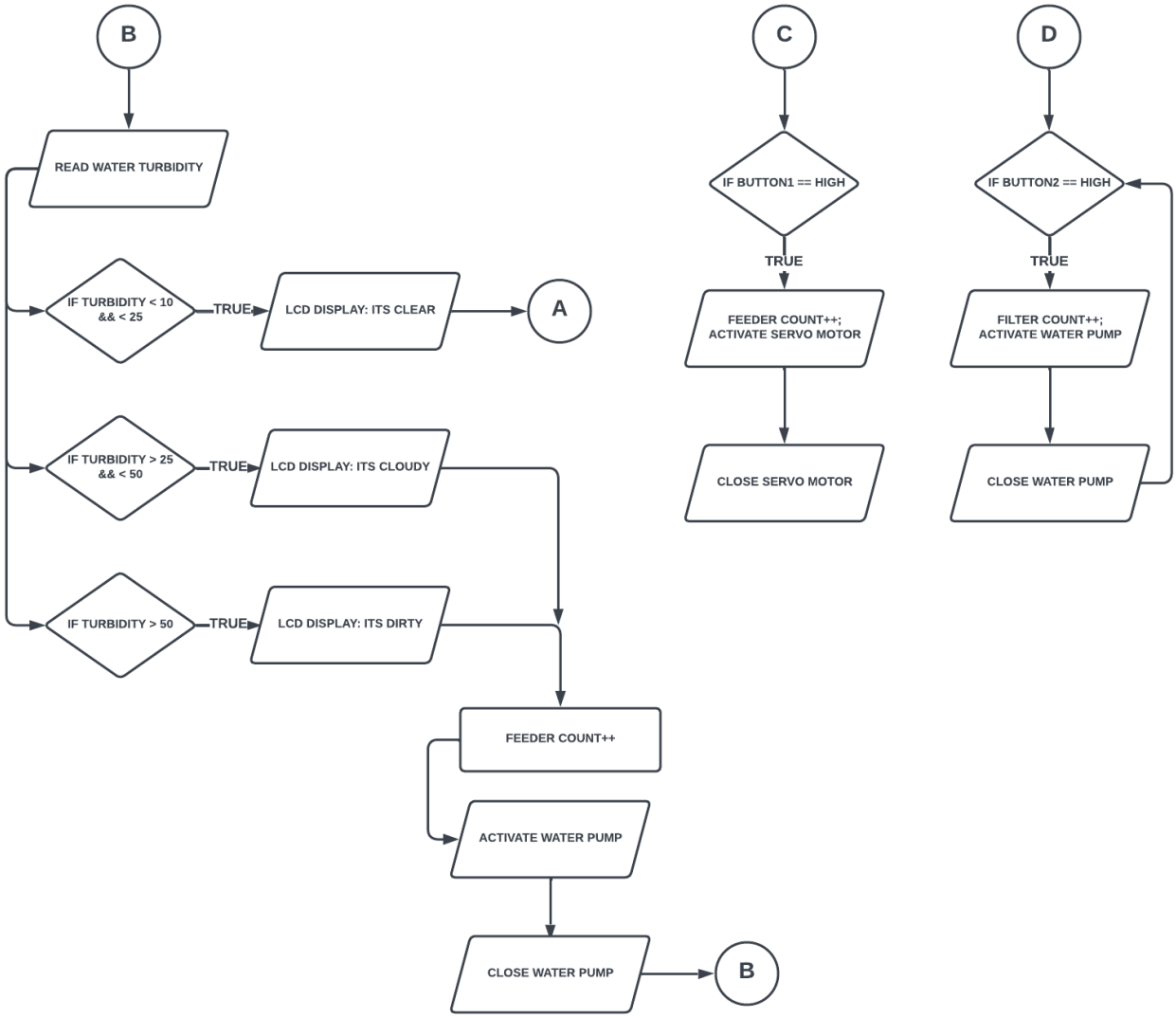


Figure 3.4 *System Flowchart of the System*

Implementation

After obtaining the system design documentation, the work was split into various modules, and the programming code started. Small code units are developed for the system. Later, during the following step, these units are integrated.

Testing and Evaluation

The researchers performed all the testing activities (functional and non-functional) to make sure that the system met the requirements. It is a stage that never ends. Once the technology is operational in a production setting, issues arise. The program must perform testing to identify any faults or errors it may have encountered during the testing step before being evaluated. This phase involves solving the issue and troubleshooting the software codes. Only after the system has been deployed are the system-related problems resolved.

Hardware Design

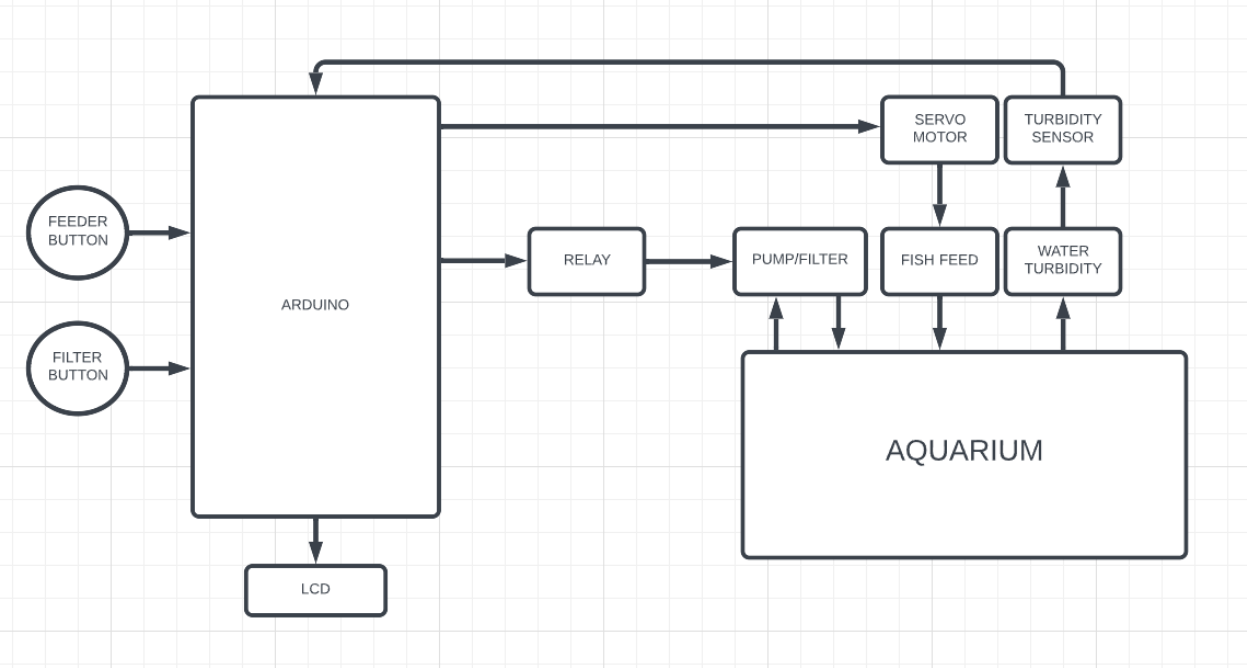


Figure 3.5. *System Layout*

Figure 3.5 depicts the devices' physical connection. The automatic timer set through the program determines the precise day and time the fish feeder and water changer device runs. It is also connected to the Arduino that controls the system and other mechanisms. The input device, such as the tactile buttons, is the manual control for the fish feeder and water filter.

The output devices are a fish feeder, water changer, and LCD screen display. The LCD screen display provides the visuals for the results of the programmed device. The fish feeder and water changer mechanism are connected to the microprocessor. The scheduled time is the access to the automatic features. The Arduino's analog, input, and output pins control the turbidity sensor. The purpose of the relay is to control the pump in filtering the water. The pump pulls the water into the designed filter.

Hardware Construction

Arduino Uno R3 Board

The Arduino board was created to work with the programming and prototyping software. An Arduino can communicate with the outside world using sensors. The Arduino software IDE can program the Arduino Uno through a computer or mobile phone to respond to changes in physical components like temperature, humidity, heat, or even light. This microcontroller is the main system of the prototype. It is where the program is uploaded to execute the following features.

Figure 3.6 *Arduino Uno R3*

Specifications:

Operating Voltage: 5V

PWM Digital I/O Pins: 14

Analog Input Pins: 6

Flash Memory: 32KB (ATmega 328P)

Turbidity Sensor

Turbidity sensors measure how much light is reflected or scattered by the water's suspended particles. Turbidity, or cloudiness or haziness, measures the total suspended solids (TSS) in a body of water. This sensor is the basis of the quality of the water. If it senses the water is cloudy, it will signal the program to filter the water inside the aquarium.

Figure 3.7 Turbidity Sensor

Specification:

Operating Voltage: 5V

Operating temperature: -30 °C -80 °C

Storage temperature: -10-80 °C

DC Response Time: <500ms

Dimension: 30mm * 20mm * 12mm

Servo Motor

Servo motors, or "servos," are electronic gadgets and rotary or linear actuators that precisely rotate and push machine parts. Servos are primarily used for linear or angular positions and speed and acceleration. These servo motors mobilize left and right. They provided a door for filling the feed container and dropping the feed inside the aquarium in a specified time delay.

Figure 3.8 *Servo Motor*

Specification:

Size:

21.5mmX11.8mmX22.7mm

Weight: 9 grams

No-load speed: 0.12 seconds / 60 degrees

(4.8V) Stall torque of 1.2 - 1.4 kg / cm (4.8V)

Operating temperature: -30 to +60 degrees

Celsius Operating voltage: 4.8V-6V

Relay

A relay is the electrical system's main voltage switch. Relays indicate that it can be switched on or off, permitting or preventing current flow. Operating a relay using an Arduino is comparable to managing a motor's output. The relay's secondary goal is to safeguard electrical circuits from overloads or malfunctions, relays with calibrated operating characteristics, and, occasionally, the use of multiple operating coils. Relays served as the bridge connection for the power supply, microcontroller, and pump.

Figure 3.9 *Relay*

Specification:

Operation Voltage: 5V
Trigger current: 5mA
Max load: 250V/10A AC, 30V/10A CD

Basic Components

LCD I2C (20x4)

Liquid crystal displays (LCDs) are commonly used to display data in devices such as calculators, microwave ovens, and many other electronic devices. The I2C LCDs are the necessary visuals for monitoring the program.

It also displays water quality or cleanliness, even the RTC or real-time clock, and the state of the pump if it is on for filling or off.

Figure 3.10 LCD Display Screen

Specification:

Display Type: Negative white on blue backlight.

I2C Address: 0x38-0x3F (0x3F default)

Operation voltage: 5V

Interface: I2C to 4bits LCD data and control lines.

Contrast Adjustment: built-in Potentiometer.

Backlight Control: Firmware or jumper wires

Grid Filter

The filter has three grids, a water inlet, and one dry box with different types of stones in each grid – that can filter or clean dirty water. It also has different types for a good quality of cleaning. The water inlet is connected to a pump to receive water and flow it into the grids to filter.

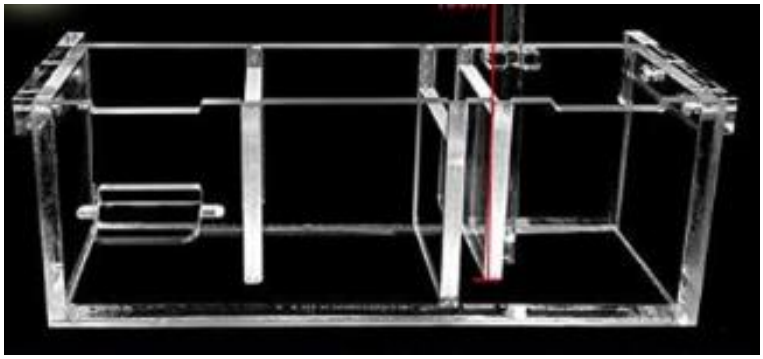


Figure 3.11 *Water Inlet and 3 Grids*

Tactile Buttons

It is an input hardware in the Arduino program, used as a manual buttons for feeder and filter.

Figure 3.12 *Tactile Buttons*

Submersible Pump

This submersible pump pulls the water into the water inlet to pass the water inside the grids for filtering purposes.

Figure 3.13 *Submersible Pump*

Jumping Wires

Jumping wires are also part of the basic components of the system. It is responsible for connecting all of the materials or tools of the system,

Figure 3.14 *Jumping Wires*

Vinyl Tube

It is the tube connected from the pump into the water inlet to help pull the water into the filter boxes.

Figure 3.15 *Vinyl Tube*

System and Hardware Integration

The researchers created this stage's intricate physical layout, sample codes, and aquarium-related components .After completing the hardware and software study ,the hardware and software design were combined.

The controls and functionalities of the hardware are integrated after the hardware and software have been developed.

Testing and Evaluation

The researchers tested and assessed the prototype using various established criteria. These parameters indicate whether or not the researchers met their goals for this design project. The parameters that are tested are shown below:

1. The Goldfish Condition
2. Water Quality
3. Accuracy of the Turbidity Sensor
4. Turbidity Sensor and Pump Connection
5. System Timer Function
    A. Pump
    B. Servo Motor
6. Water Filter

Conditions of Goldfish

Goldfish Condition	Occurrence (Yes/No)	Days occurred since the device is used
1. Improvement in goldfish Condition	*(result)*	(days)
2. The Goldfish suffer medical issues	*(result)*	(days)
3. The Goldfish dies	*(result)*	(days)

Water Quality

Water Quality	Occurrence (Yes/No)	Days occurred since the device is used
1. The water becomes cloudy	*(result)*	*(result)*

Turbidity Sensor and Pump Connection

Function	Result
The pump activates when the turbidity sensor reaches 25 above in the NTU level	*(result)*
The pump deactivates when the turbidity sensor reaches the desired minimum turbidity level	*(result)*

System Timer Function

Components	Activate on the set time (Yes/No)
Pump	*(result)*
Servo Motor	*(result)*

Water Filter

Function	Result
The time it takes to clean the water	*(result)*
The time it takes to change water from the container	*(result)*
The number of days the filters can stay Clean	*(result)*

Once a device has undergone all necessary testing, errors in its software and operation are eliminated, corrected, and removed. Researchers made changes to the project's hardware and software at this stage. The researchers will decide what changes should be made to the project's software and hardware.

CHAPTER IV

Results and Discussions

The chapter summarizes the Automated Carassius Auratus Feeder with Water Changer Mechanism prototype's design, description, structural development, method, features, limitations, and operational procedures.

Designing the System, Module, and Components Diagram

This section includes a detailed explanation of how the researchers created, assembled, and used the prototype. Also, it responds to the previously stated specified objectives. The researchers described the advancements done in this prototype compared to earlier investigations.

The researchers intended to build this prototype explicitly designed for goldfish owners or the aquarist community caring for the fish, mainly the owners.

The connection between the Arduino Board and the LCD and Buttons is the initial design that the researchers created. The users can engage with the prototype through these two elements. Various LCD models are available on the market for use in various settings. With this prototype, the researchers chose to use a 16x4 LCD to enable the menu to show the entire selection. Additionally, the researchers decided to use two tactile buttons in addition to the LCD. This prototype used both buttons. The LCD and button connections to the Arduino's pin arrangement are shown in the data below.

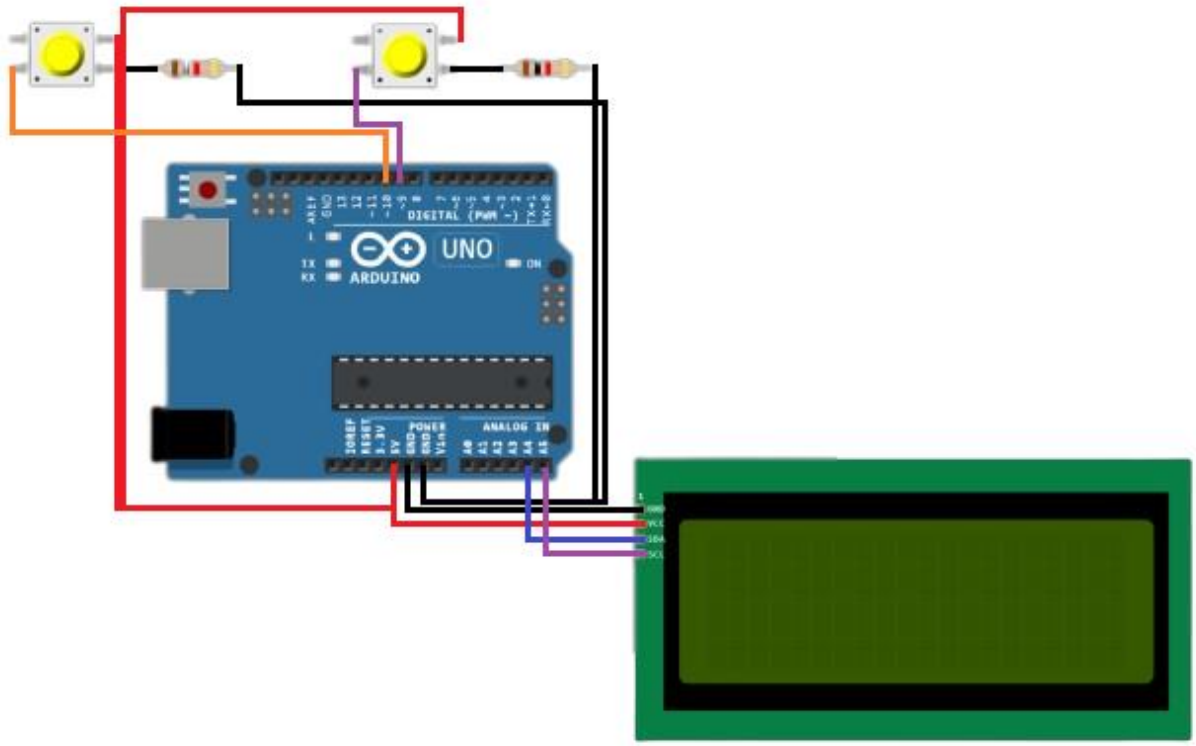


Figure 4.1. *The diagram of the connections from Arduino Uno to the LCD and Tactile Buttons*

Button	Arduino Uno
Button 1: Terminal A (Resistor)	GND
Button 1: Terminal A (VCC)	5+
Button 1: Terminal B (PIN 1)	PIN 9
Button 2: Terminal A (Resistor)	GND
Button 2: Terminal A (VCC)	5+
Button 2: Terminal B (PIN 1)	PIN 10

LCD Display I2C 20x4	Arduino Uno
PIN 1 (GND)	GND
PIN 2 (VCC)	5+
PIN 3 (SDA)	PIN A4
PIN 4 (SCL)	PIN A5

Table 1. *The connections from Arduino Uno to the LCD and Tactile Buttons*

The pin connections for the LCD Display I2C and Tactile Buttons into the Arduino UNO Board are shown in the picture and table above. The first button uses digital pin nine, whereas pin ten is used by the second. However, analog pins A4 and A5 were utilized by the LCD. It also shows that a resistor is connected from the button pins to the Arduino Uno, this is in place to restrict the flow to the ground, and the current will flow to a designated pin.

When a programmable servo motor spins from 0 to 180 degrees, it simulates the open doors of a container holding fish food. This section contains the device's automatic feeding feature. The three pins on the servo motor are (1) Ground, (2) VCC, and (3) Digital Input. All three pins from the servo motor were utilized in the connection design of the Board for Arduino. Below is a schematic showing how the Servo Motor and Arduino are connected.

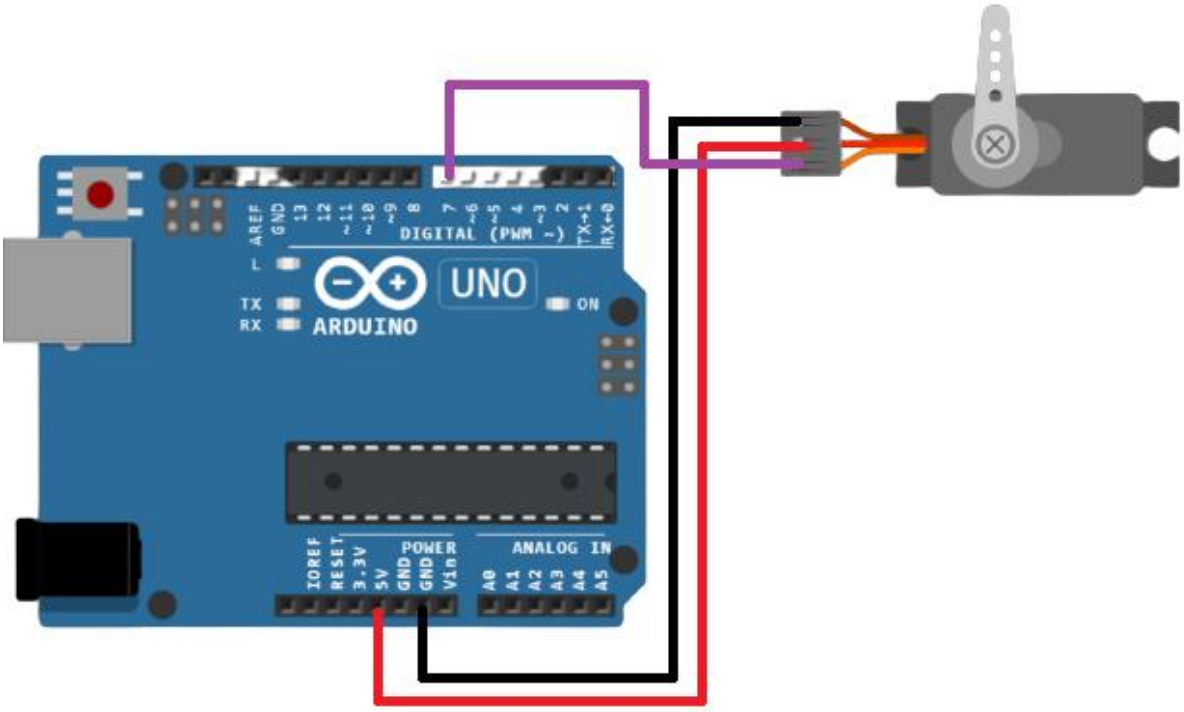


Figure 4.2. *The diagram of the connections from Arduino Uno to the programmable Servo Motor*

Servo Motor	Arduino Uno
PIN 1 (GND)	GND
PIN 2 (VCC)	5+
PIN 3 (DI)	PIN 7

Table 2. *The connections from Arduino Uno to the Servo Motor*

The pin connections between the Arduino Uno and the servo motor are shown in the figure and table. The servo motor is connected to the microcontroller through digital pin 7.

For instance. the researchers used an analog pin to read analog sensors – the Turbidity stance. The functionality of the general purpose input/output (GPIO) pins is also present on the analog pins. Sensors can take advantage of this functionality. Using the NTU level, this sensor determines the water quality, which may assist the program in determining the water quality so that it may carry out its preprogrammed purpose. The microcontroller is programmed with a Turbidity range of 10 to 25 NTU, which is appropriate for fisheries. The sensor will automatically filter and clean the water inside the aquarium if it detects that the turbidity or NTU of the water is above the range appropriate for fisheries. It is considered cloudy or unclean.

Below is a schematic showing the pin connections between the Arduino Uno Board, the Sensor Module, and the Turbidity Sensor.

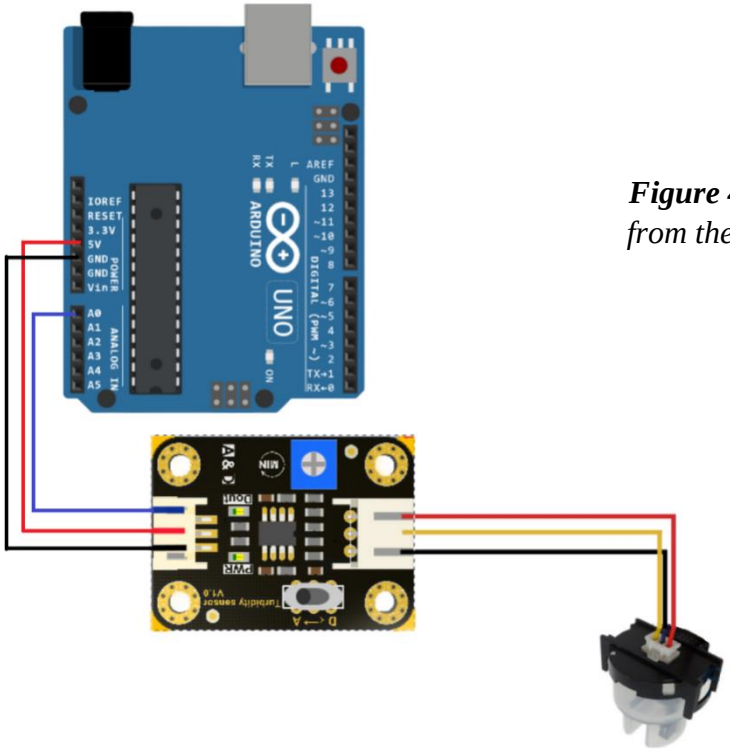


Figure 4.3. *The diagram of the connections from the Arduino Uno to the Sensor Module then Turbidity Sensor*

The picture and table above illustrate the pin connections for the Arduino Uno, Sensor Module, and Turbidity Sensor. The Turbidity Sensor's pins 1-3, GND, VCC, and Analog pin are used to link the module to the sensor, which is then connected to the Arduino Uno's Analog pin A0.

Sensor Module	**Arduino Uno**
PIN 1 (DI)	PIN A0
PIN 2 (VCC)	5+
PIN 3 (GND)	GND
Turbidity Sensor	**Sensor Module**
PIN 1	PIN 1 (VCC)
PIN 2	PIN 2 (DI)
PIN 3	PIN 3 (GND)
PIN 4	PIN 4 (AI)

Table 3. *The connections from the Arduino Uno to the Sensor Module then Turbidity Sensor*

The system will be filtered with the support of a pump by raising the water from the aquarium into the water inlet, then flowing to the three grids of the filter box that have their different foam and stones to strain the contaminated water, then recirculating into the aquarium tank. The first relay that is used for the water filter inside the aquarium is shown in the diagram.

The other relay is used for the pump's connection and power supply. This feature is only for the water changer mechanism. The pump will activate through the programmed tactile button when set to high. It can also be activated when the Turbidity Sensor senses that the water quality is already dirty, which also means that the water inside needs to be changed.

Below is a pin connection diagram from the Arduino Board to the two Relay Modules and three Submersible pumps.

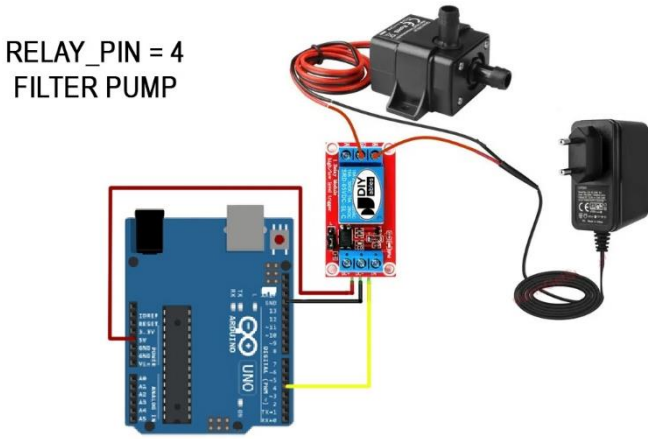


Figure 4.4. *The diagram of the connections from the Arduino Uno to the two Relay Module and three Submersible Pump*

Relay (1)	**Arduino Uno**
PIN 2 (GND)	GND
PIN 3 (DI)	PIN 4
Relay (2)	
PIN 2 (GND)	GND
PIN 3 (DI)	PIN 11
Submersible Pump (1)	**Relay (1)**
Wire (+)	PIN 1 (VCC)
Submersible Pump (2 & 3)	**Relay (2)**
Wire (+)	PIN 1 (VCC)

Table 4. *The connections from the Arduino Uno to the Relay Modules then Submersible Pump*

The figure and table above show the pin connections for the Arduino Uno, Relay Modules, and Submersible Pumps. The positive and negative wires of the pump are linked to the relay's VCC pin, while the positive wire is connected to the pump's power supply. The Arduino's GND pin is connected to the first relay's negative pin, and pin four is connected to the signal or pin of the relay. The second relay’s signal pin is connected to pin 11 of the microcontroller.

Fabrication and Prototype

Details, functionalities, and images of the finished item's real structural components were included. The researchers either took the images included here or properly cited internet images. The Automated Feeder, Filter, and Turbidity Sensor comprise the following structural components: automatic feeder's housing, filter, and circuit storage case. The aquarium is placed with all materials and parts attached. The feeder's box has a dimension of 0.42 ft. x 0.75 ft. It is also portable, removable, and simple to install in any kind of aquarium. Furthermore, affixed to the front of the case are the LCD and the buttons.

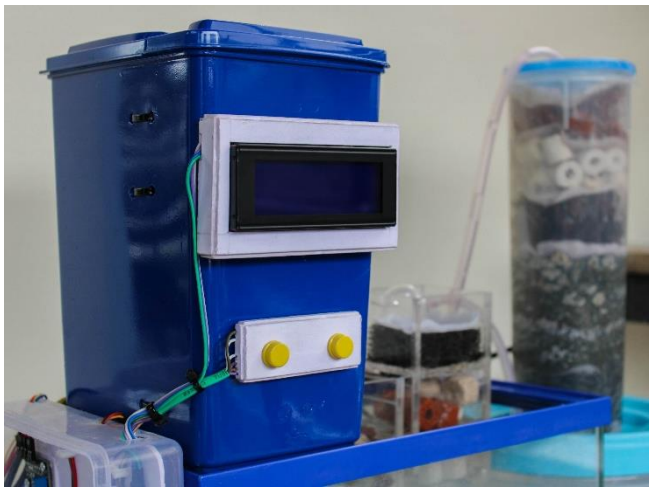


Figure 4.5. *The outside view or the front view of the fish feeder's actual prototype. The Servo is placed inside the container below the funnel*

Figure 4.6. *The inside view and top view of the fish feeder's actual prototype. The funnel is inside a cylinder canister. The servo motor stick with the feed thrower is below*

The feeder's housing, cylinder support canister, funnel, and feeds holder are all plastic. The cylinder support canister holds the device's first feature, which is the automatic fish feeder. It also includes a funnel inside to ensure it will not jam when the servo motor spins to open, and the fish food will be fed to the goldfish. The servo motor is placed below the funnel to receive the feeds as it spin from 0 to 180 degrees. The researchers applied blue spray-paint to represent the essence of fish and an aquarium.

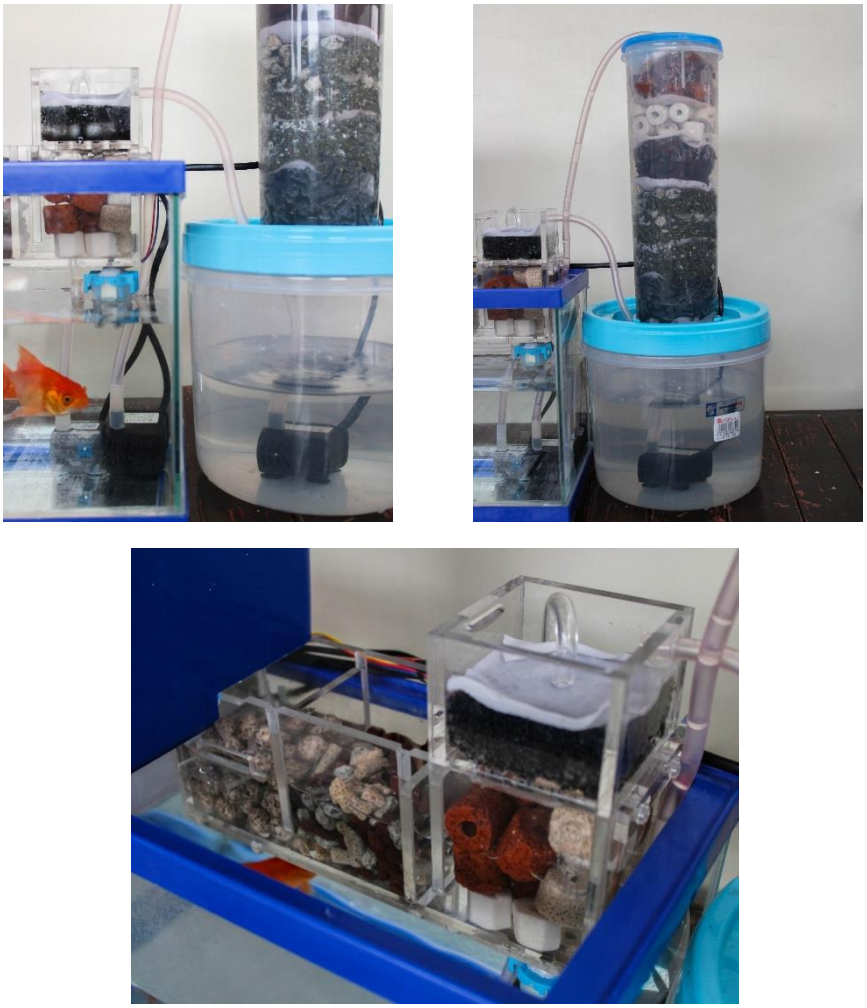


Figure 4.7. *The filter for the aquarium and the filter for water changer mechanism*

While the filter for the water changing mechanism is housed in a plastic container, the filter container at the top of the aquarium is fiber acrylic. Pumice, crushed lava, activated carbon, lava rings, and ceramic rings are used in the water-changing mechanism filter to help cleanse the water. Ceramic rings, lava rings, pepper balls, pumice, and foams are on the filter at the top of the aquarium.

The design approach for the Feeder and Filter monitoring system's LCD Display interface is shown below. The moving symbol screen that is related to the prototype was also created by the researchers.

Figure 4.8. *Images of actual interface of the LCD Display 20x4*

Figure 4.9. *Image of actual interface of the LCD Display with sensor turbidity and features count*

The Turbidity Sensor's NTU reading will appear on the screen next; it reads the water quality every 250 milliseconds and displays it on the LCD Display. Every time the feeder and filter activate, their counts are also shown on the screen. Each time the sensor detects that the water is unclean, the screen is reset, and water needs to be changed.

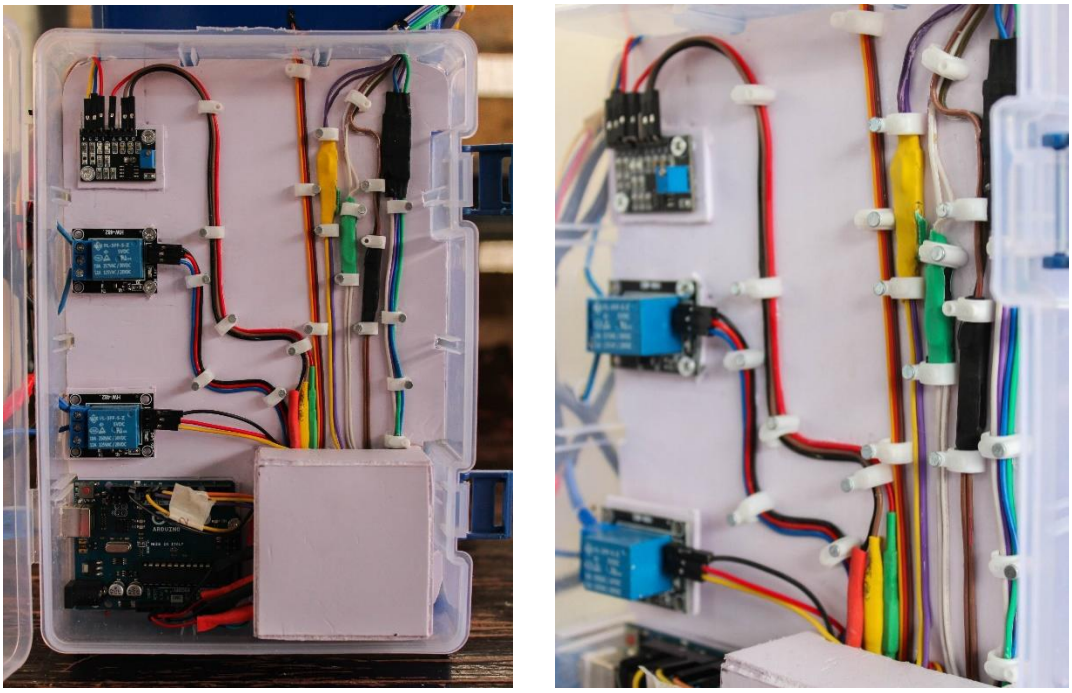


Figure 4.10. *Image of the actual wiring and circuit connections of the prototype*

The researchers utilized the Arduino kit as the prototype's circuit. To keep the circuits organized the researchers employed shrink to keep the organizable circuits' tubes, soldered identifying, and hooks. It also identifies the connection between various wires and the designated pins easier.

Creating the Program's Codes

Using the Arduino microcontroller board, the researchers could write software that would run on the device. The source code portion of the appendices contains examples of the produced codes. The researchers created all of the device's codes—from initialization to starting title, turbidity reading, feeder and filter counts, manual feeding and filtering, automation system timers, and system fusion.

The interface of Arduino software is seen below, the researchers used this software to program the microcontroller, and it is where the codes and libraries were installed.

Figure 4.11. *A print screen of the Arduino IDE Interfaxe*

Flowchart of the Program

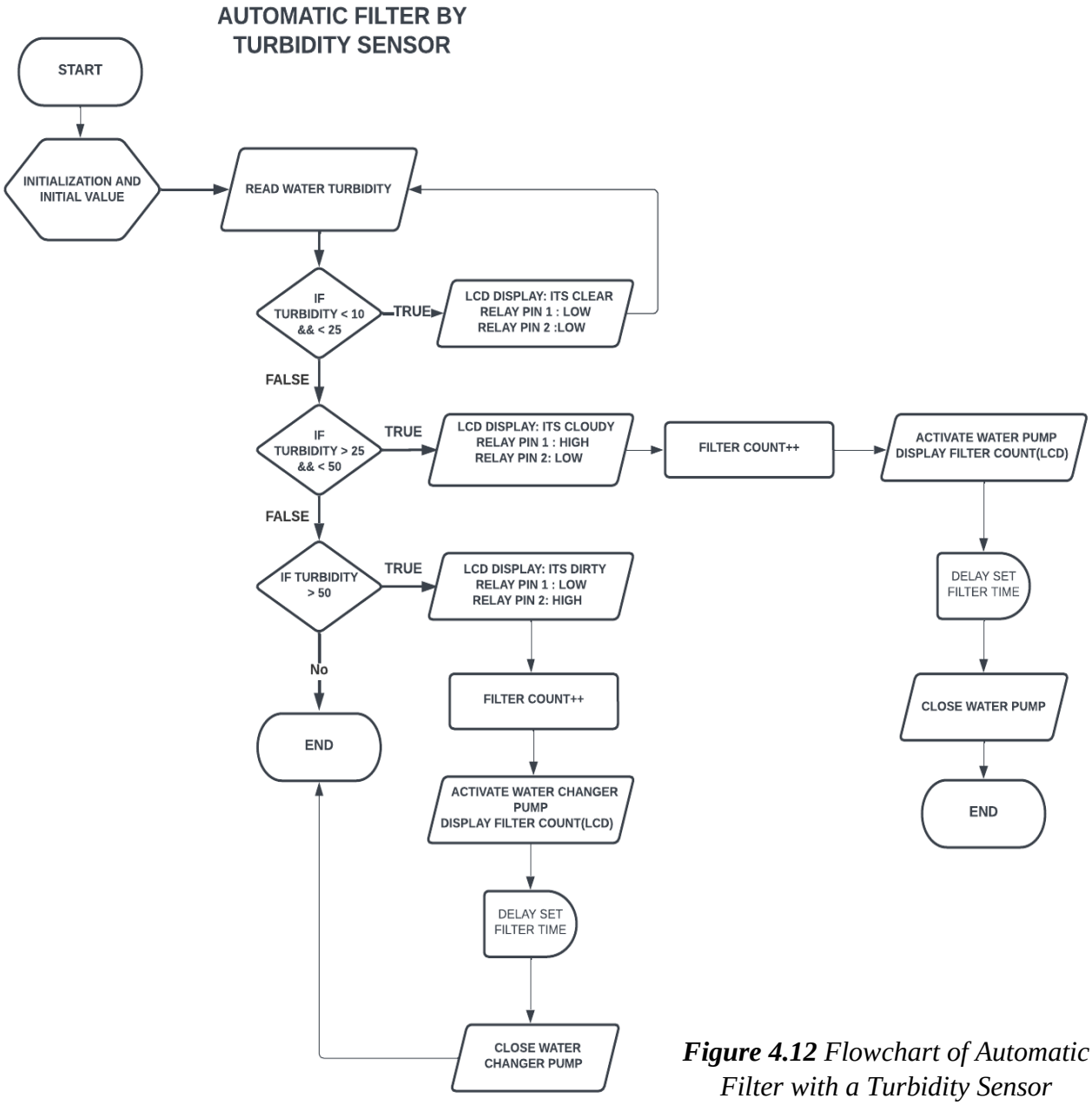


Figure 4.12 *Flowchart of Automatic Filter with a Turbidity Sensor*

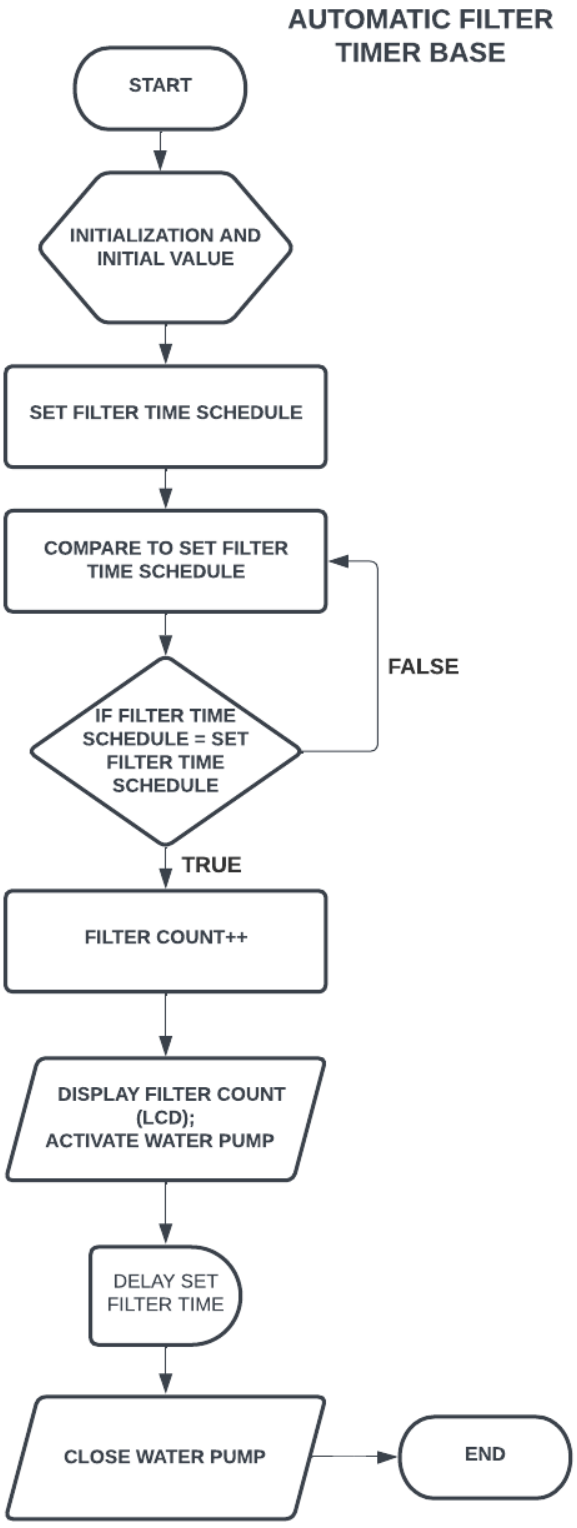


Figure 4.13 *Flowchart of Automatic Filter with a Timer*

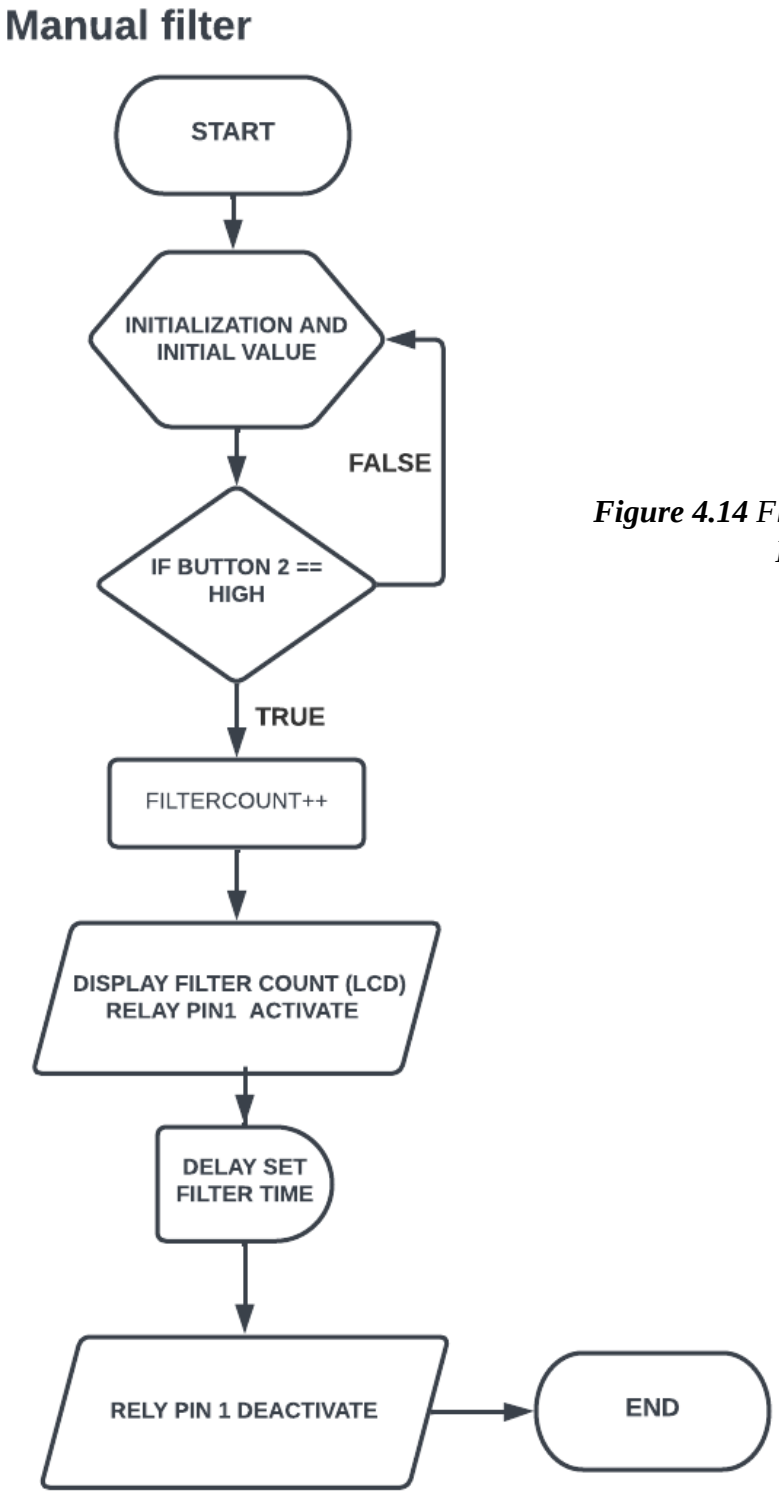


Figure 4.14 *Flowchart of Manual Filter*

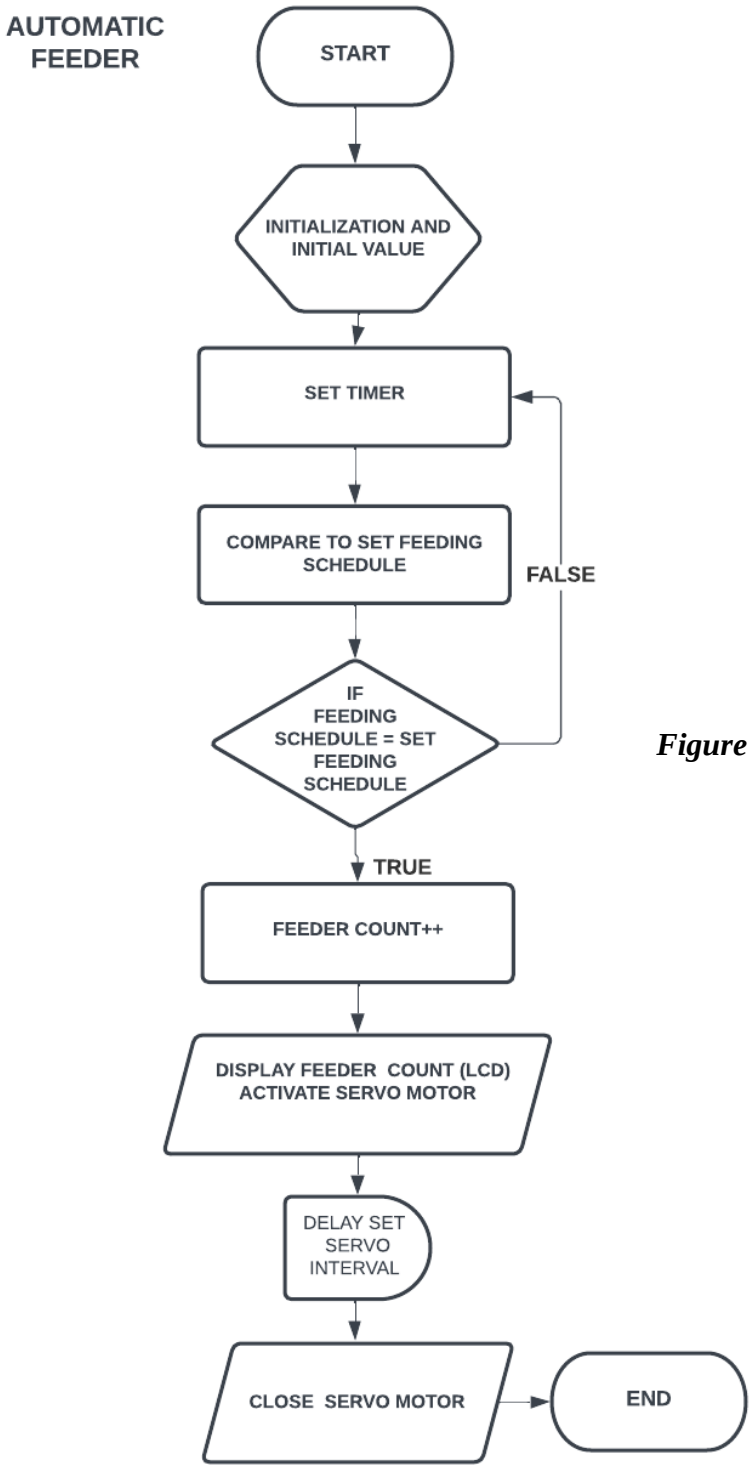


Figure 4.15 *Flowchart of Automatic Feeder*

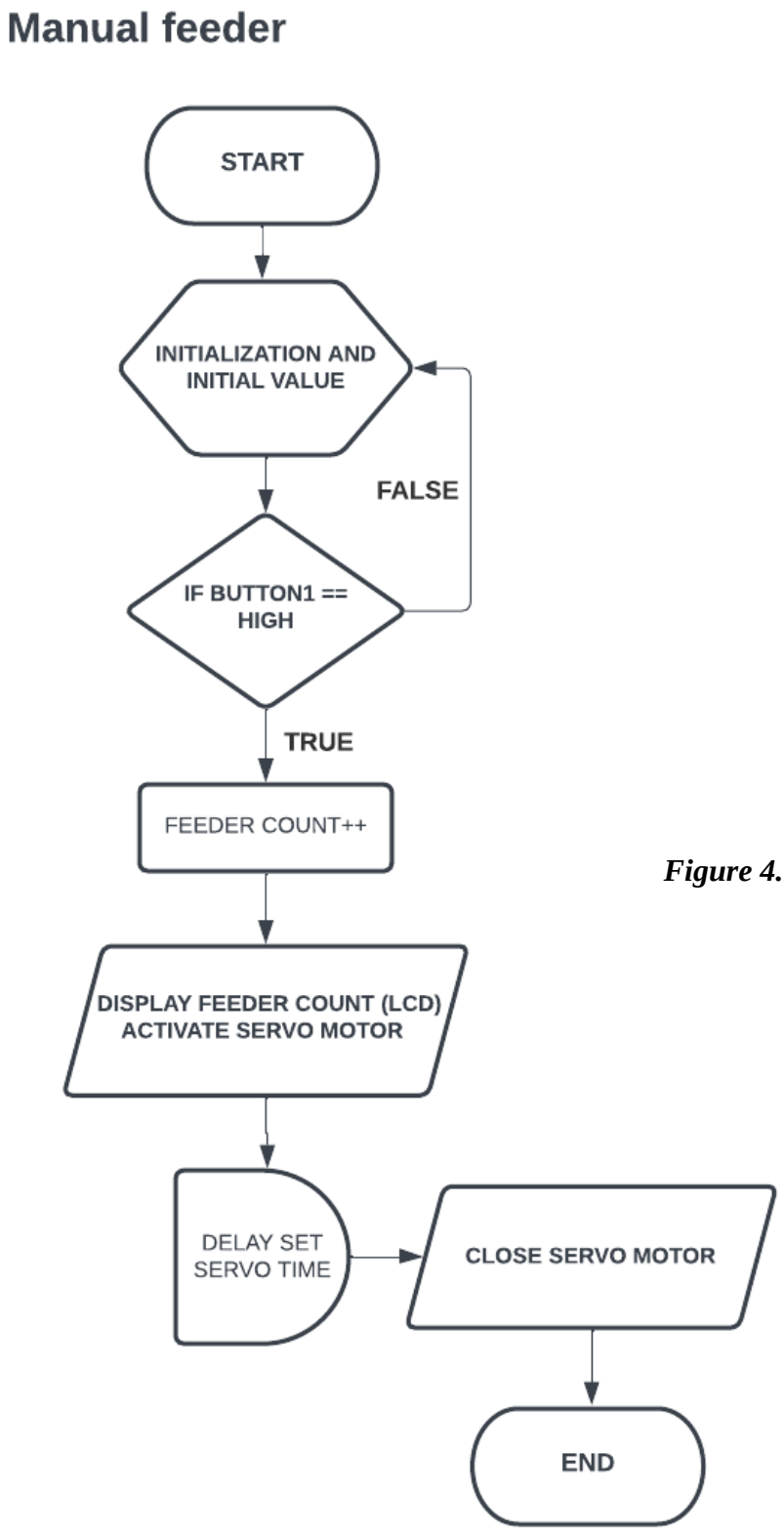


Figure 4.16 *Flowchart of Manual Feeder*

The researchers designed the flowchart to represent the entire process program, but only by its distinctive features. The system starts by turning on the Arduino Uno microcontroller. The LCD starts to initialize, and the automatic timer will also start if the screen shows the sensor reading based on NTU level as well as the feeder and filter counts.

The device can be operated directly by the user using a manual controller. It includes two tactile buttons for the manual feeder and the water change mechanism. When a user presses the feeder button, the program is redirected and the servo is operated to feed the fish. The second button controls the water changer, which activates two pumps to release water from the aquarium through the filter and into the container. The container's water will pour into the aquarium.

The Turbidity Sensor, on the other hand, has different roles. The sensor will automatically filter the water from the aquarium by turning on the first relay if the sensor detects a cloudy stage in the water quality that is higher than 25 NTU. If the sensor reads more than 50 NTU, the water is contaminated. With this, the second relay for the water changer mechanism will turn on, the two pumps will turn on, and the water in the container will change.

However, the LCD Screen's entire display will be immediately reset if the water level reaches the dirty level. When filter counts reach the maximum of 10, it indicates that it is time to change the water in both the aquarium and the container.

Results of Testing

The researchers conducted a several experimental tests and assessments. This procedure is carried out to en sure the data is accurate and consistent. These are the outcomes:

Goldfish Condition	Occurrence (Yes/No)	Days occurred since the device is used
1. Improvement in goldfish condition	Yes	36 days
2. The Goldfish suffer medical issues	No	36 days
3. The Goldfish dies	No	36 days

***Table 5**. Conditions of Goldfish*

The fish was purchased on March 24, 2023, and since then, even if there is only one within the tank, it is cheerful and active, and the condition of the fish has improved. The goldfish has not died or shown any signs of illness.

Figure 4.17. *The goldfish weight*

According to expert goldfish breeder John Parker, a standard fancy goldfish should consume around 2% of its body weight daily. A small 20-gram fish would need 2% of its weight, or 0.4 grams throughout the day. The goldfish purchased by the researchers weighs 20 grams. This is considered to give the fish a specific amount of food.

Water Quality	Occurrence (Yes/No)	Days occurred since the device is used
1. The water becomes cloudy	Yes	1day

Table 6*. Water Quality*

Figure 4.18. *Cloudy water*

This table illustrates the water quality; the fish waste and feeding cause the water to become murky or cloudy. The figure proves that the water becomes cloudy.

Function	Result
The pump activates when the turbidity sensor reaches 25 above in the NTU level	True, the pump used for the filter activates when turbidity level is 25 NTU or above.
The pump deactivates when the turbidity sensor reaches the desired minimum turbidity level	True, the pump disables when the predetermined running time has elapsed. The sensor will then determine if the water is clear or not to assess whether or not the pump should activate once more.

Table 7. *Turbidity Sensor and Pump Connection*

Figure 4.19. *Activation of filter using pump when coudy*

The outcomes of testing the connection between the turbidity sensor and the pump are displayed in the table above. The turbidity sensor must detect that the water is above the specified NTU threshold, which is number 25 according to the fisheries water quality measurement, before the pump should automatically activate. After the specified running period, the pump will not shut off once the turbidity sensor detects clear water.

When the turbidity sensor detects that the water is cloudy or the NTU level is above 25 NTU, the controller will receive the signal from the turbidity sensor and activates the pump. The water is then circulated by the pump and passed through the filter. The controller turns off the pump once the NTU level goes below 25.

Components	Activate on the set time (Yes/No)
Pump	Yes
Servo Motor	Yes

Table 8. *System Timer Function*

The table above displays the status of the pump and servo motor's system timer. The outcome demonstrates that when the required time is reached, the pump and servo motor activate or operate.

Function	Result
The time it takes to clean the water	45 minutes
The time it takes to change water from the container	25 minutes (with a delay, each pump requires 50 minutes)
The number of days the filter from the aquarium can stay clean	20 to 30 days

Table 9. *Water Filter and Water Changer*

The water filter takes 45 minutes to clean the water inside the aquarium. It uses a water filter with three grids, foams, and cloth. However, the filter cloth usually takes two weeks to change because the food taints the cloth's color. The water changer filter typically runs for 25 minutes. However, the researchers employed a 1-minute interval between each minute of filter run-time to avoid an aquarium and filter overflow. The filter from the can be cleaned twice a month. The water changer's filter can last three months without being cleaned, because it is not frequently used.

CHAPTER V

Summary, Conclusions, and Recommendations

Summary of Findings

The researchers completed the proposed course of study, combining an automatic filter, feeder, manual filter, and manual feeder into one device. Similarly, the researchers did several tests and trials to demonstrate the effectiveness and operation of the device.

Developing and Designing the Device

The researchers created various modules as they created the device to accommodate all of the prototype's components. Using a boxed-style container, the researchers developed a fish feeder to maintain the daily food intake of fish. However, the researchers found that the container did not fill the thrower and that some feeds were lodged in the corners. The researchers modified the feeder container during this evaluation and used a cylinder. The canister is efficient since it flows inside the funnel into the feed's thrower. The thrower does not fit into the funnel's tube during the servo motor testing. Therefore, the researchers embellished and refined the funnel's half tube to fit into the thrower's sphere opening.

Throughout the filter feature testing phase, the researchers found out that the initially installed filter purchased did not clean the water inside the aquarium. After a couple of tests, this proved that the existing filters need cleaner and only require a little water. Therefore, the researchers decided to purchase a new set of filters for the water filter within the aquarium and the water changer mechanism. However, the researchers used various stones, foams, sand, and an acrylic container with three grids this time.

Fabrication of the Prototype

In fabricating the device, the housing of the prototype and the arrangement of parts are in mind. The researchers used plastic containers to create the housing of each features and for the circuit. Creating the housing took little time because the researchers brought the containers, then fixed, positioned, and set them out to secure the firmness of every circuit and other devices or infrastructures.

The researchers' first study and test the prototype's proper setup for the flow of its function. They used a glass aquarium, acrylic for its small filter, and a tall round-type container for its main water filter/changer. There are failed tools they used in making the device, specifically on its sizes, but they still made some adjustments for better results. The researchers also correctly measure the container sizes they could use and fit in their aquarium. In building the prototype, they had a lot of time and effort to properly build our device which can be used in every aquarium.

Creation of Program

The design and development of the prototype was the most challenging step. However, the researchers spent their time creating the codes. Each device's code is created separately before being integrated into a single program. The project continued to advance due to changing and updating the programs using the Arduino IDE. With this, the devices may also be identified as to whether they are functioning. Even when the codes do not match or are not executed as the researchers envision, everything still functions and is set up following the program that has-been specified.

The researchers have spent much time developing and updating the codes for each unique device but undoubtedly encountered other difficulties in designing and developing the prototype beyond just the programming component. For instance, the researchers carefully selected the parts and supplies to ensure they were compatible and met the project's requirements.

The researchers also need help physically assembling the prototype, including trying to fit all the pieces together efficiently. The development of the prototype hasbeen hampered by the researchers' budgetary or time restrictions in addition to these technical difficulties. Due to limited resources, they had to prioritize some features or parts of the prototype above others or work under pressure to finish the project on time.

Overall, it is likely that the researchers encountered several difficulties in completing the prototype, even if writing the codes for the separate devices was undoubtedly a big part of the prototype development process.

Results and Evaluation of Testing

The researchers created parameters throughout the prototype's evaluation and testing phase to determine whether the prototype has attained the particular goals specified in the first section. The testing period requires two trials for each parameter to obtain unbiased results. To determine whether the timer is accurate based on the scheduled time, the researchers put a specific amount of time in the first parameter. The outcome demonstrated that the microprocessor's initial start-up time coincided with the designated time. The second parameter that the researchers tested was whether the filter and feeder system of the prototype turned off after the program ran. The outcome demonstrated that after the feeder spins, the servo likewise turns off, and after the filter runs, the pump turn off.

The relay pump and servo motor operate at their scheduled intervals without delay. They switch on and off following the program. The third test was conducted to determine whether the turbidity sensor reliably transmits the water quality. The findings demonstrated that the turbidity sensor determines whether the water is clear, cloudy, or dirty by determining the NTU level. The following testing was done to see if the tactile button matches the manual feeder and filter used in the program. The manual feeder and filter selections are made and put to the test. The outcomes demonstrated the effectiveness of both choices. The final parameter examined the water changer mechanism was created by the researchers. Using two pumps, the researchers investigated the water's recirculation. After passing through the filter and reaching the reserve container, the aquarium water will be poured back into it.

The outcome demonstrates that the water recirculation system is functioning and does not overflow. The prototype was then tested to determine its overall and systemic functionality.

Conclusions

The study aimed to create an automatic goldfish feeder with a water-changer mechanism using an Arduino UNO and evaluate its effectiveness.

Based on the research findings, the developed device can improve the care and maintenance of goldfish aquariums. The fact that the feeder and filter pumps can be controlled manually or according to a predetermined schedule, gives the user flexibility and convenience. The programmable turbidity sensor ensures that the water quality is maintained in the desired range, improving the health and well-being of the goldfish.

The fish feeder, which releases a measured amount of feed daily, prevents overfeeding and minimizes waste. The water changer mechanism, which uses a recirculating system, helps preserve water and decrease the need for frequent water changes.

The device's effectiveness was assessed by determining whether it operates according to the prescribed schedule or time. The results indicate that the device is reliable and functions as intended.

In conclusion, creating an automatic goldfish feeder with a water-changer mechanism using an Arduino Uno is an innovative idea with the potential to enhance the quality of life for both goldfish and their owners. Further research and development could lead to an even more advanced and effective automated aquarium maintenance system.

Recommendations

For further development of the device, the following recommendations are suggested:

- The device might work well for a particular kind of fish, but it might not be appropriate for fish with different needs. Fish species have different feeding behaviors and may need particular foods or feeding times. Furthermore, the temperature and water quality requirements may differ among fish species. As a result, it would be more effective if the device could recognize and modify different measurements for different kinds of fish. This could be accomplished by including machine learning algorithms that can recognize and adjust each fish species' unique traits and behaviors.
- Although the current prototype can operate manually and automatically, it must be checked regularly to ensure the content works correctly. Users may find this time-consuming and inconvenient, especially if they have several devices to monitor. It is advised to upgrade the device by adding a wireless connection to support additional gadgets like smartphones and tablets to solve this problem.

This would allow users to remotely monitor the device and receive notifications or alerts when it requires attention or maintenance.

- It is suggested to create programs that enable users to use voice prompts to control the device's operation in order to boost the convenience and accessibility of the device. With the integration of voice recognition technology, users would no longer have to click the device physically, as they could use voice commands to operate it. This would increase the device‘s usability, especially for those with physical limitations or disabilities preventing them from clicking or manipulating.
- When designing automatic fish feeder and water changer mechanisms, it is essential to consider the other parameters that need to be controlled to maintain a healthy and optimal environment for fish. In addition to feeding and changing the water, temperature, and oxygen levels should be monitored and adjusted as needed. For instance, fish's metabolism and growth depend highly on temperature, and changes outside that range can lead to stress and disease. Furthermore, fish's healthy respiration and metabolic processes depend on oxygen levels. By integrating sensors and automated mechanisms to monitor and control these parameters, automatic fish feeders and water changers can provide a more comprehensive and effective solution for maintaining a healthy and thriving aquatic environment. By controlling these additional parameters, researchers can obtain more accurate and reliable results, leading to better scientific understanding and technological advancements in various fields.

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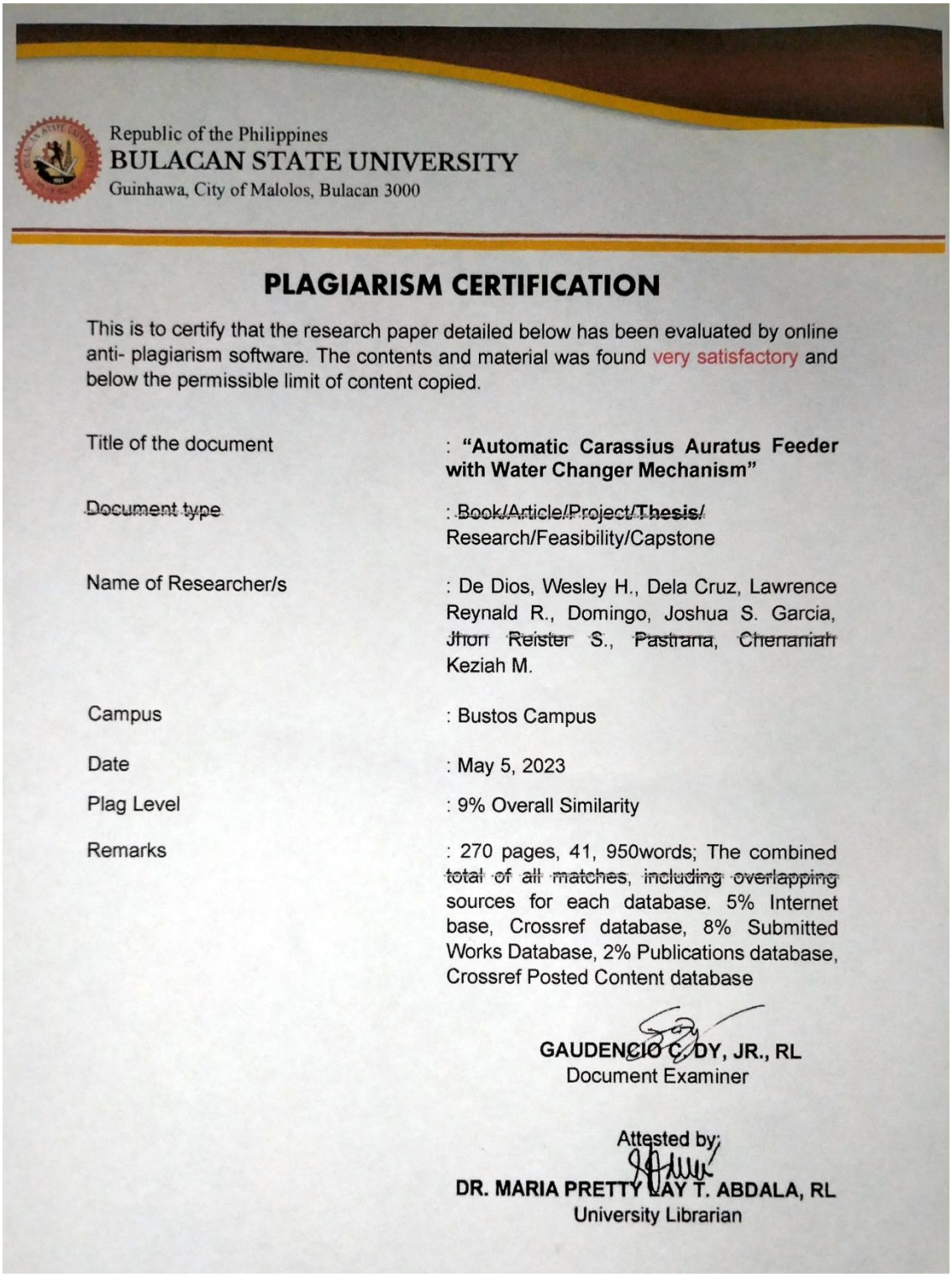
APPENDICES

APPENDIX A. Plagiarism Certificate



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Garcia, Jhon Reister S. 05-15-23

Pastrana, Chenaniah Keziah M. 05-15-23

APPENDIX C. Program Source Code

```
#include <Servo.h> //servo motor lib
#include <LiquidCrystal_I2C.h> //lcd i2c lib
#include <SimpleTimer.h>

#define FIVE_SEC 5000UL
#define ONE_MIN 60000UL
#define THREE_MIN 180000UL
#define FIVE_MIN 300000UL
#define SIX_MIN 360000UL
#define TEN_MIN 600000UL
#define FIFTEEN_MIN 900000UL
#define THIRTY_MIN 1800000UL
#define ONE_HR 3600000UL
#define FOURFIVE_MIN 2700000UL
#define TWELVE_HRS 43200000UL
#define TWENTYFOUR_HRS 86400000UL

Servo myservo; // create servo object to control a servo
LiquidCrystal_I2C lcd = LiquidCrystal_I2C(0x27, 20, 4);
SimpleTimer timer;

intbuttonPin = 9;// servo button yellow
int buttonPin2 = 10;// filter button violet
constint pump = 2;
constint RELAY_PIN = 4;
constint RELAY_BAGO = 11;
```

```
intsensorPin = A0; // turbidity pin

intbuttonState = 0; // variable to store button state
int buttonState2 = 0;
intfeeder_count = 0;
intfilter_count = 0;

unsigned long last_feeder_time = 0;
unsigned long last_filter_time = 0;

unsigned long current_time;

//symbol only
bytetailup[8] = {
  B00000,
  B00000,
  B00000,
  B11100,
  B10010,
  B01001,
  B00100,
  B00100
};

bytetaildwn[8] = {
  B00100,
  B00100,
  B01001,
```

```
  B01110,
  B00000,
  B00000,
  B00000,
  B00000
};

byte bodyup1[8] = {
  B00000,
  B00000,
  B00001,
  B00001,
  B00010,
  B01100,
  B10000,
  B00000
};

byte bodydwn1[8] = {
  B00000,
  B11100,
  B00011,
  B00000,
  B00000,
  B00000,
  B00000,
  B00000
};
```

```
byte bodyup2[8] = {
  B00000,
  B00000,
  B11100,
  B00011,
  B00000,
  B00000,
  B00000,
  B00000
};

byte bodydwn2[8] = {
  B00100,
  B01000,
  B01001,
  B11011,
  B01110,
  B00000,
  B00000,
  B00000
};

bytefaceup[8] = {
  B00100,
  B00001,
  B00010,
  B00001,
```

```
  B10010,
  B01001,
  B10101,
  B10010
};

bytefacedwn[8] = {
  B00010,
  B00010,
  B01100,
  B10000,
  B00000,
  B00000,
  B00000,
  B00000
};

inttiempo = 400;

void setup() {
Serial.begin(9600); // initialize Serial communication
myservo.attach(7); // attaches the servo on pin 7 to the servo object
pinMode(buttonPin, INPUT); // set button pin as input
pinMode(buttonPin2, INPUT);
pinMode(RELAY_PIN, OUTPUT);
pinMode(pump, OUTPUT);
pinMode(RELAY_BAGO, OUTPUT);
myservo.write(0); // rotate servo back to 0 degrees
```

```
lcd.setBacklight(HIGH);// Turn on the backlight
lcd.begin(16,4);

  //symbol
lcd.createChar(0, tailup);
lcd.createChar(1, taildwn);
lcd.createChar(2, bodyup1);
lcd.createChar(3, bodydwn1);
lcd.createChar(4, bodyup2);
lcd.createChar(5, bodydwn2);
lcd.createChar(6, faceup);
lcd.createChar(7, facedwn);
isda();
fish();
lcd.setCursor(2,2);
lcd.print("AQUA- MONITORING");
lcd.setCursor(7,3);
lcd.print("SYSTEM");
delay(5000);
lcd.clear();
fish();
lcd.setCursor(2,2);
lcd.print("THESIS - PR0JECT");
lcd.setCursor(5,3);
lcd.print("GROUP #ONE");
delay(5000);
lcd.clear();
digitalWrite(RELAY_BAGO, LOW);
```

```
}

void loop() {
intsensorValue = analogRead(sensorPin);
Serial.println(sensorValue);
int turbidity = map(sensorValue, 0, 640, 100, 0);
unsigned long current_time = millis();
delay(100);

if (turbidity < 10) {
delay(250);
lcd.setCursor(0, 0);
lcd.print("Turbidity: ");
lcd.setCursor(5, 1);
lcd.print("it's CLEAR ");
lcd.setCursor(0, 2);
lcd.print("Feeder Count: ");
lcd.setCursor(13, 2);
lcd.print(feeder_count);
lcd.setCursor(0, 3);
lcd.print("Filter Count: ");
lcd.setCursor(13, 3);
lcd.print(filter_count);
lcd.setCursor(11, 0);
lcd.print(turbidity);
  }

  //nTU less than 25 = clean water
```

```
if (turbidity < 25) {
delay(250);
lcd.setCursor(0, 0);
lcd.print("Turbidity: ");
lcd.setCursor(5, 1);
lcd.print("it's CLEAR ");
lcd.setCursor(0, 2);
lcd.print("Feeder Count: ");
lcd.setCursor(13, 2);
lcd.print(feeder_count);
lcd.setCursor(0, 3);
lcd.print("Filter Count: ");
lcd.setCursor(13, 3);
lcd.print(filter_count);
lcd.setCursor(11, 0);
lcd.print(turbidity);
  }
if ((turbidity > 25) && (turbidity < 50)) {
delay(250);
lcd.setCursor(0, 0);
lcd.print("Turbidity: ");
lcd.setCursor(11, 0);
lcd.print(turbidity);
lcd.setCursor(5, 1);
lcd.print("it's CLOUDY");
Serial.println("Automatic filter activated!");
filter_count++;
digitalWrite(pump, HIGH);
```

```
digitalWrite(RELAY_PIN, HIGH);
lcd.setCursor(0, 2);
lcd.print("Feeder Count: ");
lcd.setCursor(13, 2);
lcd.print(feeder_count);
lcd.setCursor(0, 3);
lcd.print("Filter Count: ");
lcd.setCursor(13, 3);
lcd.print(filter_count);
Serial.println("Automatic filter off");
Serial.println(filter_count);
delay(2700000); //45mins=2700000
digitalWrite(pump, LOW);
digitalWrite(RELAY_PIN, LOW);
delay(3000);
last_filter_time = current_time; //reset time
  }
if (turbidity > 50) {
delay(250);
lcd.clear();
lcd.setCursor(0, 0);
lcd.print("Turbidity: ");
lcd.setCursor(11, 0);
lcd.print(turbidity);
lcd.setCursor(5, 1);
lcd.print("it's DIRTY");
Serial.println("Automatic filter activated!");
filter_count++;
```

```
lcd.setCursor(0, 2);
lcd.print("Feeder Count: ");
lcd.setCursor(13, 2);
lcd.print(feeder_count);
lcd.setCursor(0, 3);
lcd.print("Filter Count: ");
lcd.setCursor(13, 3);
lcd.print(filter_count);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
```

```
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
```

```
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
```

```
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
```

```
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
```

```
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
Serial.println("Automatic filter off");
Serial.println(filter_count);
delay(3000);
last_filter_time = current_time; //reset time
  }

  // Automatic feeder activation every 12hrs
if (current_time - last_feeder_time>= TWELVE_HRS) {
myservo.write(180);
Serial.println("Automatic feeder activated!");
```

```
feeder_count++;
lcd.setCursor(0, 2);
lcd.print("Feeder Count: ");
lcd.setCursor(13, 2);
lcd.print(feeder_count);
lcd.setCursor(0, 3);
lcd.print("Filter Count: ");
lcd.setCursor(13, 3);
lcd.print(filter_count);
delay(5000);
myservo.write(0);
Serial.println("Automatic feeder, off");
Serial.println(feeder_count);
last_feeder_time = current_time; //reset time
  }

  // Automatic filter activation every 24 hrs
if (current_time - last_filter_time>= TWENTYFOUR_HRS) {
Serial.println("Automatic filter activated!");
filter_count++;
digitalWrite(pump, HIGH);
digitalWrite(RELAY_PIN, HIGH);
lcd.setCursor(0, 2);
lcd.print("Feeder Count: ");
lcd.setCursor(13, 2);
lcd.print(feeder_count);
lcd.setCursor(0, 3);
lcd.print("Filter Count: ");
```

```
lcd.setCursor(13, 3);
lcd.print(filter_count);
Serial.println("Automatic filter off");
Serial.println(filter_count);
delay(2700000); //45mins=2700000
digitalWrite(pump, LOW);
digitalWrite(RELAY_PIN, LOW);
delay(3000);
last_filter_time = current_time; //reset time
  }

  // Manual feeder and filter activation
manual_feeder();
manual_filter();
}

voidmanual_feeder() {
buttonState = digitalRead(buttonPin); // read button state
if (buttonState == HIGH) { // check if button is pressed
myservo.write(180); // rotate servo to 180 degrees
Serial.println("Servo activated!"); // print message to Serial Monitor
Serial.println("feeder on");
feeder_count++;
lcd.setCursor(0, 2);
lcd.print("Feeder Count: ");
lcd.setCursor(13, 2);
lcd.print(feeder_count);
lcd.setCursor(0, 3);
```

```
lcd.print("Filter Count: ");
lcd.setCursor(13, 3);
lcd.print(filter_count);
delay(5000); // wait for 5 seconds
myservo.write(0); // rotate servo back to 0 degrees
Serial.println("feeder off");
Serial.println(feeder_count);
last_feeder_time = current_time; //reset time
  }
}
voidmanual_filter() {
  buttonState2 = digitalRead(buttonPin2); // read button state
if (buttonState2 == HIGH) {
Serial.println("filter activated!"); // print message to Serial Monitor
Serial.println("filter pump on");
filter_count++;
lcd.setCursor(0, 2);
lcd.print("Feeder Count: ");
lcd.setCursor(13, 2);
lcd.print(feeder_count);
lcd.setCursor(0, 3);
lcd.print("Filter Count: ");
lcd.setCursor(13, 3);
lcd.print(filter_count);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
```

```
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
```

```
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
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digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
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digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
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digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
```

```
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
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digitalWrite(pump, LOW);
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delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
```

```
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
```

```
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
```

```
digitalWrite(pump, HIGH);
digitalWrite(RELAY_BAGO, HIGH);
delay(60000);
digitalWrite(pump, LOW);
digitalWrite(RELAY_BAGO, LOW);
delay(60000);
Serial.println("filter off");
Serial.println(filter_count);
delay(3000); // Wait for 5 seconds
last_filter_time = current_time; //reset time
  }
}

voidisda(){
for (int a=0; a<=39; a++){
if(a>=3){
lcd.setCursor(a-3,0);
lcd.write(0);
   }
if(a>=2){
lcd.setCursor(a-2,0);
lcd.write(2);
   }
if(a>=1){
lcd.setCursor(a-1,0);
lcd.write(4);
   }
lcd.setCursor(a,0);
```

```
lcd.write(6);

if(a>=3){
lcd.setCursor(a-3,1);
lcd.write(1);
   }
if(a>=2){
lcd.setCursor(a-2,1);
lcd.write(3);
   }
if(a>=1){
lcd.setCursor(a-1,1);
lcd.write(5);
   }
lcd.setCursor(a,1);
lcd.write(7);

delay(tiempo);
lcd.clear();
  }
}

void fish(){
lcd.setCursor(8,0);
lcd.write(byte(0));
lcd.setCursor(8,1);
lcd.write(byte(1));
lcd.setCursor(9,0);
```

```
lcd.write(byte(2));
lcd.setCursor(9,1);
lcd.write(byte(3));
lcd.setCursor(10,0);
lcd.write(byte(4));
lcd.setCursor(10,1);
lcd.write(byte(5));
lcd.setCursor(11,0);
lcd.write(byte(6));
lcd.setCursor(11,1);
lcd.write(byte(7));
}

voidichadirty(){
lcd.setCursor(0,0);
lcd.print("####################");
lcd.setCursor(0,1);
lcd.print("# NTU Level: HIGH! #");
lcd.setCursor(0,2);
lcd.print("#   Water Changed   #");
lcd.setCursor(0,3);
lcd.print("####################");
delay(7000);
lcd.clear();
}
```

APPENDIX D. Costing

	Material	No. of pieces	Price	Total
01	**Arduino Kit**	1	1200	1200
02	**Aquarium**	1	700	700
03	**20x4 LCD Display I2C**	1	279	279
04	**Turbidity Sensor**	2	699	1398
05	**Submersible Pump**	3	250	750
06	**Acrylic Filter with Stone Filter**	1	570	570
07	**Vinyl Tube**	1	100	100
08	**Sintra Board**	1	115	115
09	**Fish pellets**	2	119	238
10	**Feeder Box**	1	75	115
11	**Feeder Reservoir**	1	35	35
12	**Feeder Wheel**	1	12	12
13	**Water Changer Filter**	1	49	49
14	**Water Reservoir**	1	75	75
15	**Jumping Wires (M-M)**	20	3.25	65
16	**Jumping Wires (F-M)**	20	3.25	65
17	**Jumping Wires (F-F)**	20	3.25	65
18	**Relay**	2	45	90

TOTAL: 5,568

APPENDIX E.
Curriculum Vitae

WESLEY H. DE DIOS

0945-887-5271
dedioswesley@gmail.com
286 Zone 4 Sto Nino, Baliwag, Bulacan

OBJECTIVE

To obtain an internship in electronics and communication field to gain experience, fully utilize my skills, and expand my knowledge as an engineering student in preparation for my future career.

EDUCATION

2019 - Current
COLLEGE
Bachelor of Science in Computer Engineering
Bulacan State University - Bustos Campus
Bustos, Bulacan

2017 - 2019
SENIOR HIGH SCHOOL
Strand STEM (Science, Technology, Engineering, and Mathematics)
Marian College of Baliuag
Gil Carlos St. Baliuag, Bulacan

TRAININGS, SEMINARS, CERTIFICATES AND AWARDS

**Not available*

SKILLS

- Communications Skills
- Computer Skills
- Leadership
- Attentiveness
- Professional Behavior

WORK EXPERIENCE

**Not available*

PERSONAL INFORMATION

- Birth Date: January 01, 2001
- Birth Place: Baliuag, Bulacan
- Gender: Male
- Civil Status: Single
- Citizenship: Filipino
- Religion: Roman Catholic

CHARACTER REFERENCE

MR DENNIS DE DIOS
0956-165-9660
Zone 2, Sto, Nino, Baliwag, Bulacan

ENGR. WENDY E. OLLERO
0976-111-9447
0153 Bulihan, Plaridel, Bulacan

JOSHUA S. DOMINGO

0919-866-8641
jdomingo091100@gmail.com
44 Ramon Magsaysay St. Tilapayong, Baiiwag, Bulacan

OBJECTIVE

To enhance my skills, knowledge and capabilities in the field of computer science while gaining practical experience for my future professional career.

EDUCATION

2019 - Current
COLLEGE
Bachelor of Science in Computer Engineering
Bulacan State University - Bustos Campus
Bustos, Bulacan

2017 - 2019
SENIOR HIGH SCHOOL
Baliuag University
Science, Technology, Engineering and Mathematics Graduated with Honors and best research awardee

TRAININGS, SEMINARS, CERTIFICATES AND AWARDS

Leadership Training Seminar
Bustos, Bulacan
2019s

SKILLS

- Creative and Analytical
- Computer Literate. Microsoft Office Applications
- Communication Skills
- Bilingual: Filipino & English

WORK EXPERIENCE

**Not available*

PERSONAL INFORMATION

- Birth Date: September 11, 2000
- Birth Place: Baliuag, Bulacan
- Gender: Male
- Civil Status: Single
- Citizenship: Filipino
- Religion: Romsn Catholic

CHARACTER REFERENCE

MR DENNIS DE DIOS
0956-165-9660
Zone 2, Sto, Nino, Baliwag, Bulacan

ENGR. WENDY E. OLLERO
0976-111-9447
0153 Bulihan, Plaridel, Bulacan

LAWRENCE REYNALD R. DELA CRUZ

0955-521-8569
lawrence10.dc@gmail.com
San Rafael, Bulacan

OBJECTIVE

To acquire the position of computer engineer, where I can put my technical and management skills to good use in accomplishing the organization's goals and producing the best results

EDUCATION

2019 - Current
COLLEGE
Bachelor of Science in Computer Engineering
Bulacan State University - Bustos Campus
Bustos, Bulacan

2017 - 2019
SENIOR HIGH SCHOOL
Strand STEM (Science, Technology, Engineering, and Mathematics)
Baliuag University
Baliwag, Bulacan

TRAININGS, SEMINARS, CERTIFICATES AND AWARDS

Webinar. Effective Internship and Orientation of ICT Proficiency
Department of Information and Communication Technology (DICT) - May 12, 2022

SKILLS

- Photo Editing
- Time Management
- Problem Solving
- Programming (Java, c++,Python, HTML)
- Computer Literate (Microsoft Office Application)

WORK EXPERIENCE

Freelance Graphic Designer
- Complete a lot of project base work with various company
- Duration: 2019-2022

Sales Clerk
- 2LR Motorcycle parts nd maintenance
- Duration: 2021-2022

PERSONAL INFORMATION

- Birth Date: October 10, 2000
- Birth Place: Baliwag, Bulacan
- Gender: Male
- Civil Status: Single
- Citizenship: Filipino
- Religion: Roman Catholic

CHARACTER REFERENCE

ENGR. JANUARIUS CRUZ
0926-893-8556
#42Venus St. San Felipe Mojon Malolos City

ENGR. WENDY E. OLLERO
0976-111-9447
0153 Bulihan, Plaridel, Bulacan

JHON REISTER S. GARCIA

0966-993-0310
jhonreister.garcia.26@gmail.com
0375 Purok IV Liciada Bustos, Bulacan

OBJECTIVE

To practice my profession in a reputable company where I can continue to develop and enhance my hands-on skill and knowledge.

EDUCATION

2019 - Current
COLLEGE
Bachelor of Science in Computer Engineering
Bulacan State University - Bustos Campus
Bustos, Bulacan

2017 - 2019
SENIOR HIGH SCHOOL
Strand STEM (Science, Technology, Engineering, and Mathematics)
Baliuag University
Baliwag, Bulacan

TRAININGS, SEMINARS, CERTIFICATES AND AWARDS

**Not available*

SKILLS

- Creative and Analytical
- Computer Literate. Microsoft Office Applications
- Bilingual: Filipino & English

WORK EXPERIENCE

**Not available*

PERSONAL INFORMATION

- Birth Date: September 26, 1999
- Birth Place: Bustos, Bulacan
- Gender: Male
- Civil Status: Single
- Citizenship: Filipino
- Religion: Roman Catholic

CHARACTER REFERENCE

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#42Venus St. San Felipe Mojon Malolos City

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0153 Bulihan, Plaridel, Bulacan

CHENANIAH KEZIAH M. PASTRANA

0961-112-7507
chenaniahkeziah11@gmail.com
Blk 1 Lot 30 Cedarville Townhomes, Sabang Baliuag, Bulacan

OBJECTIVE

Looking for a suitable role where I can put my technical, and administrative abilities to good use while also learning about new and emerging IT trends.

EDUCATION

2019 - Current **COLLEGE**
Bachelor of Science in Computer Engineering
Bulacan State University - Bustos Campus
Bustos, Bulacan

2017 - 2019 **SENIOR HIGH SCHOOL**
Strand STEM (Science, Technology, Engineering, and Mathematics)
Jesus Is Lord Colleges Foundation Inc
101 Bocaue, Bulacan

TRAININGS, SEMINARS, CERTIFICATES AND AWARDS

Award. Huawei Certified Specialist Associate (HCSA) Storage
Huawei Technologies Co. - October 10, 2021

Award. Gold Gear Award
Dean's List Awardee - 2022

Webinar. Light TV Media Mission Conference
November 15, 2020

Webinar. Effective Internship and Orientation of ICT Proficiency
Department of Information and Communication Technology (DICT) - May 12, 2022

SKILLS

- Creative and Analytical
- Computer Literate. Microsoft Office Applications
- Programming. Java, C, C++, Python, MySQL
- Photo & Video Editing
- Problem Solving
- Bilingual: Filipino & English

WORK EXPERIENCE

Position: Staff Crew

Fast food: Jollibee junction

- Duration: July 7 – October 19, 2019
- Company: Occuhub Staffing Services – Baliuag, Bulacan

PERSONAL INFORMATION

- Birth Date: November 28, 2000
- Birth Place: Malolos, Bulacan
- Gender: Female
- Civil Status: Single
- Citizenship: Filipino
- Religion: Born Again Christian

CHARACTER REFERENCE

ENGR. EDWIN BALELIN
0932-657-4393
Tarcan, Baliuag, Bulacan

ENGR. JANUARIUS CRUZ
0926-893-8556
#42Venus St. San Felipe Mojon Malolos City

ENGR. WENDY E. OLLERO
0976-111-9447
0153 Bulihan, Plaridel, Bulacan