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# AUTOMATION OF FISH FEEDER APPLICATIONS

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**ABSTRAK**

The purpose of making Ornamental Fish Feeder Equipment In The Aquarium Automatically is to facilitate in feeding, so that when the fish keeper has a busy schedule that is quite dense and finds it difficult when going to leave the house for a long time, then the fish will be awake in the feeding process. The designed system consists of four parts: power supply, minimum system, mechanical circuit and program. The power supply is a power source to run the entire system consisting of voltage, the minimum system in the form of electronic circuits designed in such a way that it can function as a data processor with a microcontroller as a control center, mechanics serve as a dc motor drive to provide fish feed and then a program that serves to regulate the microcontroller so that it can work in accordance with the features offered. The way this tool works is by regulating feeding on fish feeders regulated by microcontrollers using RTC (Real Time Clock) time parameters, arduino as a process, DC motor (Direct Current) as output condition and LCD (Liquid Crystal Display) as user interface and monitoring. The addition of ultrasonic sensors to monitor the state of feed in the container. Based on the results of testing and for the work of the Ornamental Fish Feeder Tool in the Aquarium Automatically has shown results in accordance with the planning, namely the tool can provide fish feed automatically at a predetermined time.

## 1. INTRODUCTION

The development of technology in the field of electronics is growing rapidly and has an effect on the manufacture of advanced tools[1]. This can create tools that can work automatically, quickly, precisely, and have high accuracy, so as to make it easier for the work done by humans to be more practical[2]. The development of technology encourages human life for things that are automated. Automation in all sectors is unavoidable, so users who are initially manual shift to automation [3], [4][5].

In everyday life in the city and in the village there are many people who keep ornamental fish in the aquarium. Raising fish is a hobby that is much in demand by the community from the past until now. Because of its ease in maintenance and maintenance that makes most people want to maintain it. Fish that are maintained in the aquarium must be considered the feeding time so that the fish needs a schedule for regular feeding. However, for people who have a fairly dense level of busyness, it will feel difficult when they will leave the house for a long time. Because the fulfillment of fish needs, especially in the feeding of fish will be disrupted.

A microcontroller is a chip that serves as an electronic circuit controller that can store programs[6], [7]. The main advantage of microcontrollers is the availability of RAM and supporting I / O equipment so that the board size becomes very compact[8], [9]. A microcontroller is a computer inside a chip used to control electronic equipment, emphasizing efficiency and cost effectiveness. Technically microcontrollers are divided into 2 types, namely RISC (Reduced Instruction Set

Computer) which is limited instruction but with more facilities. CISC (Complex Instruction Set Computer) is a more complete instruction but with limited facilitie.

Feeding asks for the help of others to provide feed. Based on this, it is designed a tool that can feed fish in the aquarium automatically at predetermined times, with this tool it is expected to be an alternative solution for people who like to keep fish without worrying when leaving home for a long time.

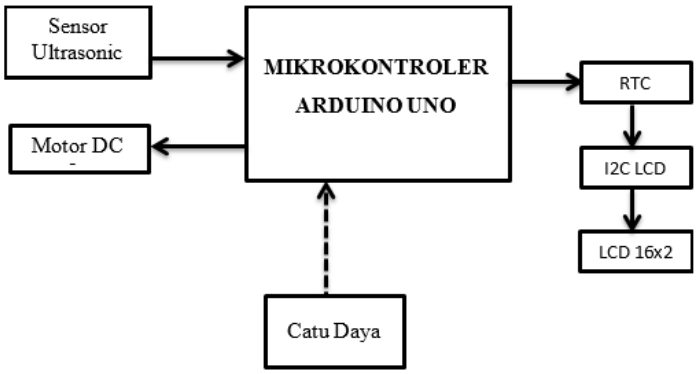
## 2. RESEARCH METHODS

The initial method in the manufacture of a tool is very important because without a design the tool is made cannot run optimally. To get maximum results, a good design is needed by paying attention to the nature and characteristics of each component used so that component damage can be avoided. In the design stage consists of several stages, namely the design of block diagrams, flow charts or flow charts, tools and materials, to the overall design of tools.

Planning requires thoroughness, tenacity and accuracy because the initial planning will determine the end of a plan in the process of making tools [10], [11]. If the initial plan is wrong then the end result will be wrong. The design process is very necessary in the process of making tools, especially the design of electronic devices. The process of designing tools is very important to start a job with the aim that the resulting tool will be in accordance with the expected, To choose the most appropriate components, To determine errors or errors that occur, minimize costs but with tools that are satisfactory results [12]–[15].

### 2.1. Block Diagram

The block diagram below describes the blocks of tools as a whole ranging from inputs, processes, to outputs in this block diagram there is only a path relationship between the blocks, but each block has a main component and a supporting component. Here is the daiagram of the block designed.




GamFigurebar 1. Block Diagram

From the block diagram above can be explained the function of each block, namely the power supply as a power source in this tool, because each circuit requires a supply in the form of dc voltage. Ultrasonic sensor as a feed-detecting sensor in a fish feed container. DC motors are used as loudspeakers to feed. 16x2 LCD is used to display data from microcontrollers. The I2C serves as a module used to change the lcd control line from parallel to serial aimed at saving pins on the connected controller. RTC (real time clock) serves as an input, where this module works as a timer or scheduling of fish feed on the system. Arduino Uno as the controller of the entire system that will regulate the performance of the system regulator.

### 2.2. HC-SR04 Ultrasonic Sensor Design

The HC-SR04 ultrasonic sensor in this device is used as a feed state detector in a fish feed reservoir, in other words the ultrasonic sensor serves as an automatic switch. Where the connection of ultrasonic sensors with arduino is the trigger pin ultrasonic sensor is the trigger voltage on the sensor readings connected with digital pin 6 and ultrasonic echo pin data pin is connected with digital pin 5 on the output pin arduino uno, vcc pin ultrasonic sensor is connected with arduino vcc pin and ultrasonic sensor ground pin is connected with arduino uno pin. In ultrasonic sensors, ultrasonic

waves are generated through a device called piezoelectric with a certain frequency. This piezoelectric will produce ultrasonic waves (generally 40kHz frequency) when an oscillator is applied to the object. In general, this device will shoot ultrasonic waves towards an area or a target. After the wave touches the target surface, the target will reflect back the wave. The wave reflection from the target will be captured by the sensor, then the sensor calculates the difference between the time of delivery of the wave and the time the bounce wave is received. Here is an image of a series of hc-sr04 ultrasonic sensors on arduino microcontrollers.

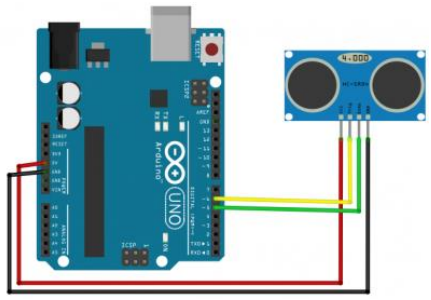


Figure 2. HC-SR04 Ultrasonic Sensor Design

### 2.3. LCD (Liquid Crystal Display) Network Design

The LCD circuit on this device is connected to the Inter Integrated Circuit module or often called $I^2C$. $I^2C$ A two-way serial communication standard using two channels specifically designed to send or receive data. LCD serves to display the status that is happening on the tool. In this project the LCD serves to display the time, and feed information is exhausted. Here is a 16x2 LCD circuit with I2C Module on the arduino microcontroller circuit.

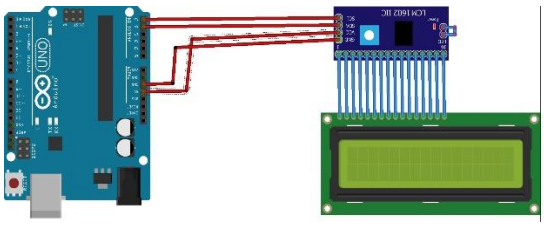


Figure 3. LCD circuit with I2C module

### 2.4. DC Motor Planning

In this tool the DC motor serves as a mechanical hardener that will provide fish feed, when the DC motor rotates then the feed will come out. The series can be seen in the following image

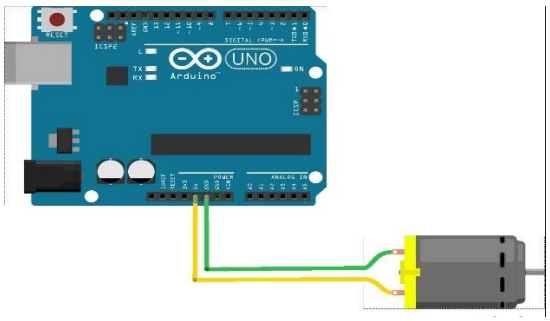


Figure 4. DC Motor Planning

### 2.5. Design *Real Time Clock* DS 3231

RTC (Real Time Clock) is a chip (IC) that functions as a store of time and date. DS 3231 is a Real Time Clock (RTC) using parallel data lines that can store data seconds, minutes, hours, dates, months, days of the week, and valid years up to 2100. In this tool the RTC is connected to the analog pin A4 and the RTC cell pin is connected to the analog pin A5 on the arduino uno. For more details the relationship of the series can be seen in the following image :

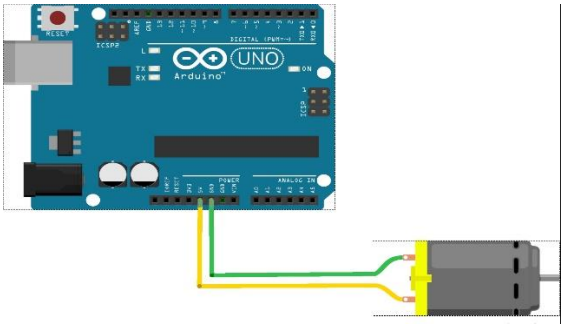
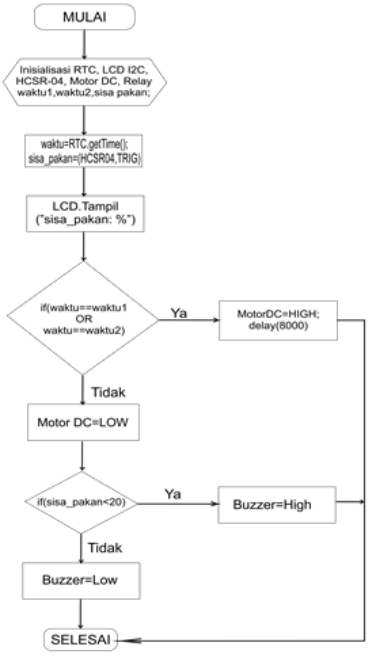


Figure 5. *Real Time Clock* DS 3231

## 2.6. *Flowchart*

Flowcharts are an overview of the algorithms in a program, which state the direction of the program flow. With flowcharts will make it easier to group several programs according to their function and tools can be analyzed properly. Flowchart or flowchart can be seen from the following image




Gambar 6. *Flowchart*

The steps taken to perform the operation on this tool in order to work is to connect the tool to the power supply to turn on the system, Set the clock on the program before it is downloaded, Download the program on arduino hardware (if the program has not been downloaded, real time clock (RTC) will move the DC motor according to the clock that has been set on the program, When the RTC is active then the DC motor will rotate and the feed will come out, The HC-SR04 sensor reads the distance on the container and the rest of the feed will be displayed on the LCD screen "remaining feed (%)", buzzer will sound if the amount of feed in the container is less than 20%.

## 3. RESULTS AND DISCUSSIONS

This automatic fish feed system consists of 1 DC motor, RTC (Real Time Clock), LCD (Liquid Crystal Display), and 1 piece of arduino uno microcontroller. RTC (Real Time Clock) serves as time on arduino microcontroller, DC 12-N20 motor serves as a hardener for fish feed, LCD (Liquid Crystal Display) serves as a time viewer and arduino microcontroller as the brain and processor of the entire system component.

This ornamental fish feed tool is placed on the side of the aquarium so that the beauty of the fish in the aquarium remains visible. The following is a look from the installation of ornamental fish feeders in an aquarium.

Figure 7. Installation of Feeder Equipment in the Aquarium

Installation of the tool as a whole that can be clearly seen a buzzer and wiring tool, which is in 1 unit of microcontroller, RTC, and adjacent to the LCD then motor DC 12-N20 mechanical feeder fish and lastly there is a distance sensor or HC-SR04 that is above the lid of the fish feed container.

Figure 8. Installation of Feeder Equipment in the Aquarium

### 3.1. Power Supply Testing

This test is done to find out if all connected components can receive the voltage source properly and avoid poor wiring or disconnection so that none of the components are not lit due to not being supplied voltage source. Because all components take power from the microcontroller, catudaya testing is enough to connect the microcontroller to a voltage source such as an adapter, powerbank, or laptop.

Figure 8. Power Supply Testing

Dapat dilihat bahwa sistem hidup, berarti bahwa catu daya berfungsi pada alat dengan baik.

### 3.2. Mikrokontroller Testing

Further testing is carried out on the Arduino Uno microcontroller which is the data processing center on this scheduling system. This test will be tested by programming arduino microcontroller and measuring the output pin using a multimeter.

Steps for testing Arduino Uno

1. Provide tools and materials
   a. Arduino Uno
   b. Multimeter
   c. Kabel downloader
   d. Software arduino
   e. Laptop
2. Testing
   a. create a program using software on Arduino Uno, give logic 1 (HIGH) on PIN 1 and on PIN 2 give logic 0 (LOW) like the program below:

```
void setup (){
 pinMode (1,OUTPUT);
 pinMode (2,OUTPUT);
}
void loop () {
digitalWrite(1,HIGH);
delay(1000);
digitalWrite(2,LOW);
delay(1000);
}
```

   After the program is completed, download the program into the arduino uno microcontroller using the downloader cable.
   b. Calibrate multi meter and place selectors on Vdc with a scale limit of 10Vdc.

c. Provides 5 volt dc suplay to the microcontroller, taking measurements on PIN 1 and PIN 2 arduino.

3. Result Test

After being measured with multi meters, data such as the following table is obtained:

Table 1. Arduino Uno Microcontroller Output Test Results

| Point of Measurement | Program Logic | Legible Voltage |
|---|---|---|
| PIN 1 | 1 | 5v |
| PIN 2 | 0 | 0 |

After uploading the program into arduino then measured the voltage on pin 1 and pin 2 when viewed in table 4.1, pin 1 given HIGH logic has an output voltage of 5 Vdc while pin 2 given LOW logic has an output voltage of 0 Vdc.

### 3.2. Motor DC Testing

The next test is the testing of the DC 12-N20 Motor, because as a mechanical driver so that fish feed can come out of the shelter container, the DC 12-N20 motor must be tested so that the fish feed can come out, testing is done by activating scheduling with a non-actual time with a difference of every 5 minutes on the downloaded program, Results from the test can be seen in the following table :

Table 2. DC 12-N20 Motor Testing Results

| No | Scheduling Hours | Meal hours | Motor DC |
|---|---|---|---|
| 1 | 15.08 | Morning | Spinning |
| 2 | 15.13 | Afternoon | Spinning |
| 3 | 15.18 | Morning | Spinning |
| 4 | 15.23 | Afternoon | Spinning |
| 5 | 15.28 | Morning | Spinning |
| 6 | 15.33 | Afternoon | Spinning |

From the results of the test in table 2 taken example 6 times scheduling with the difference per time is 5 minutes and simulates breakfast hours, and afternoon on fish. The DC 12-N20 motor also works well and in accordance with what is expected when the system is working.

## 4. CONCLUSION

The system that facilitates human work in feeding ornamental fish in the aquarium automatically based on arduino uno microcontroller has four parts, namely power supply, minimum system, DC 12-N20 motor circuit and program. The power supply serves as a voltage supplier. The minimum system is an electronic circuit that serves as a data processor with the Arduino Uno microcontroller as a control center. A series of DC 12-N20 motors that serve to regulate in feeding fish. And a program that serves to set up microcontrollers so that the tool can work according to the features offered. For the work of the Ornamental Fish Feeder Tool in the Aquarium Automatically Based on Arduino Uno Microcontroller has shown results in accordance with the planning that the tool can provide fish feed automatically at a predetermined time.

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