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Automatic Feeding Machine for Freshwater Prawn Precision Farming

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Abstract: An automated feeding machine is a device that feeds the giant freshwater prawn at a set time. This research is to determine the effective frequent feeding and feed amount per feeding on giant freshwater prawn survival and growth. The machine will have a DC motor, a giant freshwater prawn tank, a feeding tank, an Arduino UNO, a Buck converter, a relay, a gear, and belting. The feed from the tank will be dropped via a hole in the mechanism to feed the giant freshwater prawn. The analysis intended to reduce feeding rate variances and guarantee that subsequent statistical analyses have enough power to detect changes in feeding rates consistently. For future study, the features for monitoring system parameters can be added in such case to monitor the amount of feed (grams).

Keywords: Giant Freshwater Prawn, Feeding

1. Introduction

The need for food products grows every day as the population grows, but the amount of land available for agriculture does not keep pace, and the amount of land available for cultivation is shrinking, especially in metropolitan areas. One of the most pressing societal issues nowadays is the lack of decent quality food goods at reasonable prices. The major issue is how to boost productivity while using less space.

Most aqua culturists are familiar with the giant river prawn (Macrobrachium rosenbergii). While Macrobrachium species are not actual prawns, the term "prawn" is often used because of their many resemblances to true prawns. They are neither shrimp nor crayfish, although they have many characteristics with both. The claws of this species are strikingly long, and males have even longer clawed than females. This species is amphidromous, which means it spends its larval stage in brackish or saltwater before migrating to freshwater for its adult life. [1].

Most Malaysian freshwater prawn farmers still rely on a conventional farming strategy, which necessitates highly skilled farm management, work, and time. It is difficult to boost productivity by

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continuing with this inefficient strategy because one key challenge is accurately providing the quantity of protein and prawn meal. Many previous research advocates the use of wireless sensor technology in monitoring and managing the quality of pond or tank water as well as encouraging effective farm management to boost aquaculture efficiency. Freshwater prawns are territorial animals where usually 1 to 4 prawns live in per square feet pond or tank in extended cultivation. The proposed project resolved the method of feeding where all the prawns in the tank will get sufficient equal protein and prawn meal. Objectives of the study are to design and develop an autonomous feeding gigantic freshwater prawn for precision farming, and to examine the effect of frequent feeding and feed amount per meal on giant freshwater prawn survival and growth.

1.1 Compare the literature review

This table 1 show 5 prior comparable aquaculture farming projects. Project 1 aims to reduce waste and improve water quality by using an object detection approach to identify surplus fish feed and adjust feeding rates accordingly. Project 2 is a proposed prototype of an underwater surveillance system for shrimp farming. Project 3 is an intelligent fish farm system for feeding and monitoring water temperature that can be managed via a smartphone. Project 4 provides a robust fish feeding system based on monitoring variations in water ripples created by fish movement. Project 5 is a multi-feeding system for precision farming similar to the one being proposed for the giant freshwater prawn.

Table 1 Previous Projects Summary

No	Author	Title	Main Feature
1	Jerry John and Mahalingam P.R	Automated Fish Feed Detection in IoT Based Aquaponics System [2]	1. Arduino AtMega 2650 as microcontroller 2. Rasberry pi connected with Arduino AtMega 2650 3. Sensor: Dissolved Oxygen sensor, Total dissolved solid sensor, pH sensor, Water temperature sensor, Air temperature sensor, Light intensity sensor and chlorine sensor, Water level sensor.
2	Ing-Jer Huang, Chin-Chang Hung, Shiann-Rong Kuang, Yun-Nan Chang, Kuan-Yu Huang, Chang-Ru Tsai and Kai-Lin Feng	The Prototype of a Smart Underwater Surveillance System for Shrimp Farming [3]	1. Underwater camera to check shrimp 2. Water quality sensor AI image recognition
3	Pupug Ginanjar, Sarah Opipah, Dadan Rusmana, Muhlas, Mufid Ridlo	Prototype Smart Fish Farm in Koi Fish Farming [4]	1. Arduino AtMega 2560 as a microcontroller 2. RTC module DS3231 for timer 3. DS18B20 temperature sensor

	Effendi and Eki Ahmad Zaki Hamidi		4. HX711 with load cell sensor 5. Application blynk as cloud to get the data for user interface
4	Ratna Aisuwarya and Eddo Frans Suhendra	Development of Automatic Fish Feeding System based on Gasping Behavior [5]	1. Arduino Uno as a microcontroller 2. Servo Motor GY-521 MPU-6050 gyroscope sensor
5	James L. Kunza, Eric L. Brunsona, M. Christopher Barnhartb, Elizabeth A. Glidewellb, Ning Wanga, Christopher G. Ingersoll	Pulsed flow-through auto-feeding beaker systems for the laboratory culture of juvenile freshwater mussels [6]	Multi feeding for the precession farming.

2. Materials and Methods

A rotational tank system is used in the mechanical feeding system prototype. Figure 1 depicts the mechanical feeding design of the rotational tank system. The rotational tank system is made up of a 3-inch pvc pipe, a dc motor, a gear, and a belting. The tank provided various holes for dropping food to feed.

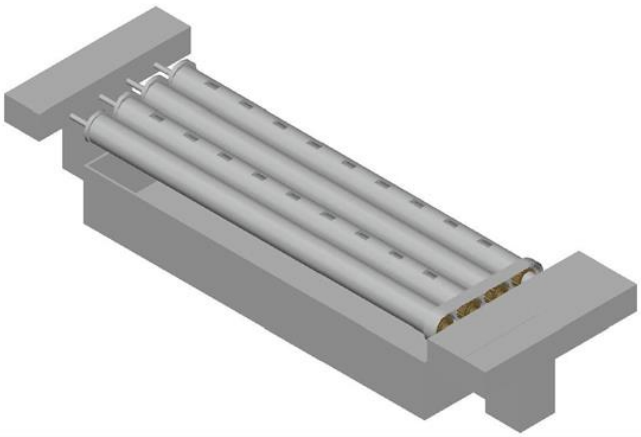

Figure 1 3D model of the machine

2.1 Automated system

Figure 2 depicts the whole block diagram for developing the project. The project is a timer for an automation system. The Arduino UNO will serve as the primary microcontroller in this project. All orders to be carried out will be handled here. The project's timing sensor is the RTC DS1307. The project's output is a DC motor and relay that is connected to a pipe to rotate it.

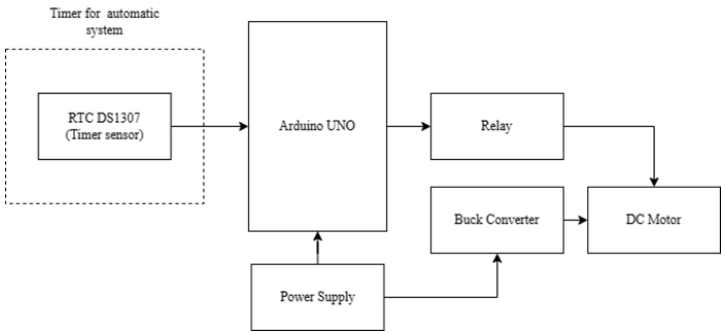

Figure 2 Block diagram of the project.

Figure 3 shows the flowchart of automatic feeding system briefly describe on how the process of the feed Giant Freshwater Prawn being executed. The DC motor function will turn ON for 5 to 10 seconds.

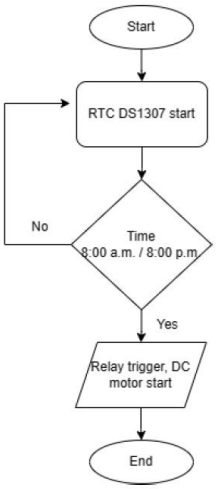

Figure 3 Flowchart of the automated system.

2.2 Mechanical of the tank

Figure 4 shows the four pipes will be hung on an acrylic board. Every end cap pipe already has a 3cm gear size stick. The distance between the pipes is 20cm, and the length of the belting is similarly 20cm. The canvas for the tank will be 1.5 feet in height, 6 feet in length, and 3 feet in width.

Figure 4 full prototype of the project

The first condition occurs when the time is 8:00 a.m. on a daily basis. If this condition is satisfied the DC motor turns ON for 5-10 seconds. Similarly, at 8:00 p.m., the DC motor turns ON for 5-10 seconds. The DC motor is attached to the pipe containing the food of the giant freshwater prawn, and the revolving pipe will drop the food into the tank through the hole in the pipe.

3. Results and Discussion

Automatic feeders have routinely fed giant freshwater prawn two to four times a day. Then there will be a look at how things have improved after the auto feeder was installed. Included are the allocation of feed based on giant freshwater prawn age, the enhancement of water quality, and the amount of feeding continuity.

3.1 Results of Automated Feeding Machine

Figure 5 depicts the output display after the entire circuit has been constructed and simulated. The Arduino IDE was used to write the programmed code, which was then uploaded to the Arduino Uno. The RTC module's current date and time are shown on the output display. The current date and time are received from the memory contained in the RTC ROM, and the RTC module is constantly operating (battery installed on the back of the module), even when the power to the Arduino Uno is switched off. The date and time information are used to turn on and off the DC motor through the Relay.

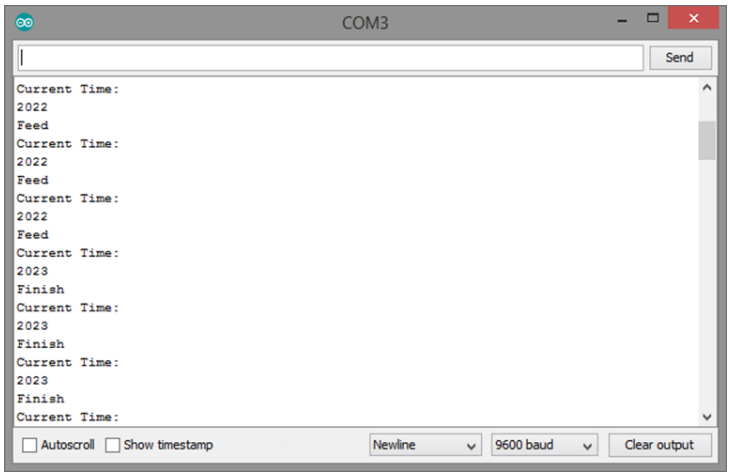

Figure 5 Output display on serial monitor

3.2 Tables of experiment results

This method has been evaluated to meet research objectives, including the effective frequency of feeding and feed quantity per feeding on Giant Freshwater Prawn survival and growth. The feeding of Giant Freshwater Prawns takes place twice a day, in the morning and in the evening. The amount fed varies depending on the speed of the DC motor by the food tank. The testing was conducted for 1 pipe. Table 4.1 shows the quantity of feed data acquired from this experiment.:

Table 2: Experiment result for 1 pipe

No	Speed DC motor (V)	Duration (Sec)	Quantity of food (g)
1	2	5	3.44
		7	3.66
		10	3.74
2	4	5	3.12
		7	3.20
		10	3.25

From the test that we have, the higher the quantity of food, the slower the speed of the DC motor and the longer the duration of the rotation tank.

4. Conclusion

At the conclusion of the study, an autonomous system project was created. The purpose of this project is to create an autonomous feeding system for giant freshwater prawns for precision farming. The elements of an autonomous system will be activated twice every day. The autonomous system is made up of a DC motor that controls the food tank to drop the food. The following results were reached after testing an autonomous feeding system for giant freshwater prawns. The creation of a prototype system capable of autonomously feeding giant freshwater prawns was successful, and the amount of feed is fairly spread over all tank spots.

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