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Design and Implementation of A GSM Based Automatic Fish Feeder

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Abstract: There has been an increase in the inland farming of catfish in Nigeria to meet with its demand. However, the farmers may situate their farm far away from their places of residences. In other to optimise the feeding of the fish even when the farmer is not available, the automatic fish feeder wad designed and implemented. This design makes use of a Global System for Mobile (GSM) module to ease communication from the farmer to the fish feeder. The farmer can send the quantity of feed that should be released as an SMS and the fish feeder disperses that amount. The hardware design for the fish feeder consists of a GSM module for communication, Arduino microcontroller as centre processing unit, a dc motor to control the flow of food from the food container to the pond

Keywords: Arduino Nano, fish feeding automation, GSM module, dc motor

1. Introduction

Fish Farmers with ponds located far away from their places will face an increase in labour costs related to the feeding of the fish. This increase of labour costs can affect farmers with lots of ponds. Automating this aspect of fish farming can help to reduce not only labour costs but fish feed costs as it reduces wastage. In automating the feeding of fishes in a pond we are incorporating gsm technology into the control system. This can allow a farmer to control the feeding of their fishes at any location. A sms sent from a farmer's phone can activate and control the quantity of feed to be released into the pond. The farmer's phone number would have been registered on the feeder memory. This sms would be in the form of a number. This number corresponds to the quantity of feed to be released into the pond. This is necessary since the quantity of feed fishes consume are related to their age, weight and the number of fishes in a particular pond. As fishes grow, the food quantity required increases. This also allows the farmers to adjust feeding quantity and feeding time as at when required.

1.1 Literature Review

Under this section, we perform a literature review of similar works. Mohapatra et al (2009) tested a demand feeder for carp feeding and evaluated its efficiency with respect to manual feeding. They found out that demand feed fish gained on average a 12.615 more weight than hand – fed fish. Yeoh et al (2010) designed an automatic fish feeder controlled by an adjustable digital timer. The owner can program this time to change the cycle time and dispensing time. Vaddadi et al (2012) created an embedded floating auto fish feeder for smart pond management for fish feeding and measurement of pond parameters. The data collected is used in changing the pond conditions in order to optimise fish growth.

Ozigbo et al (2013) developed an automatic fish feeder using a PIC16F84A microcontroller. This system is made up of the mechanical body with a blower chamber and electric motor and the electronic circuit powering and controlling the system. They achieved an efficiency of roughly 86.7%. Abdallaha and Elmessery (2014) produced two different controls, automatic feeder for mirror carp production. They had an opened control system and a closed loop control. The open control was using an ATM89c51 microcontroller to give out an exact dose based on the carp cycle while the closed loop was based on the water temperature, amount oxygen consumed, fish age and fish weight. The closed loop system was discovered to be better than the open loop system. Ayub et al (2015) developed a mobile robotic system using a PIC16F84A microcontroller and a dc servo motor to deliver food along a track and its performance was better in terms of faster process of food delivery, more even dispersion of food and a precise amount of food value. Ani et al (2015) developed a solar powered automatic shrimp feeding system. The system uses a 10 hour timer operated by the user to set the time for feeding, a magnetic contactor as a switch. The system was designed for feeding vanname shrimps. Atoum et al (2015) introduced a visual signal processing system for control of fish feeding in tanks with the aim of increasing profit. Appana et al (2016) designed a feeder system for shrimp farming with a dsPIC5011 microcontroller, a Real Time Clock (RTC), an external EEPROM and an LCD. The result obtained indicated that the feed conversion ratio improved by 30% while the growth rate increased by up to 30%. Udin et al (2016) designed an automatic fish feeder for an aquarium using Programmable Logic Circuit (PLC) and a Global System for Mobile (GSM). The system feeds the fish at a pre-determined time and sends an SMS to the owner

when the feed in the food storage drops lower than a predetermined level. Ogunlela and Adebayo (2016) designed an automatic fish feeder with a bidirectional motor, feed platform and electrical control box. They analysed the system and found out that the feeding efficiency was higher in automatic feeding than manual feeding. Hasim et al (2017) developed a fish feeder system using Raspberry Pi. The feeder system was for pet fish and used a web based application to enable pet fish owners feed their fish on time. Nirwan et al (2017) designed an automatic fish feeder system using an arduino uno and stepper motor and a blower to disperse the food evenly in the pond. Sabari et al (2017) designed a smart fish feeder for home aquariums using a gsm module and Liquid crystal display (LCD) and a keypad for inputting values and an arduino for controlling the entire system. Premalatha et al (2017) worked on a smart automatic fish feeder using a PIC microcontroller, with gsm, a mini seed sprayer an ultrasonic sensor and a real time clock. Kaimal et al (2017) developed a smart aquarium using a Programmable Logic Controller (PLC) and Supervisory Control and Data Acquisition (SCADA) to control parameters such as temperature, ph level, dissolved oxygen level etc. It also makes use of a microcontroller to analyse data from the light, temperature and pH sensors. Deroy et al (2017) implemented an automated fish feeder robot. They used a solar panel, batteries, arduino uno, dc motors among others. The system was mounted on a boat to distribute the feed in the pond. The system's prototype was 82% operational and was recommended to fish farmers. Rahayani and Gunawan (2018) proposed a design for an automatic feeder and aerator system for shrimps. The system makes use of microcontroller, sensors, solar panels, battery and servo motors among others. The farmer can set the time and quantity of feed for shrimps.

2. Materials and Methods

Figure 1 shows the block diagram of the system. The gsm based fish feeder is powered by a 12V 7.2AH Battery that is being charged using a 30W 12V Solar Panel. This is because the motor being powered is a 12V D.C. motor. The arduino nano can be powered with a 6V – 20V dc through the Vin Pin and the arduino nano powers the SIM900 gsm module. The motor turns on a fan in an enclosed area and uses this force to push out the fish feed pellets out into the fish pond.

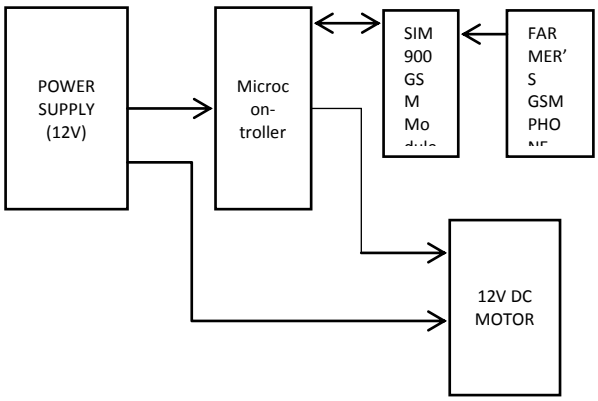

Figure 1: Block Diagram of the System

When ansms is received through the sim900 module, the arduino program checks if it is from the pre-registered mobile number before it reads the content. The content which is usually a number is saved and multiplied by 100 to get the period for which the motor will be on. Then the motor is turned ON via a relay for the number of seconds requested for by the USER.

The flow chart is shown in Figure 2. Via tests we have noted the quantity of feed dispersed by the fish feeder for various times. This information is then used by the farmer to determine what time it sends to the feeder to disperse the required quantity into the fish pond.

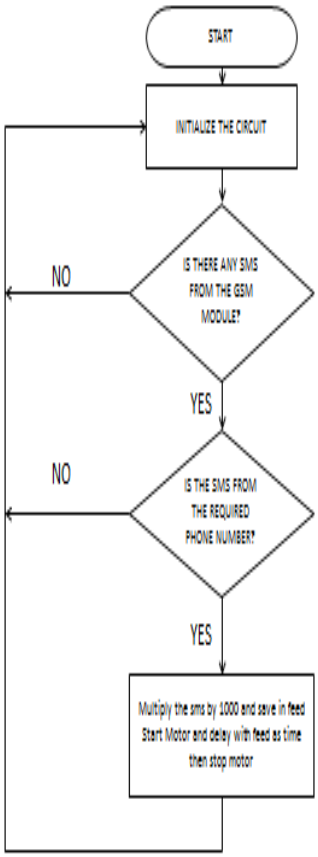

Figure 2: Flow Chart System

The arduino nano is used as a microcontroller. The SIM900A gsm module is connected to it at Pin 9 and 10. The 12V relay is controlled via a transistor connected to Pin 3. The relay turns on the 12V dc motor. The Motor and the entire circuit is powered from the 12V battery. The battery is charged using a 24W 12V Solar Panel.

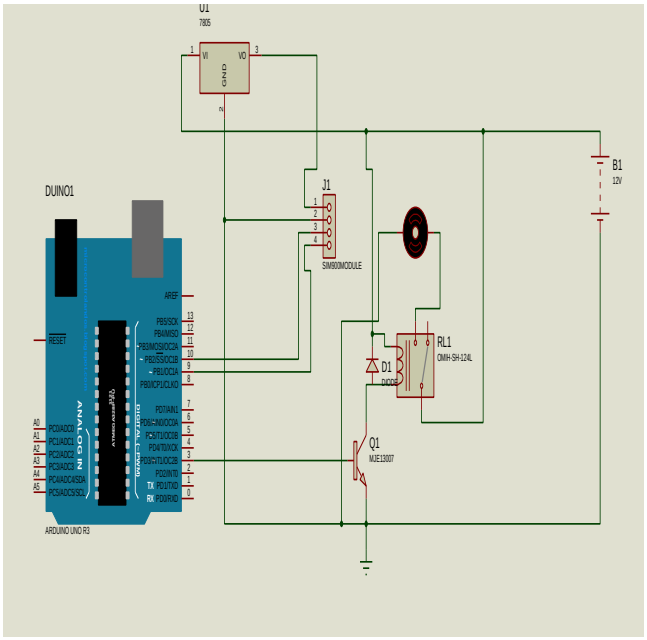

Figure 3: Circuit Diagram

3. Results and Discussions

The Arduino was programmed using an arduino IDE in C language. The circuit was built on a veroboard, tested and then connected to the mechanical part of the feeder and then tested. The quantity of feed released for various periods of time was weighed and noted for the farmers use. The hardware implementation is shown in Figure 4 while Figure 5 shows the feed fisher with the circuit connected to the motor.

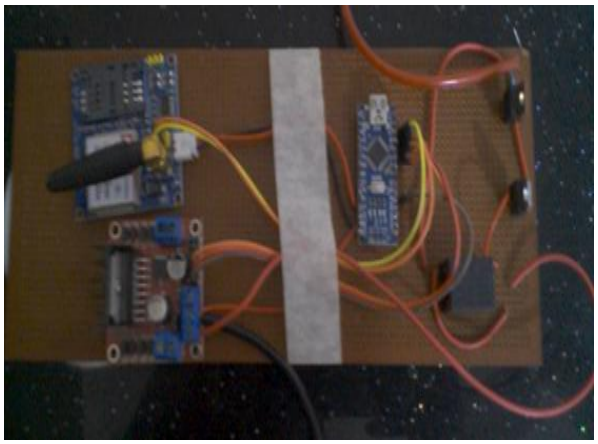

Figure 4: Hardware implementation of circuit

Figure 5: Picture of Fish Feeder showing the circuit connected to the fish feeder

4. Conclusion

The Arduino Nano microcontroller was used to control the system. It worked according the design and can be used by fish farmers to manage their fish farmers located in areas far away from where they live. Fish farmers can use this to supplement the labour required to grow fishes

References

[1]. Abdallah, S. and Elmessery, W., 2014.An Automatic Feeder with Two Different Control Systems for Intensive Mirror Carp Production. *Journal of Agricultural Engineering and Biotechnology*, pp.36-48.

[2]. Ani, D., Cuento, M., Diokno, N. and Perez, K., 2015.Solar Powered Automatic Shrimp Feeding System. *Asia Pacific Journal of Multidisciplinary Research*, 3(5), pp.152 - 159.

[3]. Appana, D., Alam, M. and Basnet, B., 2016.A Novel Design of Feeder System for Aqua Culture Suitable for Shrimp Farming. *International Journal of Hybrid Information Technology*, 9(4), pp.199-212.

[4]. Atoum, Y., Srivastava, S. and Xiaoming Liu, 2015. Automatic Feeding Control for Dense Aquaculture Fish Tanks. *IEEE Signal Processing Letters*, 22(8), pp.1089-1093.

[5]. Ayub, M., Kushairi, S. and Latif, A., 2015.A New Mobile Robotic System for Intensive Aquaculture Industries. *JOURNAL OF APPLIED SCIENCE AND AGRICULTURE*, 10(8).

[6]. Deroy, M., Espaldon, A., Osa, J., Macalla, G. and Pascua, D., 2017. Design and Implementation of an Automated Fish Feeder Robot for the Philippine Aquaculture Industry: Feeding Mechanism and Float Design Module. *Mindanao Journal of Science and Technology*, 15, pp.89 - 102.

[7]. Hasim, H., Ramalingam, M., Puviarasi, R. and Ernawan, F., 2017.Developing fish feeder system using Raspberry Pi.

[8]. Kaimal, A., Jaison, R., Santha, V. and Anand, S., 2017.Smart Aquarium. *IOSR Journal of Electrical and Electronics Engineering*,.

[9]. Mohapatra, B., Sarkar, B., Sharma, K. and Majhi, D., 2009. Development and Testing of Demand Feeder for Carp Feeding in Outdoor Culture Systems. *Agricultural Engineering International: the CIGR Ejournal*, XI.

[10]. Nirwan, S., Swarnakar, R., Jayarajan, A. and Shah, P., 2017.THE DEVELOPEMENT OF AUTOMATIC FISH FEEDER SYSTEM USING ARDUINO UNO. *International Journal of Modern Trends in Engineering & Research*, 4(7), pp.64-68.

[11]. Ogunlela, A. and Adebayo, A., 2016. Development and Performance Evaluation of an Automatic Fish Feeder. *Journal of Aquaculture Research & Development*, 07(02).

[12]. Ozigbo, E., Anyadike, C., Gbadebo, F., Okechukwu, R. and Kolawole, P., 2013.Development of an automatic fish feeder. *African Journal of Root and Tuber Crops*, 10(1), pp.27 - 32.

[13]. Premalatha, K., Maithili, P. and Nandhini, J., 2017. Smart Automatic Fish Feeder. *International Journal of Computer Sciences and Engineering*, 5(7), pp.92-95.

[14]. Rahayani, R. and Gunawan, A., 2018. Proposed Design of an Automatic Feeder and Aerator Systems for Shrimps Farming. *International Journal of Materials, Mechanics and Manufacturing*, 6(4), pp.277-280.

[15]. SabariAkilesh, K., Savitha, V., Vinithra, N. and Dhanasekar, J., 2017. Smart Fish Feeder. *International Journal of Scientific Research in Computer Science, Engineering and Information Technology*, 2(2).

[16]. Uddin, M., Rashid, M., Mostafa, M., Salam, S., Nithe, N., Rahman, M. and Aziz, A., 2016. Development of Automatic Fish Feeder. *Global Journal of Researches in Engineering: A Mechanical and Mechanics Engineering*, 16(2), p.11.

[17]. Yeoh, S., Taip, F., Endan, J., Talib, R. and SitiMazlina, M., 2010.Development of Automatic Feeding Machine for Aquaculture Industry. *Pertanika J. Sci. &Technol*, 18(1).