AUTOMATIC FISH FEEDING AND MONITORING SYSTEM FOR AQUARIUM USING 555 TIMERS

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Abstract-Pet ownership in India has increased by 14% over the past 29 years. It is not feasible for fish owners to leave extra food in their fish's tank before leaving for an extended period. And overfeeding fish is one of the leading causes of fish fatality. When the food begins to break down in the tank, the proteins release ammonia, nitrites, and reduce the amount of oxygen in the water, which are harmful for the fish as it leads to its death after few days. There are many options available for feeding cats and dogs, but there are not as many choices for fish owners. Natural food is already available in the pond. It may include detritus, bacteria, plankton. Supplementary feeds are regularly distributed to the fish in the pond. It is very difficult   to determine how much artificial food should be distributed regularly to each pond. The quality of water in that pond is also another factor to be considered to obtain the best results.   It is also not feasible for fish owners to feed them in a proper cycle especially during their in-availability. The flow of water fish ponds discusses on how every day should be monitored. This project ensures quality by handling the PH and temperature. This system is designed to monitor the water temperature, quality and automatic feeding of an aquaculture environment.
Keywords-PH, temperature, water quality, automated fish feeding.

1. INTRODUCTION

Food is the important element for growth and production. The management of feeding is one of the main challenges   for aquaculture development. It is an unhealthy practice for   the fish owners to leave extra food in the tank before their unavailability as it may cause overfeeding of the fish. Over- feeding causes death of the fish. Also, the food breaks down in the water thereby releasing the proteins and nitrites, which reduces the amount of oxygen in it which pertains to be harmful for the life of fish. Fish have a feeding schedule of once per day every day, making it difficult for the fish owner to be away from home. Thus, there is a need for an automated device that can reliably feed a fish. Thus, an automatic fish feeder might be used which provides proper timely feeding   at predetermined time and at the same time environment is monitored and maintained appropriately. Whenever the pH level and temperature of water go below the minimum, an alert will be given, so that fish will be saved. This enables the fish owners who would be away from aquarium or pond for a long time to be kept updated about the aquaculture regularly.

2. OBJECTIVE

The main objective of this project is,
  ➢ To ensure proper growth and maintenance of fish.
  ➢ To design and develop automatic fish feeder for aquarium and ponds useful especially during the owner's unavailability.
  ➢ To monitor the environment of the aquarium and update the user.

3. WORKING PRINCIPLE

In this project, the main working involves the automation process of feeding and monitoring the fish pond. Using the components mentioned below, the system is implemented.   The Arduino Uno which has a microcontroller i.e Atmega328 and 555 timers are used in this system. The 555 timers in monostable mode provides a time delay based on the values of the resistors and capacitors for the feeding system which will activate the relay to feed the fish. The pH sensor and temperature sensor send their corresponding values to the Arduino UNO. After reading the data, Arduino decode the input values and sends a signal to the parallel port through w11hich the LCD displays the value of temperature and pH of the aquarium.
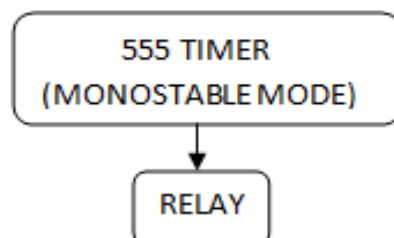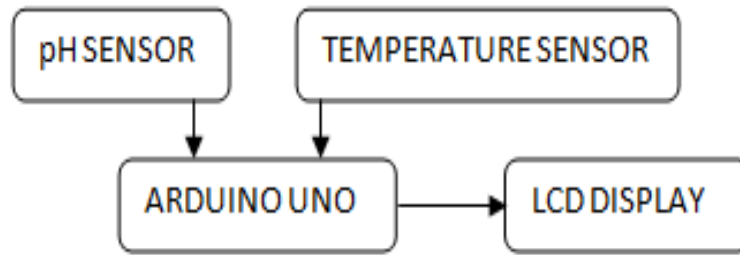

Fig. 3.1 Feeding System

Fig. 3.2 Monitering System

4. LITERATURE REVIEW

4.1 Development and Performance Evaluation of an Automatic Fish Feeder by St. Joseph, Michigan, American Society of Agricultural and Biological Engineers, 2014

The operation of the feeder does not require highly technical expertise and is cost effective. The feeder evaluation is based on feed conversion ratio (FCR) and feeding efficiency (FE).

4.2 Design and Construction of Automatic Fish Feeder using Atmel 8052 Microcontroller by KO Ojo & OA Benard, 2018, Vol: 7

A control system is attached to the device allowing the fish to be fed at pre-set time as required by user. The machine adequately manages and preserves feed under harsh conditions.

4.3 Electronic fish feeder by Gerard R. Davet Jean-Paul Davet, 2016

The aesthetic nature of the food distribution system enhances the decor in the environment in which it is used, as well as performing the function for which it is intended.

Fig. 4.1 Fish Pond with Fish Feeder

5. COMPONENTS USED

The following are the components which are used in implementing this project:
- 555 Timers
- Temperature Sensor
- PH Sensor
- 5vrelay
- Arduino Uno
- Diode
- Resistors
- Capacitors
- LCD Display

6. SOFTWARE COMPONENTS

6.1 Arduino IDE

In this project, the values from the pH sensor and temperature sensor are sent to the input pins of Arduino UNO. The Arduino code written in C++ is uploaded to the Arduino so that the information received from the sensors is processed to get the desired output.

7. HARDWARE COMPONENTS

7.1 Arduino UNO

In this project, the pH and temperature sensor are connected to the digital pins of Arduino UNO to receive input and the output is delivered to the LCD display.

7.2 PH Sensor

PH is a measure of acidity and alkalinity, or the caustic and base present in a given solution. In this project, the pH sensor is used to determine the pH of the pond. As the pH level increases the pond becomes unsuitable for fish culture, pH is one of the important factors that governs the purity of the water. The output of the pH sensor is connected to the input pin of the Arduino UNO to determine the pH of the aquarium.

7.3 Temperature Sensor

In this project, the temperature of the water is measured because increase in temperature affects the dissolved oxygen level and the rate of photosynthesis. This will lead to decrease in the metabolic rate of living organisms in the pond. Aquatic organisms need optimal temperature to maintain a good health. So, it is necessary to monitor the temperature of the pond to have good cultivation. Here, the output of the temperature sensor is connected to the analog pin of the Arduino to determine the temperature of the aquarium.

7.4 555 Timers

In this project, 555 timers is used as an time delay element which provides feed for the fish in the aquarium for a particular time interval. Here the 555 timer is in monostable mode which will activate the relay to feed the fish.

7.5 5V Relay

In this project relay is used to open and close the fish feeding chamber. The output of the 555 timer is connected to the relay to make it open and close after receiving the clock pulse.

8. RESULTS

The circuit is implemented in simulator as below. In the feeder system, when the clock pulse from the timer is received at regular intervals by the relay, it opens and the food is dispensed. Here instead of the relay, the LED glows for showing the open (LED 1) and close (LED 2) of it. In the monitoring system, the pH and temperature of the water is detected using the respective sensors and the output is given to Arduino UNO which would display in the LCD screen.
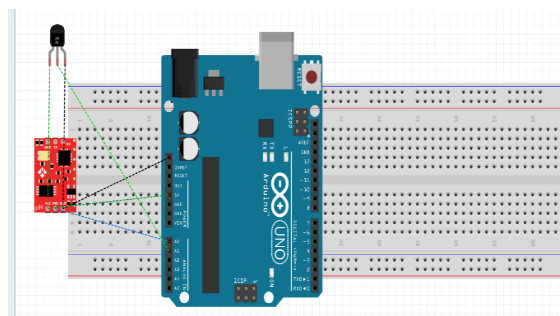
8.1 Monitoring System

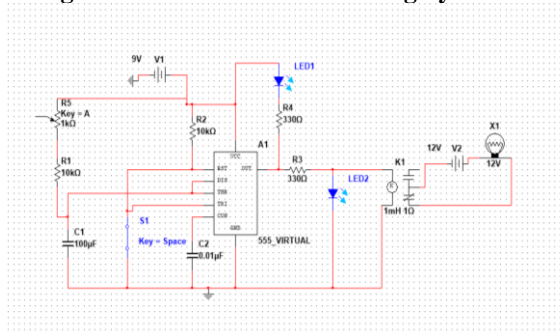

Fig. 8.1 Simulation of Monitoring System

Fig. 8.2 Simulation of Feeding System

CONCLUSION

This project mainly deals with the automation of fish feeding system which is implemented using 555 timers. The parameters like pH and temperature play important role for the clean and healthy life in an aquarium. Thus, the pH level of water and the temperature is monitored using pH and temperature sensors which are connected

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to Arduino. This project is useful to reduce overfeeding and starvation problems, which may cause death of fish. And also overfeeding may cause water in the pond to get polluted and this is monitored by pH sensor. Temperature of pond is monitored by the temperature sensor, thereby reducing the chances of dying of fish. Studies say that the feeding efficiency is higher in the automatic feeding (which is 20.9%) than in manual (which is 18.6%) which makes this method effective one. Thus, the working of the system has been tested thoroughly and it is said to function properly and successfully.

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