IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE)
e-ISSN: 2278-1676,p-ISSN: 2320-3331,
PP 18-21
www.iosrjournals.org

Smart Aquarium

Adarsh Kaimal, Rinu Jaison, Santha V, Sunitha Anand
(Applied Electronics and Instrumentation, Adi Shankara Institute of Engineering and Technology, India)
(Applied Electronics and Instrumentation, Adi Shankara Institute of Engineering and Technology, India)
(Applied Electronics and Instrumentation, Adi Shankara Institute of Engineering and Technology, India)
Applied Electronics and Instrumentation, Adi Shankara Institute of Engineering and Technology, India)

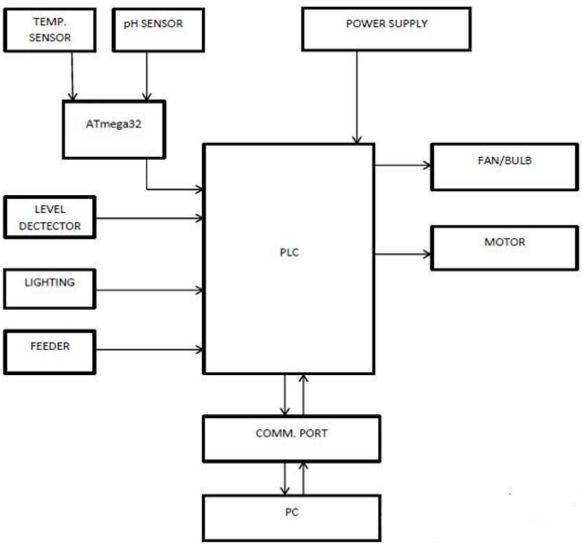
Abstract: *Fish keeping is a popular trend nowadays. People from all the age groups like to keep fish at their homes, offices etc. for decoration purpose or as a hobby. Commercial fish farming and ornamental fish farming has become very popular. Therefore it's important to automate aquariums/ponds as it is difficult to check the conditions of an aquarium manually. During periodic intervals, water needs to be changed, the fish needs to be fed, the temperature, pH level and water level of the aquarium needs to be maintained. The project, 'Smart Aquarium' is developed using PLC (Programmable Logic Controller) and SCADA (Supervisory Control and Data Acquisition) to automatically control and maintain parameters such as temperature, pH, water level, lighting, feeding, and dissolved oxygen level.*

Keywords: *PLC, Aquarium. ,pH, temperature, lighting, level, feeder*

I. Introduction

Pet ownership has been increasing at a steady pace in the last 20 years. After cats and dogs, the most popular pet is now the freshwater fish. The maintenance of fish aquariums is a very difficult task itself. Whenever you have to clean up your aquarium or you have to feed, you have to do a lot of things. You have to turn off your aquarium's power head/air pump and feed manually and turn on the air again after an hour. The project with which we came up is Smart Aquarium, which is an automated fish aquarium. The project will be more efficient than the systems available in market, now days. In addition to the efficiency it will be of lower cost as well. The project's audience is the group of people interested to keep fishes at their homes or offices but don't have time to take care of, or they are worried to keep on asking their neighbors to take care of the fishes in their absence. The project is an automated system to take care of fishes. It will replace the manual maintenance of fish aquarium with its automated functions. It will monitor the physical changes in the water and will maintain it to the ideal conditions, with required changes. The aquarium will perform all the steps automatically like temperature control, pH control, monitor lighting, feeding, water renewal etc. The aim of our project is to replace manual maintenance of fish aquarium with an automated system which employs PLC.

II. Block Diagram



Out of the five parameters that is being controlled, lighting, pH and temperature is given as input to the microcontroller.The lighting to the fish tank is controlled by the microcontroller. The digital output of pH and temperature from the microcontroller is given as input to the PLC. Other inputs to the PLC includes float switches for level detection. According to the temperature that is set, the fan or bulb becomes on or off .The mototr is used to drive the feeder element.

III. Methodology

Different parameters are controlled according to different conditions. The various conditions are:
Condition 1: when temperature falls below 35 °C, the bulb is used to raise the temperature of the water. When temperature rises above 35 °C, fan is used to compensate for the temperature rise.
Condition 2: when pH value is not 7, display and buzzer in used to indicate the changes in pH.
Condition 3: Red, white and blue lighting is provided for growth of fishes and it is controlled by a timer.
Condition 4: Two float switches are used to detect and maintain water at an optimum level.
Condition 5: Automatic feeding is done at regular time intervals.

IV. Implementation

Project work is divided into two modules.
1. Analog Section
2. Digital section

Analog Section:
The analog section consists of:
- pH sensing
- Temperature sensing
- Lighting

The above mentioned parameters are the input to the microcontroller (ATmega 8).These are converted to digital values by ADC present in the microcontroller which is in turn fed to the input of the PLC.

Digital Section:
Its input section consists of:
- Level
- Output of microcontroller (temperature and pH)

Its output section consists of:
- Feeder control
- Temperature control (bulb and fan)
- Level control

V. Result

We have developed an automated aquarium which controls parameters such as temperature, pH, lighting, level. We have incorporated an automatic feeder and an aerator. 16x2 LCD module is used to display the values of the pH and temperature.

Fig 1: Smart Aquarium

VI. Conclusion

We started off the project with the aim to accomplish the simple looking task of designing an automatic aquarium. The basic idea proposed in this project works well and can be implemented on large scale industries like fish cultivation, commercial fisheries etc. Having a Smart Aquarium will save our time and we would not have to be worried for our fish and their aquariums for long time. Since PLC is used as the controller, many aquariums can be automated using a single PLC. Though we are able to achieve all the goals of our project but still we think that lots of advancement can be done on this project. For advancements, we need more time, money and hard work.

VII. Future Scope

As the aquarium needs 24/7 constant power to work, lots of power is consumed. So in order to reduce this, solar cells or panels can be used to get the constant power, which in case of any power failure doesn't stop the working of the aquarium. GSM module can be used for sending the report on the aquarist's cell number. Dead fish removal can be accomplished with the help of a robotic arm.It can be applied in the field of aquaponics, where water from an aquaculture system is fed to a hydroponic system and the by-products are broken down by nitrifying bacteria into nitrates and nitrites, which are utilized by the plants as nutrients, and the water is then re- circulated back to the aquaculture system.

Acknowledgement

We sincerely thank our department of Applied Electronics & Instrumentation, our project guide Mr..Prasanth Krishnan and project coordinators, Mr. Sreedeep Krishnan and Mr. Bibin Bhaskar for their immense support throughout the project.

References

[1]. *International Journal of Science and Research (IJSR) ISSN (Online):2319-7064 Impact Factor (2012): 3.358 Volume 3 Issue 9, September 2014* www.ijsr.net Licensed Under Creative Commons Attribution CC By Design and Control of Aquarium Water Management System using Programmable Logic Controller (PLC).

[2]. Development of Automatic Fish Feeder By Md. Nasir Uddin, Mm Rashid, Mg Mostafa, Belayet H, Sm Salam, Na Nithe, Mw Rahman & A Aziz, International Islamic University Malaysia

[3]. *International Journal of Advanced Research (2015), Volume 3, Issue 7, 1476-1481* Assessment Of Agrochemicals Residue In Fish Ponds In Agricultural Areas Of Ifugao Province Nelson Latap, Dr. Chiemela F. Anyanwu, Dr. Ricardo L. Ildefonso.

[4]. Fish farm management and microcontroller based aeration control system Moataz K El-Nemr1*, Mohamed K El-Nemr2 .Department of Agricultural Engineering, Faculty of Agriculture, Kafrelsheikh University, Egypt; Department of Electrical power and Machines Engineering, Faculty of Engineering, Tanta University, Egypt) March, 2013.

[5]. *World Journal of Agricultural Research, 2014, Vol. 2, No. 4, 176-182*Aquaculture Monitoring and Control Systems for Seaweed and Fish Farming Nitaigour Premchand Mahalik1,*, Kiseon Kim21Department of Industrial Technology, Jordan June 25, 2014; Revised August 08, 2014; Accepted August 15, 2014.

[6]. www.liveaquaria.com
[7]. www.algone.com
[8]. www.drsfostersmith.com
[9]. www.freshfromflorida.com