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Intelligent Aqua-tronix

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Abstract – *This paper presents the design & implementation of "Intelligent Aqua-tronix" which deals with the automation of fish pond and fish tank by effective utilization of electronic technology to maintain fish health, reduce labor work and enhance fish production. This system monitors the pond in time domain and takes necessary actions like feeding, the draining and refilling of water, water and temperature level monitoring, pH level measurement and water turbidity detection. While feeding can be done 3 to 4 times a day, draining and refilling of water is based on the condition of water. The temperature level & pH of the aquarium is critical to the survival of the fish and requires close monitoring. In order to fulfill the need of food its necessary increase the fish production and it can be achieved by the maintaining ponds condition at the appropriate level.*

Key Words: Fish production, Aquarium, user friendly, temperature, pH sensor, level, feeding, intelligent control, etc

1. INTRODUCTION

Aquarium offers a beautiful way to appreciate the beauty & diversity of aquatic lives. The popularity of the aquatic hobby has grown steadily over the years as people look to bring a piece of nature into their homes. Aquarium is a man-made ecosystem designed to grow and preserve aquatic life. The concept of aquaculture can be employed for domestic fish production so as to reduce the problems of malnutrition in an ever increasing human population especially in India. The dramatic growth of cities coupled with incessant migration emanating from rural-urban drift in India. As a result, this has brought with new challenges such as widespread and increasing urban food insecurity, malnutrition as well as poverty.

The traditional method of growing fish is not only labor intensive but time consuming and requires total attention. This does not permit part time in fish farming. Hence there is need to develop a system that will automate the process of maintaining aquaculture so that minimal supervision will be required in fish farming.

Growing public demand for a healthy, tasty and affordable food is stimulating "spark" in this industry.
The decline in wild fish populations as a result of overharvest and water pollution has promoted the culture of farm fresh that are grown in contaminant-free waters in indoor tank systems.

Fig -1: Residential fish tank

Fig -2: Commercial fish farming

1.1 Present Theory & Concept

Presently several ways are used in fish production. In this case advance irrigation is used and the water level of ponds is maintained to raise fish. The ponds build artificially are earthen ponds. In this case control of water quality is crucial. Fertilizing, clarifying is done manually, as long PH and oxygen levels at appropriate level the production is at high side. For study of present technology & pre assessment of project, we have visited many fish ponds. Those include *Government of Maharashtra's Fisheries plant at Rankala, Kolhapur* as well as *Ratnagiri*.

We observed the present ways that the workers manage the fish ponds. In household fish tanks also there is need to change water over a decided period. The water temperature control, lighting of aquarium environment, feeding of fish, draining and infilling of the aquarium tank are all need to control which is not possible manually.

Case study of present theory:

Fig -3: Fisheries Department of Maharashtra's Fishery Plant at Rankala

Fig -4: Fisheries Plant at Ratnagiri

2. DESCRIPTION OF INTELLIGENT AQUA-TRONIX

Fig.5 is the block diagram of proposed system. In this system aerator is used for availability of oxygen within the aquarium. The heater & the temperature sensors are used to regulate temperature within aquarium system. The inlet & outlet pumps are used for infilling & draining of water with delay of 3 to 4 days. The pH sensor is used to sense pH of water. The feeder is used to feed fishes 2 to 3 times a day. All theses assembly is controlled by the microcontroller via the intelligent interface.

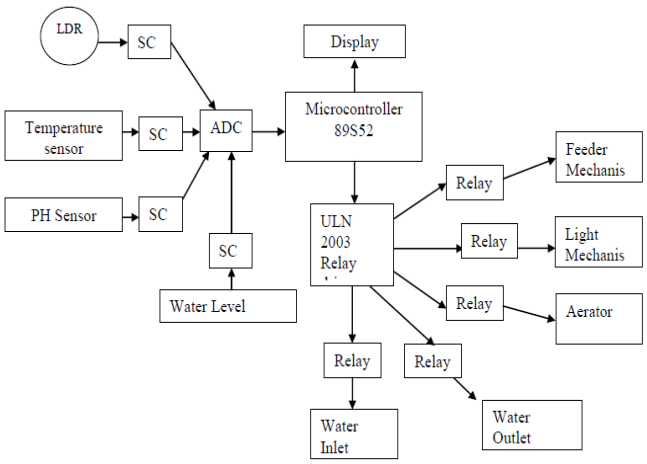

Fig -5: Block diagram of Intelligent Aqua-tronix

3. SYSTEM IMPLEMENTATION

The system comprises of hardware assembly and software system.

3.1 Key Steps Involved:

1. Measurement of area of land to be used for aquarium construction
2. Assembly of aquarium.
3. Implementation
4. Testing for proper functioning

3.2 Key factors of aquarium:

1. Heater and the temperature sensor- To regulate the temperature within the aquarium system. Platinum resistance thermometers offer excellent accuracy over a wide temperature range from –200 to +850 °C.

Fig -5: Pt100

2. Aerator- To ensure availability of oxygen within the aquarium.

Fig -6: Aerator

3. Inlet and outlet pumps- For infilling and draining of the system respectively.

4. Level sensor- To monitor water level in system especially during infilling and draining exercise.

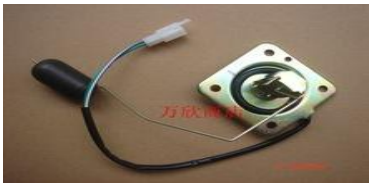

Fig -7: Level sensor

5. Dirty sensor- Enables microcontroller to change the water as at when due.

6. Feeder-For adequate feeding of the fishes.

7. Light sensor- To automate the lightning of the environment.

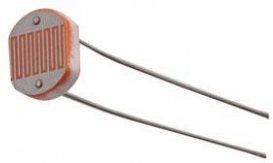

Fig -8: LDR

8. pH sensor- To measure pH of water

Fig -9: pH sensor

The output elements comprising the heater, feeder, aerator, inlet pump, outlet pump and LEDs are all controlled by the microcontroller through actuators via the smart interface.

9. LCD- To view data input to the controller via keypad

3.3 FLOW CHART

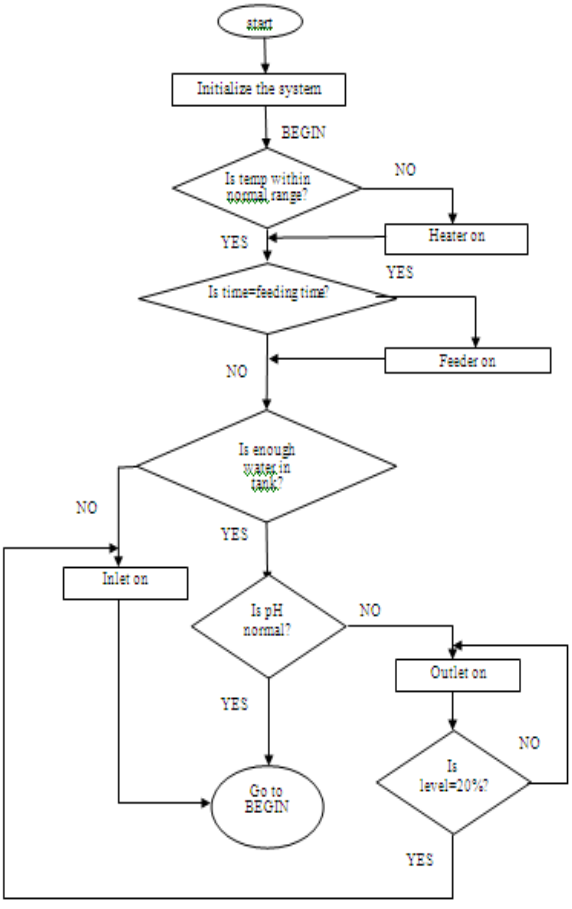

Fig -10: Flow chart

3.3 Software system

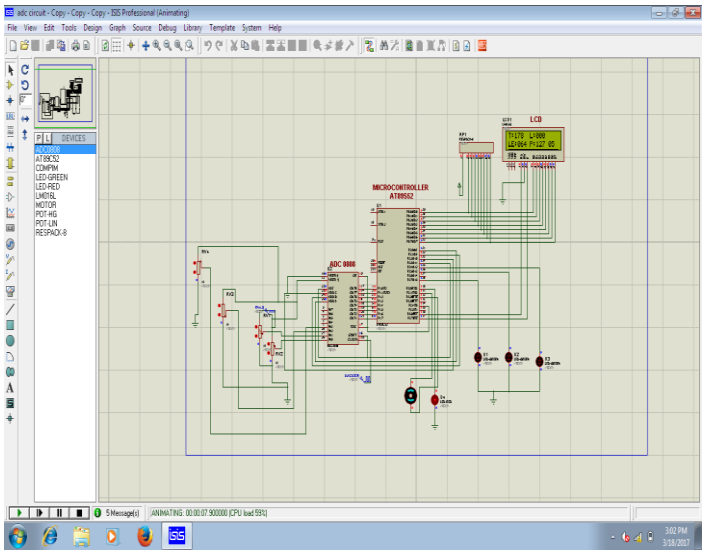

Fig -10: System simulation

3.4 Hardware implementation

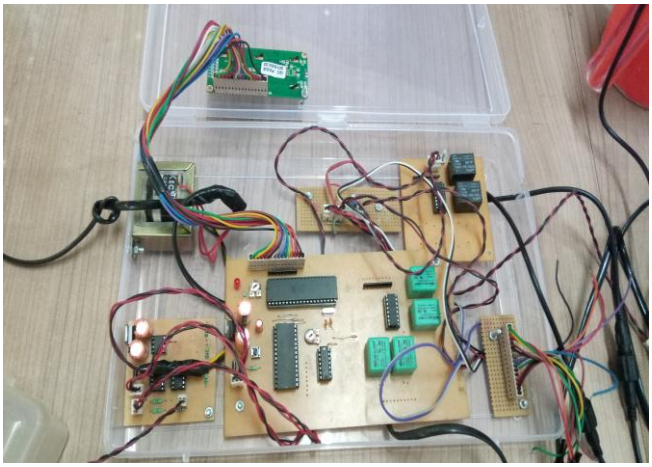

Fig -11: Hardware system

3. CONCLUSIONS

An intelligent user-friendly aquarium control system for efficient fish production has been described and implemented in this work using a prototype aquarium system.

This is referred to as *INTLLIGENT AQUA-TRONIX.*

The concept described can be explored for both domestic and commercial fish production particularly in both rural and urban regions of the Maharashtra environments as well in other states of the world.

Future work will focus on using linear programming technique to realize cost optimization in the proposed INTELLIGENT AQUA-TRONIX design framework for users.

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