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DESIGN AND IMPLEMENTATION OF AQUACULTURE MONITORING AND CONTROLLING SYSTEM USING IOT

X.Kishore Austeen[1], V.Harish Kumar[2], S.Venkatesan[3], R.M.Raghul[4]

[1234]*Panimalar Engineering College, Chennai, Department of ECE.*

Abstract – *This paper presents the design and implementation of aquaculture monitoring and controlling system using IOT. In this model, the temperature and pH level of the water in an aquarium is noted and updated in the cloud using IOT. The main aim of our project is to implement it in a prawn hatchery where the temperature and pH level has to be monitored frequently. This model will reduce the man power and human error in an aquaculture industry. The data that is updated in the cloud can be used in big data to analyze and predict the temperature and pH level in the upcoming seasons to make the required measurements. The temperature of the water is controlled using a heating mechanism (basically a heater) and a cooling mechanism (basically a chiller machine) automatically. If there is a change in the pH level, then a notification is sent to the user so that the required measurements can be taken manually.*

Key Words: **Temperature, pH level, Heating mechanism, Cooling mechanism, IOT, Aquaculture industry, Prawn hatchery.**

INTRODUCTION

In a prawn hatchery, the seeds (prawn hatchlings) has to be in a tank (or) aquarium for 12 days where it gets converted from naupli to postal larvae stage. During this period extensive care has to be taken. The seeds are very sensitive to diseases like UV bacteria, white spots, etc. To prevent these diseases, the main precaution that has to be taken is controlling the temperature. Usually it is done by monitoring the water temperature for every one hour using a thermometer and activating the heater manually to maintain the temperature between 32^0C – 34^0C. In this method there is a high possibility of human error. To overcome these possibilities of error, we have designed this system which will be monitoring the temperature and pH level of the water continuously and keep it updated in the cloud so that the data can be reviewed whenever needed as well as it sends a notification to the user as "STATUS ABNORMAL" so that if there is a change in the pH level, the required measurements can be taken manually. If the temperature decreases, the heating mechanism is activated automatically and if the temperature increases, the cooling mechanism is activated automatically. With the use of this system the temperature can be maintained more precisely so that it provides a much healthy and safe environment in a prawn hatchery.

LITERATURE REVIEW

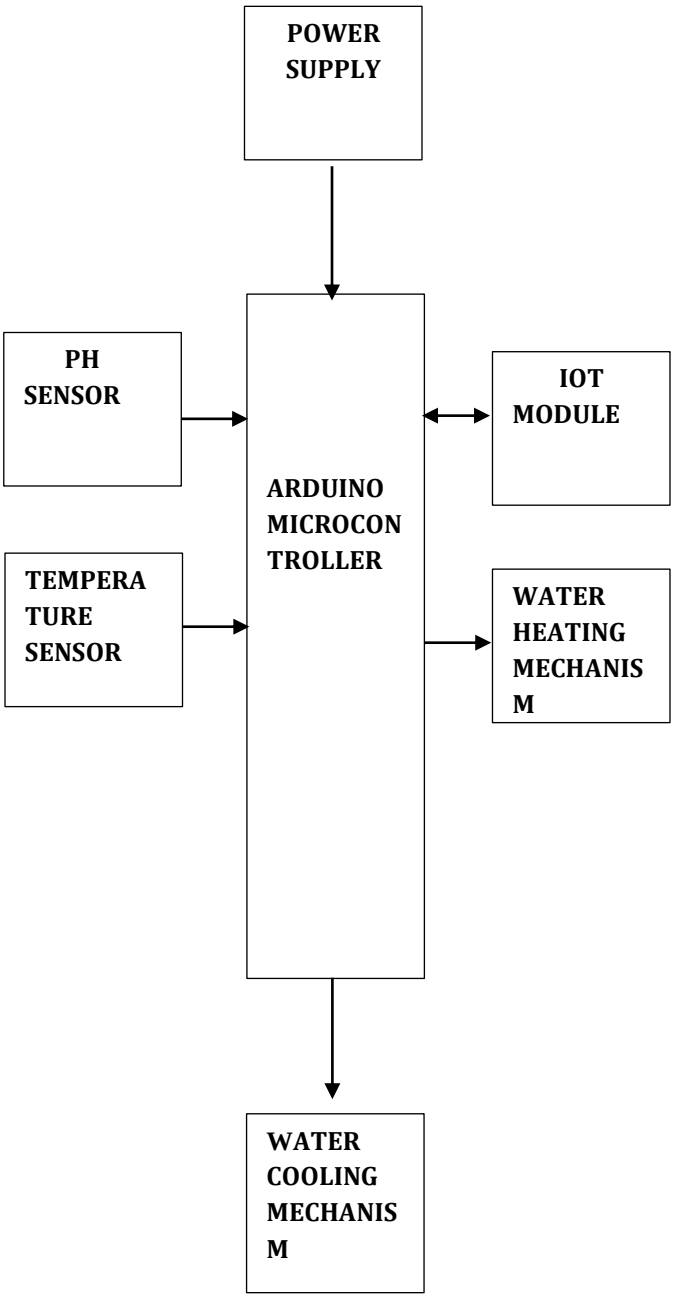
In the last few decades there is a considerable growth in the development of sensors and actuators. IoT in our perspective can be viewed as things-oriented since we have made use of sensors and actuators. It can make use of heterogeneous devices to collect various data and actuators can perform differently.[1] The efficiency of the model is based on analysis of the collected data accurately. Whatever data is collected at the controller must be compared with given parameter threshold values and intelligently analyze the environment and take the decision accordingly. [2] The system proposed by Luca Catarinucci et al. is to improve the efficiency of health care system. Their system uses a variety of sensors attached to the patient's body which gives various parameters like ECG, Blood Pressure, motion, temperature etc., are sent to the device using a wireless protocol (RFID). The device then constantly monitors the patient and helps in handling emergency cases immediately by notifying the doctors and nursing staff.[3] The author has described the use of IOT sensors to make the ordinary city a smart city. The various sensors continuously monitor various areas such as structural stress on the buildings, water and air quality, humidity, temperature, noise, traffic, city energy consumption, parking, etc. Their proposed architecture was implemented in the city Padova,

Italy. [4] The various parameters of the aquarium water used for analysis and favorable for growth of fishes have a threshold range. The controller should strictly monitor these parameters specified in the condition. If the value crosses any boundary it should be communicated with the user for immediate necessary actions. The values differ according to different parameters. [5][6][7] The "Internet" in the IoT is the link that connects and communicates with the user. The ZigBee protocol can be used by model to send the data to the controller and then wirelessly communicate to the user. The user can be informed about the status of various parameters collected by using internet as the medium.[8] IEEE802.15.4 specifies the standard ZigBee protocol which is used to create small area network with low power and low bandwidth. This protocol is basically used where the system architecture demands wireless connection and ZigBee is simpler and less costly than Bluetooth (IEEE 802.15.1) or Wi-Fi (IEEE 802.11).

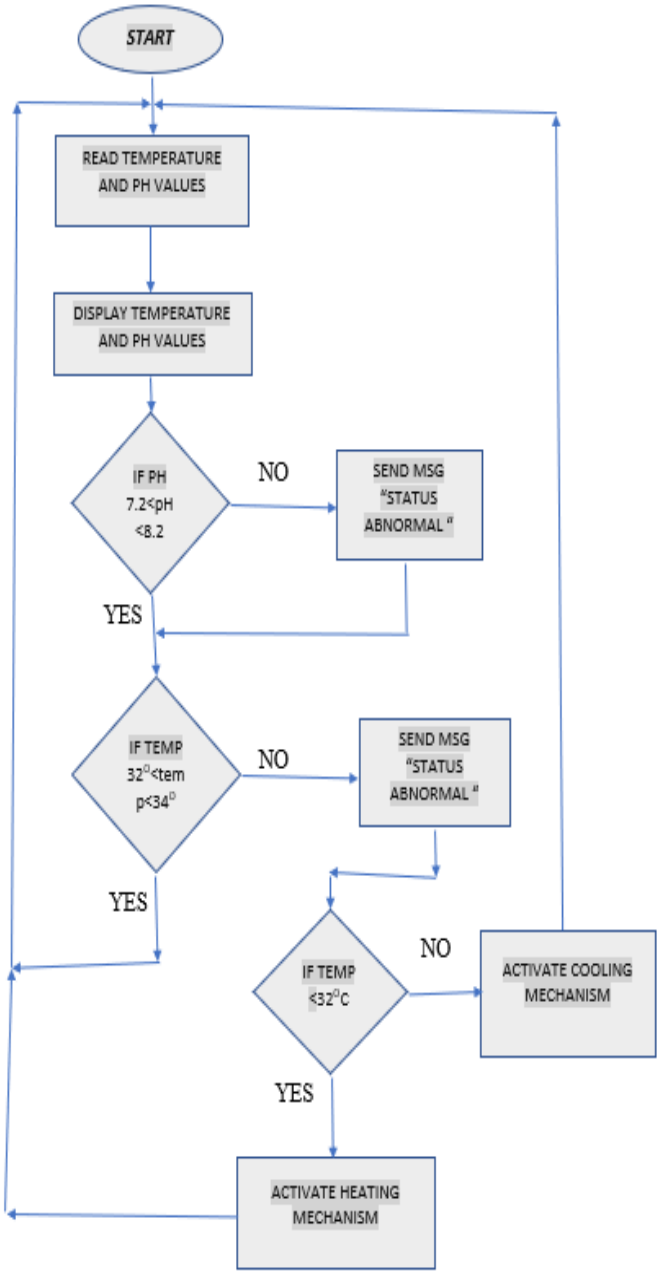
OBJECTIVE

The objective of this project is to create a controlled environment in an aquaculture industry by reducing the man power and human error as well as to monitor the aquarium from any part of the world.

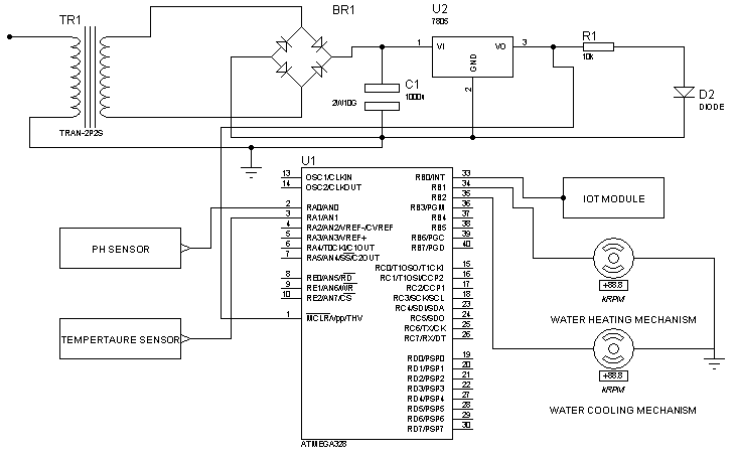
BLOCK DIAGRAM



FLOW CHART



CIRCUIT DIAGRAM



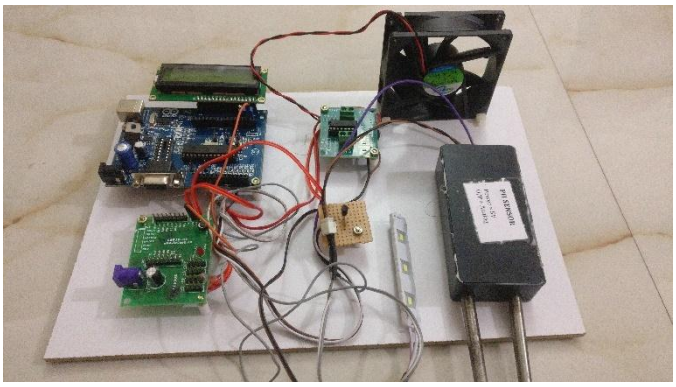


FIG. Prototype of the project.

HARDWARE TOOLS USED

- IOT module
- Power supply
- Micro controller
- PH sensor
- Temperature sensor
- Relay
- Water heating mechanism
- Water cooling mechanism

SOFTWARE TOOLS USED

- Embedded c
- Arduino ide

RESULTS

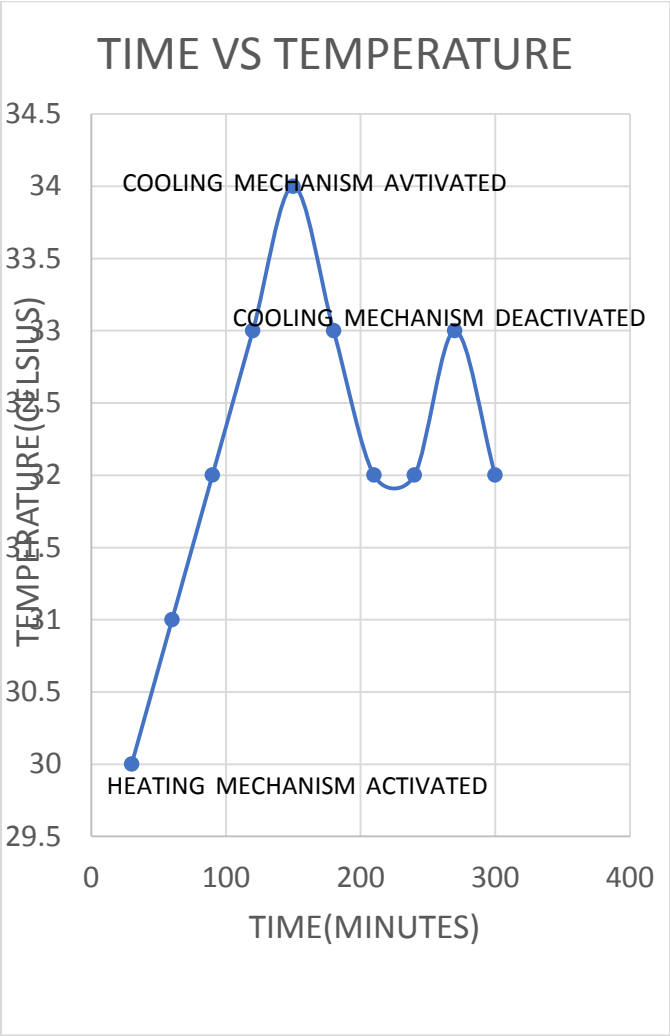


FIG. Graph on time vs temperature.

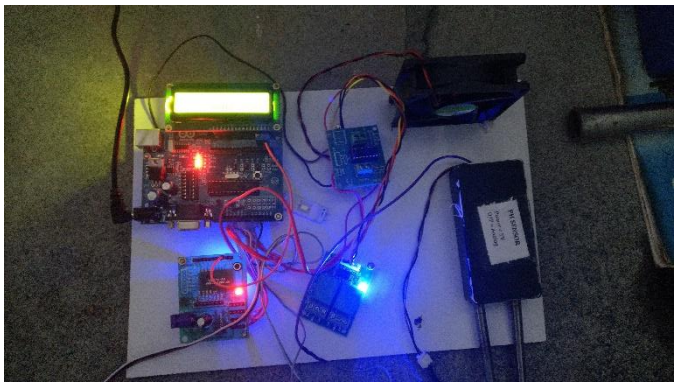


FIG. Working condition of the prototype

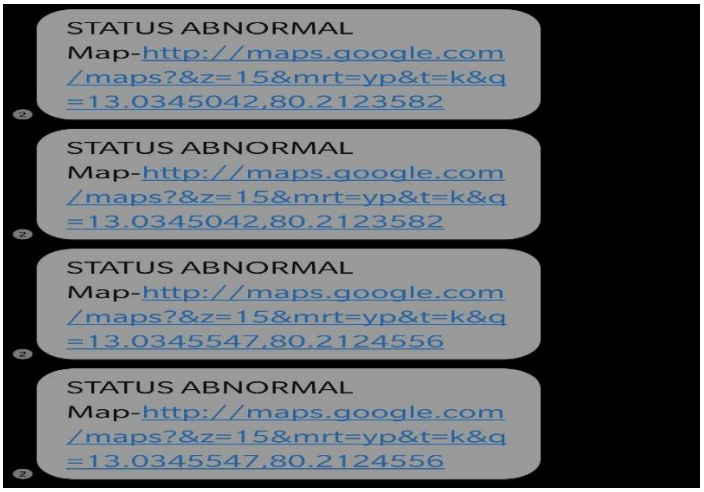


FIG. Notification to the user

CONCLUSION

By implementing this system, maximum productivity in an aquaculture industry can be obtained as it decreases the man power and human error. It provides a healthy and stable environment in a tank (or) aquarium in a prawn hatchery so that different kinds of diseases can be prevented and loss of seeds can be reduced drastically leading the company to a greater profit.

FUTURE SCOPE

In the future, these data can be used in big data to analyze and predict the changes in temperature and pH level during different seasons so that the required measurements can be made in advance.

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