Aqua Sensor Kit for Checking Dissolved Oxygen in Fish Pond

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Abstract:

The aqua farmers are facing many challenges through their manual checking procedures for mandatory parameters such as Dissolved Oxygen (DO), temperature, pH level, that affect the yield and life span of the fish or prawn/shrimp in fish ponds. The proposed Aqua Sensor Kit (ASK) paves a way for intelligent monitoring and controlling of the parameters. The ASK will monitor the three parameters in periodic manner (for every 30 minutes) set by the user and sent to the farmers (maximum 3 numbers) through SMS or web page. The DO decreased below a threshold level the fish or prawn will die, so the ASK will monitor continually by respective sensors and transfer the data to farmer, and also accordingly switch on the aerators to improve the DO levels and switch off the aerator when required DO level reached.

Keywords: Sensors, Arduino uno, LCD display, GSM module, IoT

I. INTRODUCTION

The aqua culture, Fish is the part of wealth and income for the country. These days there are a number of fishes which are dying due to the lack of oxygen levels and other criteria. Sometimes even the farmers are being a bit negligent towards their work due to which the fish ponds are being converted to barren land. Even though the farmers make use of aerators they sometimes due to overpower consumption of aerators the power supply increases which in turn is a loss for the farmers.

Technology is the tool which makes impossible to possible, virtual objects to real objects and much more dynamic things come to livelihood because of the technical advancements. So why not fishes be part of this mighty magic. To increase the productivity of fishes and to ease the farmers with the latest advancements for their comfort.

Priorities for food safety and quality have increased in the international fish trade. 80% of international fish exports to major fish importing countries in the world are conditioned to give more priority to their price quality. About 50% of fish exports originated in developing countries. They have less ability to spend money to take care of the quality of the fish as per their demand of the importing countries Fish quality management is very important as fish are susceptible to pathogenic organisms quickly [1].

Aquaculture in India has grown from a livelihood to an industry level. This transition was made possible by the development and standardization of new production methods and systems. There is a need to develop low cost technologies to reduce the cost of production without affecting the increased and demand yield. For this low cost materials from agricultural waste can be used. Various studies are conducted to improve the yield of ragandi fish like bio films by Patricia et.al [2].

India is the second largest producer of fish in the world and accounts for 6% of fish production. Recent developments in the fisheries industry have boosted production and productivity and increased fish exports. In addition, it has increased employment and improved welfare and socio-economic status for millions of people living in coastal areas. Although India has significant fish resources for breeding, seafood production still needs to be increased as it is depleted. Fish production has increased 6.5 times in the last two decades

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due to the freshwater aquaculture sector, which has reached about 95%. Our country's fish exports - value added, expansion of fisheries, - development of technological processing facilities [3].

II. LITERATURE SURVEY

In Andhra Pradesh many rice fields in Coastal areas are being converted into brakish water fish farms due to high remuneration for the last one decade. Farmers draw brackish water through creeks in to the land to an extent of about 5 to 8 km and stored millions of gallons of salt water on surface in big tanks leading to change in soil properties and also the coastal ecosystem which is known for its diversified plant and animal activities. Further, the area under shrimp farming in coastal districts of Andhra Pradesh increased so rapidly that it reached to an extent to as high as 1 lakh he consequence of it is that the adjoining cultivated fields are affected due to secondary salinization leading to reduction in crop yields. The worst phase of it is that the ground water get contaminated and habitats of coastal areas are deprive drinking water [4].

The ability to manipulate dissolved oxygen (DO) in a laboratory setting has significant application to investigate a number of ecological and organismal behavior questions. The protocol described here provides a simple, reproducible, and controlled method to manipulate DO to study behavioral response in aquatic organisms resulting from hypoxic and anoxic conditions. This technique and protocol were developed for direct application for aquatic macro invertebrates; however, small fish, amphibians, and other aquatic vertebrates could be easily substituted. It allows for easy manipulation of DO levels ranging from 2 mg/L to 11 mg/L with stability for up to a 5 min animal-observation period [5].

Groundwater in the study area is of hard, fresh and alkaline nature. Groundwater is almost globally important for human consumption as well as for the support of habitat and for maintaining the quality of base flow to rivers. Being naturally filtered in their passage through the ground, they are usually clear, colorless, and have excellent quality, being free from microbial contamination and require minimal treatment Unfortunately, it seems that we can no longer take high quality groundwater for granted, as a threat is now posed by an ever-increasing number of soluble chemicals from urban development, industrial activities and modern agricultural practices. There has been indiscriminate exploitation of groundwater resources in the Asian countries, particularly in India, leading to a decrease in groundwater potential, lowering of water table [6].

III. SYSTEM MODEL AND ASSUMPTIONS

The following models are studies to implement the proposed ASK to acquire the proper yield and ease the burden handled by the farmer.

Fish do not like any kind of changes in their environment. Any changes add stress to the fish and the larger and faster the changes, the greater the stress. So the maintenance of all the factors becomes very essential for getting maximum yield in a fish pond. Good water quality is characterized by adequate oxygen, proper temperature, transparency, limited levels of metabolites and other environmental factors affecting fish culture. The initial studies of water quality of a fish pond in India were probably conducted by Kelly and Pruthi [7].

After that many workers have studied the physico-chemical condition of inland waters either In relation to fish mortality or as part of general hydrological survey which covers, impact of Physico-chemical

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parameters on growth of indian major carps cultured in different ponds at krishna district, Andhra Pradesh, India. The details of various pond ecosystems also have been studied by workers. Bhatnagar and Singh studied the pond fish culture in relation to water quality in Haryana [8]. However, the present chapter would provide the basic guidelines, parameter wise for the fish farmers in obtaining high fish yield in low input via maintaining water quality of their ponds.

III. PROPOSED MODEL

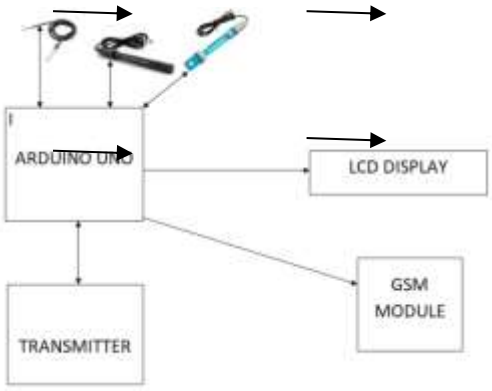
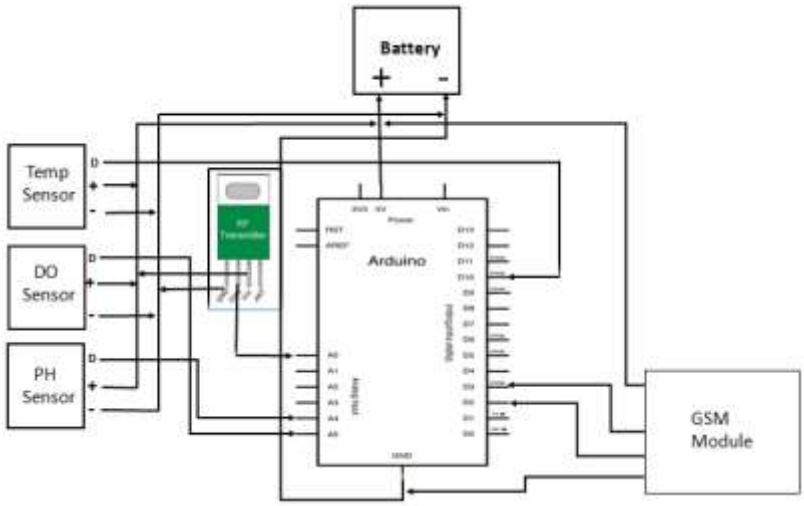


Figure: Block diagram of Aqua Sensor Kit(Above) (Below)Schematic diagram with Ardino UNO



The figure shows the block diagram of aqua sensor kit for checking dissolved oxygen. The ASK is the embedded sensor kit and it is a floating device such as a plastic water bottle of size 12 to 20 inches size. The core part of this devise is the IOT Technology which makes use of Arduino UNO.It has a analog and digital pins for taking the inputs and producing the output. The code can be dumped which is written in C language. The various elements of this devise is explained here under.

ARDUINO UNO

The Arduino Uno is an electronic device which takes the inputs from the sensors and sends the output to the GSM Module. The signals are collected by the sensors which run on the power system which is supplied from battery. Each sensor will function individually in non exclusive mode, and carry the signals continually to the users, here the farmers or field or aqua culture manager. In general the Arduino Uno kit specifically contains the pin for sensor connections and toggle switch and DC jack. The Uno kit has the capability of receiving signals from the sensors and send the data to the output devices such as mobile and networking computer system. It is advised to use 5V power supply that produces 2A power. The individual sensors are

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connected to the Uno kit at any specified pins. Arduino UNO is a friendly echoed system which allows the users to write the codes on their own according to the requirement of the user. Here the arduino is coded in C language for receiving and sending the sensor signals.

GSM MODEM

Global System for Mobile communications (GSM) was developed in bell laboratories and it exploded for widely use in mobile communication throughout the world. It uses the digital cellular technology to tramsit the mobile voice, further operates at 850,900, and 1800,1900 MHZ band widths, SM for its communication uses time division multiple access technique. It digitizes and reduces the data and send the reduced information through two different streams of client data with their own time slots. GSM contains mainly 2 components.

Mobile station: Mobile station is the one where the mobile phone which consists of the transceiver, the display and the processor and is controlled by a SIM card operating over the network.

Base station: Base station acts as an interface between the mobile station and the network subsystem. It consists of the Base Transciever Station which contains the radio transceivers and handles the protocols for communication with mobiles. It also consists of the Base Station Controller which controls the Base Transceiver station and acts as an interface between the mobile station and mobile switching center. Network subsystem: It provides the basic network connection to the mobile station. The basic part of the network subsystem is the mobile service switching center which provides access to different networks. It also consists of the home location register and the visitor location register which provides the call routing and roaming capabilities of GSM.

LCD DISPLAY

LCD (liquid crystal display) is the technology used for displays in notebook and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it.

The Liquid Crystal library allows you to control LCD displays that are compatible with the Hitachi HD44780 driver. There are many of them out there, and you can usually tell them by the 16-pin interface.

SENSORS

Sensor is a device module or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics. A sensors sensitivity indicates how much the sensors output changes when the input quantity being measured changes. Sensor converts the physical parameter into a signal which can be measured electrically, here we use three types of sensors namely DO sensor, ph sensor and temperature .

DO sensor is a measure of free oxygen molecules in water and can be used to perform a wide variety of experiments to determine changes in dissolved oxygen levels. DO in water comes from two main sources are atmosphere and photosynthesis .ph sensor is used to measure the ph value of water Temperature sensor is a device typically a thermocouple or RTD that provides for temperature measurement through an electrical signal.

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IV. RESULT AND DISCUSSION

A kit is designed for the use of checking the dissolved oxygen level, pH and DO in the fish ponds in regular interval of times set by the user. The kit consists of aerators and sensors which are the vital parts for bringing the proper values of the water in fish ponds. The image shown was taken while taking a trail of the sensor kit, where the farmer satisfied with the proposed hassle-free ASK. Based on this kit the farmer gets the detailed view of his fish pond like pH level of the fish pond, DO level of the fish pond and temperature of the pond. Upon seeing the values, the aerator gets on/off on its own without any manpower. For using the aerator the power supply is given to aerator through solar panel which is a direct means of sunlight and also the power consumption and cost of it reduced.

Technology intervention:

To maintain dissolved oxygen content to a threshold level, through Automatic sensor.

Implementation of IoT Technology and we are installing a dissolved oxygen sensor to send feedback to the user through an android app

Android application for real time monitoring of dissolved oxygen level in fish ponds.

Optimal oxygen supply to fish ponds makes it possible to maximize utilization of the given biological possibilities

CONCLUSION

The aqua project consists of the webpage and also the mobile application which is user friendly i.e the farmers can see the data of the DO, pH and temperature in both these applications and make use of them for the upbringing of their fishes and pond. The better the pond which contains oxygen the better fishes can grow so it very vital to check the oxygen levels and send the data every now and then. The user will be interacting the GUI(Graphical User Interface) so even an uneducated man can use this project in the most efficient manner.

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