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IOT based smart water monitoring system for Fish Farming Ponds

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Abstract *–Fish farming is a pisciculture involves raising fish commercially in tanks or enclosures such as fish ponds, usually for food. Thus fish farming of specific types of fish species requires certain conditions that have to be reached. The purpose of the current method is to create a safe and secure that helps the fish pond owners and aquatic planters in producing high quality fish by maintaining normal water levels in the fish tank. Therefore, monitoring and taking actions to maintain the habitat's sustainable environment for certain fish species inside of fishing ponds over distributed machine to machine communication, which will shorten the time needed for some basic actions, is the main motivation for this paper. In this paper we present an upgrade on a functional Internet of Things (IoT) system for monitoring fish farming ponds. The IoT system consists of various sensors that measure important factors of the water quality like temperature, light intensity or water level, as well as small board computer that processes the data and sends sound and visual notifications to the fish farming manager. Water quality parameters maintain balanced positions, culture is the basis for the health and development of living organisms. It is recommended to monitor and evaluate water quality parameters on a regular basis.*

Keywords: - Fish farming ponds, monitoring, temperature, pH sensor, and microcontroller.

I.INTRODUCTION

Users can afford a better lifestyle supported with better decision making with the help of IoT (Internet of things). Internet of things technology has taken the world by storm. Right from smart cars to smart cities to Smart home, devices are taking full control of sensing the environmental parameters to bring better monitoring and controlling capabilities to an ever connected users.

Aquaculture industry is one of the top industry which needs technology push because this is projected as one of an alternate source of income to boost employment by various state governments across India.

Our Pond Monitoring System has been designed and developed keeping the high risks associated with aquaculture farming in mind. With our real-time-monitoring capabilities, our Pond monitoring system gives a dramatic boost to the Aquaculture farming yield and productivity.

Fish farming pond is an artificial man-made eco-system and on the most basic level we can differentiate two types of ponds, ponds that breed tropical fish that are used as pets commonly known as aquariums instead of ponds, and ponds that breed fish for food. Our focus in this paper are the ponds that bread fish for food, typically build and maintained in remote eco-clean areas, near to water springs, and any outside environmental stress will negatively impact on the fish production. This is due to the fact that fish are cold-blooded animals that regulate their temperature directly by the surrounding environment. Consequently on this, temperature is one of the many key parameters that is needed to be monitored, combined with other important factors like light intensity, water level in the pond and etc.

II. LITERATURE REVIEW

S.No.	Title	Author	Findings	Remarks
1	Internet of Things (Iot) Based Smart Water Quality Monitoring System.	K. Spandana1*, V.R. Seshagiri Rao2	WSAN also known as wireless sensor and actuator network is a network consisting of distributed sensors to monitor physical or environmental conditions such as pressure, sound, temperature etc. This system includes a gateway that provides connectivity to the used world and distributed nodes, which can transfer the data through the network to main location. The modern networks are bidirectional in nature and enable the	The interfacing is done between the transducers and the sensor network on a single chip solution wirelessly using a WI-FI module. For the monitoring process the system is achieved with reliability and feasibility by verifying the four parameters of water. The time interval of monitoring

			sensor activity. This research ensures a safe supply of drinking water. This system consists of different water parameters. The data is processed by microcontroller. At last data from the sensors is viewed in the web server designed monitoring system for water quality.	can be changed depending upon the need. Ecological environment of water resources is protected in this research. The time is reduced and the cost is low in this environmental management.
2	IoT based water and soil quality monitoring system.	**Ganesh Babu Loganathan** Head of the Department, Department of Mechatronics Engineering, TishkInternationalUniversity, Erbil, Iraq, **Dr.E.Mohan** Principal, P.T.LEE. Chengalvaraya Naicker College of Engineering and Technology,Kanchipuram, Tamilnadu, India. **R.Siva Kumar** Research Scholar, Shri JJT University, Jhunjhunu, Rajasthan, India.	For testing water and soil quality a traditional technique is used to accumulate their samples and send to the work to check and break down. This system is tedious and not conservative. Through appropriate sensors the water quality is tested endlessly to get its actual character. In standard farming, development of the plants is used to continue and upgrade human life. In any case, that to boot respects less creation owing to absence of attentiveness regarding the land waterlessness, no opportune chemical uses and affordable harvests for the land. The Wi-fi module exchanges data gathered by the sensors to the controller, and exchanges the data to the computer. This system continuously monitoring thecontamination of the water assets, soil quality.	The pH rate of the soil and its temperature rate is monitored remotely and has been done with the very minimal cost. The regular updates provide knowledge about the field in terms of water content in the soil. It efficiently manages the energy and human resources. Wireless monitoring alongwith low power consumption makes it a useful system for the farmer to incorporate and use it inthe agricultural farm. IoT is changing the future of technologies and how objects behave around us.
3	Aquaculture monitoring and control system: An IoT based approach	Preetham K. preethamksjmp@gmail.com Siddaganga Institute of Technology, Tumakuru, Karnataka Mallikarjun B. C. mallikarjun_bc@sit.ac.in Siddaganga Institute of Technology, Tumakuru, Karnataka K. Umesh	Today Internet of Things (IoT) is one of the rapidly developing fields for giving social and financial points of interest. Currently IoT field is flourishing in areas like medical, agriculture, transportation, training, etc. IoT is of most importance because of aquaculture is a backward region of applied science. In contrast with other zones like agriculture, consequently, it's essential to determine the issues that are in this area with the assistance of technology. Water quality might be a basic issue, it mainly depends upon numerous parameters like dissolved	The aqua-farmers can be facilitated by the methodology executed for the precise and reliable observance of water parameters as compared to the actual fact that manual testing will take longer and water quality parameters could change with time. It additionally takes pro-active measures before any harm was done. Despite the fact that the primary

		a umesh kulmi11@gmail.com Siddaganga Institute of Technology, Tumakuru, Karnataka Mahesh F. M. mmutnalkar@gmail.com Siddaganga Institute of Technology, Tumakuru, Karnataka Neethan S. neethanskhadri@gmail.com Siddaganga Institute of Technology, Tumakuru, Karnataka	oxygen, carbonates, turbidity, ammonia, nitrates, salt, pH, temperature, etc. The proposed system continuously monitors the water quality parameter using sensors, the detected information is conveyed to the aqua-farmer mobile via the cloud. Accordingly, actions will be taken in time to reduce the losses and improve productivity. Among the issues, the slow latent period within the care of water quality, and therefore the wastage of resources like water, in cultivation are the necessary problems has to be addressed. The proposed system monitor the aquarium and uses the waste water from the aquarium to grow the plants, in turn, the pH and ammonia neutralized water from hydrogen clay pellets in grow bed is fed back to the aquarium.	cost is high, there will be no extra expense and maintenance once it is installed. Thus, the framework implemented will reach the farmers for reducing the harm from climatic changes and confirms growth and health for aquatic life. This improves productivity, helps in improving foreign trade and increases the GDP of the country. Moreover the gathered information can be inspected utilizing big data analytics and necessary steps can be taken before the water quality parameter crosses the edge value range. The aqua-system automated using IoT,

				decreases the energy labour cost and consumption.
4	Design and Implementation of IOT Based Real Time Monitoring System for Aquaculture using Raspberry Pi	Dr.M.S. Chavan , Mr.VishalP.Patil , SayaliChavan ,Sharikmasalat Sana ,ChailatliShinde	As said earlier Internet of things is one of the rapidly growing fields for delivering social and economic benefits, advancement in integrated on chip computers like Arduino, Raspberry pi the technology is reaching the ground level with its application in agriculture and aquaculture. Water quality is a critical factor while culturing aquatic organisms. It mainly depends on several parameters like dissolved oxygen,ammonia, pH, temperature, salt, nitrates, carbonates etc. The quality of water is monitored continuously with the help of sensors to ensure growth and survival of aquatic life. The sensed data is transferred to the aqua farmer mobile through cloud. As a result preventive measures can be taken in time to minimize the losses and	Due to sudden climatic fluctuation which leads to changes in water quality parameters wnw a days commercial aquaculture is facing many problems. Presently aqua farmers are depending on manual testing for knowing the parameters of water. This will consume time and inaccurate because water quality parameters may alter with time. By using automated farming systems allow the following benefits: 1) Origin of production close to the market demand 2) Improved environmental

			increase the productivity.	control 3) Reduced losses caused by major disasters 4) Reduced management environment.

III. MONITORING SYSTEM FOR FISH FARMING PONDS

The current system includes the Arduino Mega2560 [6] board one of the many small board computers, that consumes very low power and it is widely available. Connected to this control unit are various sensors for monitoring some of the parameters which can belabelled as input units, actuators such as relays that can be labelled as output units, executive units that affect some parameters, such as the heater and some interactive elements such as LEDs, buzzer, LCD display.

To sense the environment the IoT smart monitoring system includes several sensors and based on the readings from these sensors, the fish pond manager can make important decisions for improving the quality and quantity of the fish production. The temperature is the driving factor of all processes that happen in the fish pond. It not only affects the development and growth of the plants and other animals in the pond, but also regulates the oxygen level in the water. The optimal temperature for tropical fish is 25°C with allowed deviations of 2°C and for fish that live in rivers like the trout that temperature is too hot so the optimal temperature for it is around 14°C. Therefore there is a need to monitor and regulate this parameter through additional equipment. The monitoring is done by a waterproof digital temperature sensor with accuracy of ±0.5°C. Data is read from the sensor and depending on the values the board sends control values to the heating equipment. The regulation or heating of the water is done by an Omron GL3 205p1c Solid-StateRelay, which receives the control signal from the board and then turns off or on the heater. This kind of relay is used because it has a fast reaction time, it is electronic (there are no mechanical contacts as in standard relay) and it's more durable of the harassment done by the PID heating algorithm. Also in this parameter there is a heater element. All of the standard heaters for fish pond or aquariums have a thermostat built in, but in this system with the control of the heater from the board the risk from malfunction of this element is lowered multiple times.

To allow the fish to have a normal life cycle the light intensity in the fish breeding process is very important. With proper light intensity you are allowing the fish and the plants to have a normal life cycle. If you are breeding a fish type that is a natural occupant in that area where the pond is, the needs of light are automatically satisfied, but if you are breeding other types of fish you need to control it. It is important to determine what type if light is most suitable, in which intensity and the time interval. Basically you need to determine the day/night cycle. The lightning parameter affects the fish color, feeding habits, mating drive, orientation and territory placement, and also affects photosynthesis of the plants and the oxygen levels in the water. The most suitable "day" period in the ponds is between 10 and 12 hours, it can be longer but it can't be lower in any case. In our system we regulate the day-night cycle using RTC module (DS1302 RTC [8] which indicates the time and depend on it we switch on or off the light. We use LED for lightning and with a little more complex solution you can even control the LED intensity depending on the clock, you can have less bright light in the morning and evening and highest brightness during mid-day. Every change in the water level, either raising or lowering, it affects in a great manner the finishes in the pond and causes suitable reaction from them. The fish occupy some area of movement, feeding and relaxing, either at the bottom or at the top of the pond, and by lowering the water level that area shrinks and causes inadequate living conditions and may cause battle for survival among the fish. This is why we need to keep the amount of water at some constant level. The IoT monitoring and control system measures the water level in the pond using a simple magnetic float sensor, Water level sensors float switch P45 [9], which notifies the end-user when the water drops below our desired limit. Using a float sensor instead of the conventional electric sensor such as droplet depth detection sensor is much friendlier to the occupants of the pond because there is no water-electricity contact.

IV. METHODOLOGY

The following seven steps outline a simple and effective strategy for finding information for a research paper and documenting the sources you find. Depending on your topic and your familiarity with the library, you may need to rearrange or recycle these steps. Adapt this outline to your needs.

Step 1: Identify and Develop Your Topic- State your topic idea as a question. For example, if you are interested in finding out about use of alcoholic beverages by college students, you might pose the question, "What effect does use of alcoholic beverages have on the health of college students?" Identify the main concepts or keywords in your question. In this case they are alcoholic beverages, health, and college students. Test the main concepts or keywords in your topic by looking them up in the appropriate background sources or by using them as search terms in the Coastal Bend College Library catalogue and in online databases such as Literati or CINAHL. If you are finding too much information and too many sources, narrow your topic by using the AND operator: beer AND health AND college students, for example.

Step 2: Find Background Information- Once you have identified the main topic and keywords for your research, find one or more sources of background information to read. These sources will help you understand the broader context of your research and tell you in general terms what is known about your topic. The most common background sources are books and review articles.

Step 3: Use Catalogues to Find Books and Media- Use keyword searching for a narrow or complex search topic. Use subject searching for a broad subject. Print or write down the citation (author, title, etc.) and the location information (call number and library). Note the circulation status. When you pull the book from the shelf, scan the bibliography for additional sources. Watch for book-length bibliographies and annual reviews on your subject; they list citations to hundreds of books and articles in one subject area.

Step 4: Use Databases to Find Journal Articles- Use online databases to find citations to articles. Choose the database that best suits your particular topic; for example, search Literature Online for literary criticism topics, CINAHL for nursing topics, and Academic Search Complete for psychology topics. These databases and more are located on the library's website under Online Resources. If the full text is not linked in the database you are using, write down the citation from the database and search for the title of the journal in the Library Catalogue. The catalogue lists the print and electronic versions of journals.

Step 5: Find Internet Resources- Use search engines and subject directories to locate materials on the Web. As information on the Internet varies in its reliability, it is suggested that you use directories such as the Library's Delicious Links [organized by subject] or Google Scholar, which contains links to the library's resources when available.

Step 6: Evaluate What You find- You may be asked to utilize peer reviewed articles in your assignments. Many journals are peer reviewed, meaning that submitted articles are scrutinized by one or more experts in the field before they are published in the journal. Not all items in a peer reviewed journal have gone through this process, however. These items may include letters, editorials, news, and book reviews. Generally, only the primary articles, such as studies or review articles are peer reviewed.

V. CONCLUSION AND FUTURE SCOPE

Our Pond Monitoring System is a one stop solution to enable a technology led smart monitoring of your Ponds. You are in complete control of any unforeseen situation which can crop up if there is an unfavourable fluctuation in the critical parameter. With our next generation IOT technology, pond monitoring gets the necessary push towards productivity it deserves.In this paper we have presented water monitoring IoT smart system for managing and improve the fish productions in fish farming ponds. The current implemented system consists from the most vital sensors that are needed to monitor the water quality and notify the fish pond manager on-site.Current IoT system lacks the ability to process the data to the fish farming manager via any remote platform: web or mobile platform. However thanks to the great robustness of the Arduino platform, by using various expandable modules, the current system can be expanded using different types of modems.

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