DEVELOPMENT OF IOT BASED FISH MONITORING SYSTEM FOR AQUACULTURE  
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ABSTRACT
Aquaculture mainly refers to cultivating aquatic organisms providing suitable environments for various purposes, including, commercial, recreational, public purpose. This project aims to enhance the production of fish and maintain the aquatic environment of aquaculture in Bangladesh. This paper presents the way of using Internet of Things (IoT) based devices to monitor aquaculture's basic needs and help provide things needed for the fisheries. Using these devices, various parameters of water will be monitored for a better living environment for fish. These devices consist of some sensors that will detect the potential of Hydrogen(pH) level, the water temperature. An android-based mobile application has also been developed. In this system, farmers, fishermen, and people related to aquaculture will be the users of an android application.

Keywords: Aquaculture; Carrying Capacity; Ph Values; Fisheries; Intrinsic Growth Rate.

I. INTRODUCTION
Aquaculture is one of the prospering segments in developing countries like india as it contributes 1.07 percent of the GDP. It is found that fish necessity of the country by 2025 would be in terms of 1.6 crores tones and due to the overfishing regular fisheries have been drained therefore commercial aquaculture has been appeared. Aquaculture comprises the arrangement of exercises, information and methods for the rearing of underwater plants and a few types of animals in the water. This action has incredible significance in monetary advancement and food development. Constant checking of the physical, synthetic and organic guideline of lake and pond water helps not only to identify the control the negative states of aquaculture yet additionally to maintain a distance from natural harm and the breakdown of the production process. The observing of physical and substance factors like pH, Oxygen and temperature in water is crucial to keep up sufficient conditions and avoid unfortunate circumstances that cause the failure of aquaculture. As a result, a farmer need not hire workers at their site, consequently, drive down operating costs and improve efficiency.

II. LITERATURE SURVEY
1. Internet of Things(IoT) based Smart Water Quality Monitoring System
K.Spandana, proposed that the wireless sensor networks. WSANS which is used to monitor physical 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. The remarks found in this system is by using the WI-FI module the interfacing is done between transducers and the sensor networks on single chip For the monitoring process the system is achieved with reliability by verifying the four parameters of water.

2. IoT Based Water and Soil Quality Monitoring System
Ganesh babu, Proposed WI-Fi module which exchanges data gathered by the sensors to the controller and exchanges the data to the computer. This system continuously monitors contamination of water essents and soil quality. The remarks found in this system was, remote monitoring of the soil pH rate and its temperature, sensor rates were very high and it was done with the minimal cost. The regular intervals of updates which show the knowledge about the soil and water content did not perform well.

3. Aquaculture Monitoring and Control System: An IoT Based Approach
Preeta Mk proposed a system which continuously monitors the water quality parameter and detects the values and sends this information through the cloud. The main remark in this system was that it monitors
only aquariums, not ponds or lakes. Manual testing will take longer and the water quality parameters could not change with time. The primary cost is very high so these facts should be overcome which makes the farmers with no extra expense when it was implemented.

4. Design and Implementation of IoT based Real Time Monitoring System for Aquaculture using Raspberry Pi

Dr.M.chavan proposed the advancement in integrated chip in computers like Raspberry Pi which reaches the ground level with its application in agriculture and aquaculture ,it mainly depends on the parameters such as temperature and pH ,and they are checked by using the pH and temperature sensor. The main remark we can see in this system also manual testing takes too much time to verify the parameters and they are not taken in the regular intervals.

5. Initial Development of the Hybrid Aerial Underwater Robotic System: Internet of Things for Aquaculture Farms

Bing OuYang,paul S.wills proposed a team of collaborative aero-amphibious robotic sensing platforms integrated with water quality sensors; a land-based home station that can provide the automated charging and sensor cleaning ; and a backend processing center that includes a machine-learning monitoring system prediction model. Aquaculture, especially fish farming which plays a vital role in ensuring food security worldwide. However for fish farming to be sustainable and economically viable, drastic improvements to the current labor-intensive and resource-in efficient operations are required.

6. Development of an IoT Water Quality Monitoring System for Data Based Aquaculture Siting

Edward Olmedo, Mic proposed a similar IoT approach for aquaculture via a proposed water quality monitoring system with design features that are targeted for aquaculture sighting applications (i.e., shellfish fisheries). Currently available commercial measurements are often expensive, which limits the amount of measurement points that can be achieved at the given cost. In this paper software based tools are limited to accuracy and efficiency of measurement of data at particular point.

7. IoT Based Fish Stress Factor Monitoring System

Abdul Razza, Fahad saif proposed, composed of four sensors integrated with Arduino UNOs and the wireless modules for evaluating water parameters. Measured values are available through mobile application remotely. Sensor readings are compared with pond-specific parameters, the parameters used in this system can cause stress to fish in ponds and fish growth is disturbed by these stress factors.

8. Development of IoT-Based Fish Tank Monitoring System

Maria Gemel M.B proposed the development of fish Tank Monitoring System using the Internet of Things(IoT) which modules with the four sub systems water quality monitoring system video surveillance of the tank, on-demand of feeding machine and cloud data storage. During the evaluation, the calibrated sensors for water quality monitoring were shown as accurate. The aquaculture management system will be significantly improved with the adoption of recent technological advantages.

9. Development of an IoT-Based Aquaponics Monitoring and Connections System With Temperature-Controlled Greenhouse

Lean Karlo Tolon. S proposed a monitoring and automatic correction system for an aquaponics set-up in water. It also includes monitoring of pH level and Temperature of the recirculating water of the system and the canopy area of the plant. The manual testing of the data to check the results whether they are below or above the threshold level takes some time to verify the values.

10. An IoT-Based Smart Aquarium Monitoring System

Ahmad Kanal proposed a development of prototype of an IoT-based Smart Aquarium for fish life habitat. This system operates as fish feedings systems and controlled by the smartphone in its operation. Arduino MEGA and nodeMCU is used between the smartphone and the controller which control the operation. The system only considered for the water quality in the aquarium and it is not applicable to check for pond and sea water.
11. Internet of things enabled the real time water quality monitoring system

S.K. Geetha proposed model in this paper uses TICC3200 a controller with built in WI-FI module and dedicated ARM M-CU for wireless communication purpose. TI CG3200 reduces the complexity and improves speed of operation compared with controllers with external WI-FI module, but comparison of many microcontrollers and embedded components used make the results not to shown in an accurate manner, power consumption is also high in this system.

12. A survey of smart water quality monitoring system

Jian Hua Dong proposed this article showing the technologies for the smart water quality monitoring systems. They explored about three major subsystems, namely the data collection subsystem, the data transmission subsystem and the data transmission subsystem, they explore the selection of water quality parameters, existing technologies on online water quality monitoring identification of the locations of the sampling frequencies.

13. IoT based water quality monitoring system by using Zigbee protocol

Halima Haque, In this paper she dictates the damage caused by water and what can be done to resolve those issues by involving the Internet of things (IoT). This paper indicates the use of specific sensors that calculates the various parameters of the quality of water which includes Conductivity and the dissolved Oxygen. The values from the sensors have been measured and calculated using the micro controllers, then the processed remote values have been transmitted to the raspberry pi, the central controller which uses the Zigbee protocol.

14. Design of low-cost autonomous water quality monitoring system

Aravinda Rao, In this paper, he proposed a low-cost wireless water physiochemistry sensing system. The result indicates that with appropriate calibration, a reliable testing the monitoring system can be established. This will allow these catchment managers to continuously monitoring the quality water at higher spatial resolution than has previously been feasible, and to maintain this surveillance over an extended period of time, in helps to understand the behavior of aquaculture animals relative to water pollution using data analysis.

15. Design of smart sensors for real-time water quality monitoring

Neil Andre Cloete, In this paper he describes work that has been done on design and development of a water quality monitoring system. The system is able to measure the physiochemical parameters are used to detect water contaminants. The sensors, which are designed from first principles and implemented with a signal conditioning circuits, are connected to a microcontroller-based measuring node, which processes and analyzes the data.

III. PROPOSED SYSTEM

This paper proposes an IoT-based Aquaculture system to improve and monitor the quality of water for the fishing industry. In this research, the following important parameters have been considered such as: the suitable temperature and the pH level. It is believed that the proposed system will make the aquatic environment more profitable, productive and sustainable. This will make an enormous contribution to the health and economy of Tamilnadu. The government should take good care of this sector by investing, making strict environmental policies and creating are liable communication farmers, fisherman and other people related to this sector. To tackle the huge fish demand for the booming population in Bangladesh. Also, we need to focus on the things that are harming the aquatic environment for the proper development of the fish. For the whole research, the main concern was to secure fish health for more production of the fish. For this purpose, an IoT based fish monitoring system was build to check the elements measurements and ensure whether the fish are healthy and getting the all the necessary things for a happy life. By this system, Fisheries will know the pH level and temperature and provide the equipment to maintain equilibrium level. Thus the fish will grow healthy.

IV. RESULT

By studying the above literature surveys and research papers, this project represents an IoT (Internet of Things) based on the smart water quality monitoring system that aids in the continuous measurement of water condition based on the two parameters which are very important for measuring the water conditions i.e., pH and Temperature. 12V battery with switch is connected to the power supply Adapter. In power
supply adaptor, regulator is fixed to ensure a steady constant voltage supply which is 5V. Now power supply unit is connected to Node Mcu (esp8266) with base board. Resistor is inserted to adjust current flow and to divide the voltages, it connects to the temperature sensor and Node Mcu pH sensor is connected to the Node Mcu and power supply unit. In pH sensor, LDR and temperature sensors are inserted. Now the pH sensor and temperature sensor made to float in different types of water (pond, sea, tap) and detect the pollution in the water. Now these values are sent through wi-fi module which is attached to the Node Mcu, it enables the internet connectivity transfers the measured data from sensors to the cloud. This prototype is designed in such a way that it can monitors the number of pollutants in the water. It checks the temperature and potential of hydrogen level in the water and sends this information to further processing which is performed at a personal computer (PC). The obtained data is sent to the cloud by using IoT based ThinkSpeak application to monitor. The quality of water, now coming to pH for fish can tolerate in the range of 6.5 to 8, and temperature should be in the range of 75-80 degrees Fahrenheit (23-27 degrees Celsius) fish can’t survive in too cold water, when the values of pH and temp are above the threshold level automated changes is done in the excel sheet in the thinkspeak. The uniqueness of our proposed paper is to obtain the water monitoring system with high frequency, high mobility and low powered.

Fig 1: Circuit Connections

Fig 2: Working of Project

Fig 3: Result displayed in Think Speak website
V. CONCLUSION

The IoT incorporates several technologies such as the information technology, cognitive sciences, communication technology and low-power electronics. IoT have become a predictable trend of development of information industry, which certain to bring new changes to our lives. The aim of our project to give commercial aquaculture development includes a considerable number of commercial, biological, Engineering, precision measurement and calculation areas. Technological development can produce more accurate control and higher economic efficiency. This article discussed physical measures such as temperature level, pH value using A/D signal processing, via wireless transfer to the terminal server.

VI. REFERENCES