ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ
VISVESVARAYA TECHNOLOGICAL UNIVERSITY - BELAGAVI

A
Technical Seminar Report
on

"IOT BASED AUTOMATED FISH FARM AQUACULTURE MONITORING SYSTEM"

Submitted in the partial fulfillment for the award of
Bachelor of Engineering
in
Computer Science and Engineering

Submitted by

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2022-23

GOVERNMENT ENGINEERING COLLEGE

TALAKAL – 583238, KOPPAL

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Certificate

This is to certify that the Technical seminar work entitled **"IOT BASED AUTOMATED FISH FARM AQUACULTURE MONITORING SYSTEM" carried** out by **DEEPA S WADKAR** bearing the **USN 2LG20CS404** Bonafede student of Government Engineering College, Talakal in partial fulfillment for the award of Bachelor of Engineering in Computer Science and Engineering of the Visvesvaraya Technological University, Belgaum during the year 2022-2023. The seminar report has been approved as it satisfies the academic requirements in respect of seminar work prescribed for the said Degree.

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ACKNOWLEDGEMENT

The completion of any Technical Seminar Presentation brings with it a sense of satisfaction, but it is never complete without thanking those people who made it possible and whose constant support has crowned our efforts with success.

I would Specially thank my Technical Seminar Guide **Asst Prof. Tejaswini Eshwar Achar,** Department of Computer Science and Engineering for their expert guidance, encouragement and valuable suggestion at every step.

I would also like to thank **Asst Prof. Tejaswini EshwarAchar** , Technical Seminar Coordinator Department of Computer Science and Engineering for giving continuous support and guidance to carry outthe technical seminar.

I would also like to express my gratitude to **Prof. Veeresh**, Head of the Department ofComputer Science and Engineering for encouraging and inspiring me to carry out the technicalseminar in the Department.

I would also like to thank **Dr. Rajashekar U**, Principal of Government Engineering College, Talakal for Continuous Support and Constant Encouragement in the esteemedinstitution.

I would also like to thank all the Staff members of Department of Computer Science and Engineering for their encouragement and valuable suggestions.

I am extremely happy to acknowledge and express my sincere gratitude to our friendswho gave us constant support and encouragement and well wishers for their help andcooperation.

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ABSTRACT

Internet of Things (IoT) is a very fast growing technology and the field of IoT is extending its wings in everyone of the areas today. With the progression in computers like Arduino, Raspberry pi, the innovation is achieving the ground level with its application in farming and aquaculture. In this work, we have outlined and actualized monitoring of water quality of aquaculture utilizing RaspberryPi, Arduino, various Sensors, Smartphone Camera and Android application. Water quality parameters used in this work are Temperature, pH, Electrical Conductivity and Colour. Sensor acquisition is conducted by Arduino and Raspberry Pi is used as data processing device as well as server. Photo acquisition is also performed by Raspberry Pi with the help of the smartphone camera to detect the colour of the water. Android phone is used as the terminal device. A user can monitor the water condition using an android app through Wi-Fi within Wi-Fi range and through Internet from anywhere in the world. Some analysis is performed with the four parameters value to determine the overall approximate condition of the water and required action. Every feature in this checking gadget can work legitimately and easily.

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CHAPTER 1

INTRODUCTION

Aquaculture is one of the thriving areas in many countries in the world since demand for fish andthe fish prepared food is expanding day by day. According to The United Nations Food and Agriculture Organization (UNFAO) "2012 State of World Fisheries and Aquaculture ", Worldwide yearly production of fishery items add up to around 128 million tons. The animal protein intake per individual is about 15% and increase the human reliance on fishery resources. The average consumption of fish products is 19 to 20 kg per person per year today and will be 16.7kg per year in 2030 according to UNFAO.

Production of fisheries, advancement and future food needs are firmly related. Aquaculture comprises of the set of exercises, information and techniques for the rearing of aquatic plants anda few animal groups. This activity has an awesome significance in financial improvement and foodproduction. Commercial aquaculture is confronting numerous issues because of sudden climatic vacillation leading to changes in water quality parameters. Aqua farmers are relying upon manualtesting for knowing the condition of the various parameters of the water. But this manual testing is time consuming and also give inappropriate results as parameters for measuring water quality changes continuously.

It will be better if automatic monitoring can be done somehow. So modern technology should be brought to aquaculture to overcome this problem. For rural development, technologies have to support several key application areas, for example, living quality, wellbeing, environmental change etc. So we have to be more selective in choosing the appropriate technologies for this kindof advancement. The model proposed in this work will assist the fish farmers in monitoring fish ponds using IoT. Integrating sensor and internet technology in combination with a user-friendly interaction interface smartphone application, desktop application, and web services to provide real-time monitoring of fish ponds; system database contributes significantly to reducing the risk of losses and improving efficiency. GSM modem is also used which reduces internet consumption. Internet is the main issue while former in the field area.

CHAPTER 2

EXISTING SYSTEM

In previous systems, an automatic system for automated fish farming where they monitor the water temperature, pH and water level, using Wi-Fi remote connection, which might be a drag for systemsthat are placed faraway from areas where cellular or any sort of internet connection is out there . In order to address this problem, another system a GSM type of notification by sending SMS messagesto the end-user. One disadvantage of this proposed system, is that the process of notification to the end-user after specific time intervals or after a particular parameter value is reached, and not in real-time. The pH is a ration of the hydrogen ion concentration and designates whether the water is acidic or basic in reaction. Phytoplankton and other marine plant life eliminate carbon dioxide from the water during photosynthesis, so the pH water body increases during the day and drops during the night. Waters with low aggregate alkalinity regularly have pH estimations of 6 to 7.5 preceding sunrise, however when phytoplankton development is substantial, at evening pH esteems may ascend to 10 or significantly higher. The pH of natural waters is significantly impacted by the convergence of carbon dioxide which is an acidic gas. pH changes in pond water are for the most part affected via carbon dioxide and ions in harmony with it. Control of pH is necessary for diminishing ammonia and H2S poisonousness.

CHAPTER 3

PROPOSED SYSTEM

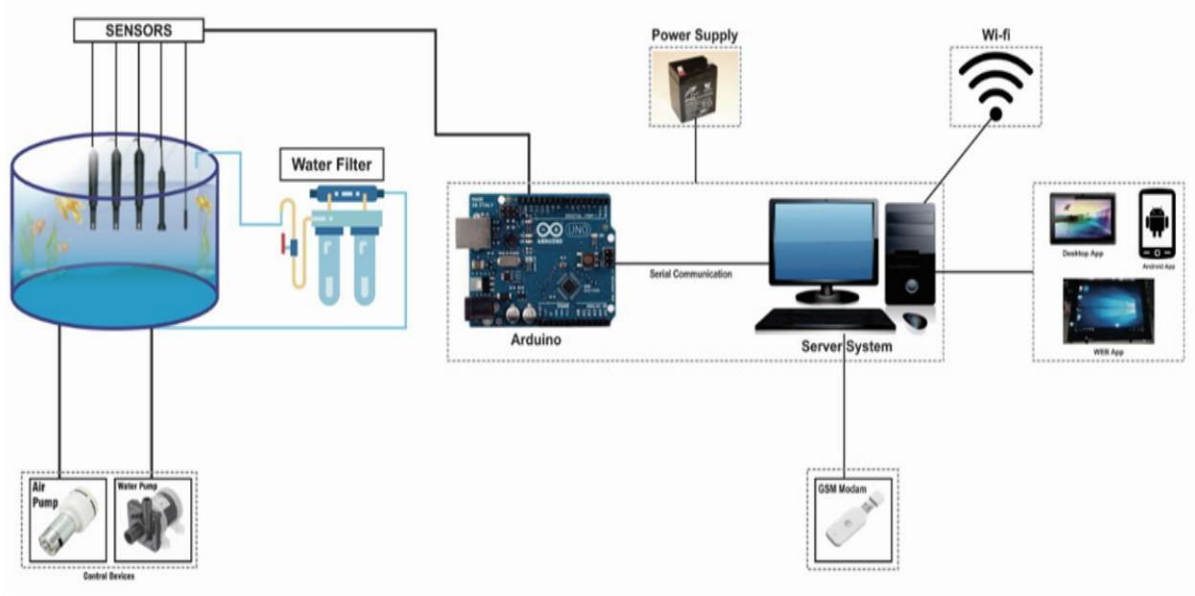

Fig 3.1: Workflow Proposed Model

The proposed model primarily focuses on the continuous monitoring of parameters of water quality from time to time, to take inhibitory measures for avoiding the actual damages in inhospitable environment. Proposed architecture uses different sensors (Temperature, PH water level, Turbidity, Motion detection). These sensors are configured with Arduino Uno for sensing and observing measurements in aquatic environment. Arduino Uno a low cost small computer board used as controller hub comprises with various analog and digital pins and operated with Arduino IDE software for interaction with computer system with controller using serial port. The proposed desktop application provides directly view to analyze the measurements and daily basis reports. For remote monitoring android application and web based application are proposed with interactive GUI (Graphic User Interface) provides services for a user to monitor the aquatic field. Motor pump and air pump is also working automatically using actuator relays. embedded with GSM modem in provide services as system alert which sends the notification to farmer if the aquatic pond is in critical condition.

CHAPTER 4

ADVANTAGES AND DISADVANTAGES

4.1 ADVANTAGES

- Remote Monitoring: One of the primary advantages of an IoT-based automated fish farm aquaculture monitoring system is that it allows remote monitoring of the farm. The system can be accessed from any location, allowing the farmer to keep an eye on the farm's activities in real-time.

- Increased Efficiency. With an automated monitoring system, the farmer can monitor the fish farm's conditions more efficiently, reducing the need for manual labor. The system can also be set up to perform various tasks automatically, such as feeding the fish, adjusting water temperature, and controlling the lighting.

- Improved Water Quality: Maintaining good water quality is essential for the health of the fish. With an IoT-based automated monitoring system, the farmer can monitor water quality parameters, such as pH, temperature, and dissolved oxygen levels, and make adjustments as necessary to maintain optimal conditions.

- Early Detection of Issues: With real-time monitoring, the farmer can quickly detect any issues that arise, such as changes in water quality or disease outbreaks. Early detection allows for prompt action to be taken, preventing significant losses.

- Reduced Costs: An automated monitoring system can help reduce labor costs by reducing the need for manual labor. It can also help reduce the cost of feed and energy by optimizing feed and water usage.

- Increased Production: With improved monitoring and management of the fish farm, the farmer can optimize conditions to maximize production. This can lead to higher yields and increased profits.

4.2 DISADVANTAGES

- High initial investment: Setting up an automated monitoring system can be expensive, especially if it involves purchasing new equipment or retrofitting an existing system.

- Dependence on technology: An IoT-based automated system requires a reliable internet connection, as well as reliable sensors and equipment. If any of these components fail, the system may not work correctly, which could result in losses.

- Cybersecurity Risks: As an IoT-based system relies on internet connectivity, it can also be vulnerable to cyber attacks. Without adequate security measures, such as firewalls and regular software updates, the system can be compromised, leading to loss of data or control of the system by unauthorized parties.

- Technical Expertise: Setting up and maintaining an IoT-based automated monitoring system requires technical expertise, which may not be readily available or affordable for some fish farmers.

- Maintenance and Upkeep: An automated monitoring system requires regular maintenance and upkeep to ensure it remains operational and accurate.

CHAPTER 5

APPLICATIONS

- Sensors: Analog pH Sensor for Arduino (SEN0161) from Dfrobot is used to measure pH of water in this work. This pH sensor is specially intended for Arduino and has built-inconvenient connection and features. A BNC connector is required to connect the sensor withArduino. The range of this sensor is 0-14 pH. It has an accuracy of ±0.1 pH at a standard temperature of 25ºC and operating temperature range is 0-60°C.

- Arduino: As the sensors we use in this work are specially designed for Arduino, we use Arduino for sensor acquisition. Our Arduino version is Arduino Uno. Arduino Uno is a microcontroller board which is based on the AT mega328P. It has 6 analog input pins and 14 digital input/output pins. Its operating voltage is 5V and recommended input voltage range is 7-12V.

- Raspberry Pi: The central processing unit of this work is Raspberry Pi3. which is the heart of this system. Raspberry pi3 is small, low cost computer board using Noobs, a Debian version of the Linux operating system. It has higher speed and number of processor core than previous versions of Raspberry pi. It has already inbuilt Wi-Fi and Bluetooth. Raspberry pi can conduct serial data communication with Arduino as it is a small computer.

- Android Smartphone with MTP: Any android smartphone with Media Transfer Protocol (MTP) can be used in this purpose. MTP permits media files to be exchanged atomically to and from portable devices.

- Dataplicity Service: If Dataplicity Agent is installed on our device (Raspberry pi), it will sharply set up and keep up a secure HTTPS association with the Dataplicity IoT Router. We can access our Raspberry pi covered by Dataplicity anywhere as it has a viable internet connection.

CONCLUSION

This work designs and implements a unique aquaculture monitoring system based on IoT. Both Wi-Fi and Internet are combined in this system for convenience. This work finds a way to give better result with low cost than other available systems. Aqua farmers can avoid time consuming manual testing now. This will help the aqua farmers to produce more number of fishes which will help to fulfil the demand for fish. Though we have created a system to control a demo aeration system, more actuators such as heating rods, fish feeder etc. will be integrated to this system. We will develop a better way to capture image and use better image processing techniques to provide better result.

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