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Water Quality Data Transfer and Monitoring System in IOT Environment : A Survey

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ABSTRACT

Habitually water quality monitoring commands to manually accumulation of water representations and Commission to the lab for examining and investigating. To conquer this laborious culmination and to promote a low-potential, low-cost and configurable system to guarantee water quality for secured drinking water to the environment. The system which can be utilized in a distant area to assemble the information concerning, water level, water PH, water temperature, and carbon dioxide quantity present in water. In this paper, we are achieving a system for monitoring the water quality and accommodating innovative technologies such as IoT (Internet of Things), WSN's (Wireless sensor network) and communication pattern. This reconfigurable water quality monitoring system lives of water parameter Sensors, an ARM-based microcontroller (STM32 Nucleo), ZigBee communication module and a personal computer. The ARM-based microcontroller board (STM32 Nucleo) is programmed on STM32CubeMX software in C programming language. simultaneously we are collecting four parameters of water such as Water temperature, Water PH, the water level in real time and carbon dioxide present in water. ZigBee protocol is used for isolated position data transfer from a microcontroller to devoted computers, which will be factoring the captured data in a graphical plot.

Keywords: IoT (Internet of Things), Sensors, ARM-based Microcontroller, ZigBee.

I. INTRODUCTION

To achieve individual as well as the professional assignment on the periodic basis, we are using broadcast information technologies and Wireless Sensor Networks. Rendering safe drinking water and different application of wireless technologies need the help of data procurement, environmental monitoring systems and computerization of the different process. Nowadays, we have lots of services like easy establishment and preservation, low expense, low horsepower. The sensor is at the isolated finding adopted for the mobile sensor interface. The sensor network is commonly used in the reinforcement at Smart home, Smart City, environmental monitoring, fishing surveillance, traffic management, research in agriculture, forestry management, remote healthcare, disaster restriction [2]. Wireless Sensor Network consists if Signal processing involves, signal conversion from analog to digital, Sensors bulge which will sense data of equipment and Connectivity [4]. Our system will be used for the intercommunication between individual or computers and the atmosphere through wireless transmission loops [5].

Wireless Sensor Networks incorporates signal processing, connectivity, planted computing, sensor nodes for sensing, [7].The proposed system will facilitate the synergy of persons and processors as well as the encompassing environment by wireless media [4].Aquaculture is the wireless sensors networks comprised of a huge number of individual-organized sensors stationed in a monitoring range that recognize, assemble, broadcast and process information from superintended objects from the area embraced in a coordinated fashion. These networks have a very important investment value, with the connected expansion of wireless sensors networks, more and more; realms and organizations of the software showed great enthusiasm [5]. Wireless Sensor Networks basically were used in manufacturing employment and soldiery but today's complex applications are used for various businesses from light to heavy -mechanical

applications. Wireless Sensor Networks has authorized system user control and monitor connected devices to sense the data through various wireless transmission standards like Radio Frequency Identification (RFID), General Packet Radio Service (GPRS), Wi-Fi, Bluetooth, cellular technologies, and ZigBee.

Superfluous data retrieval, exclusive monitoring, high monitoring exactness, low charge cycle, extended coverage area, fast network substantiation and low power dissipation are different accounts of Wireless Sensor Networks. The production and development in microcontrollers, electronics, digital systems, Information Technology, Microelectronics and Telecommunications, we saw the fast evolution of information systems as well as mobile administrations for the control and surveillance [6]. In the current contemporaries of mobile technology and the interconnectivity between materials, our concept of the Internet of Things (IoT) is born, which include the presentation and interconnectivity with several objects [8]. The Wireless Sensor Networks in the real world is endless from environmental monitoring, environmental preservation, weather variations, tracking, localization, positioning and so on.

The Internet of Things (IoT) was extended with Wireless Sensor Networks as well as the environmental network which combines different module to reciprocate the knowledge and data by sensors which are the sensing accessories, actuators, and processors. The system is the consolidation of things which are connected into networks arrangements. The object is monitoring, pursuing, establishing, commanding, recognizing and sensible things all are achieved by the Internet of Things (IoT) [9]. Design of a real-time water quality determination system using Intel microcontroller, Global System for Mobile interfaces module miscellaneous water quality measuring sensors, analogue to digital and a liquid brilliant display. Microcontrollers consist of complex construction, the extension time and cost.

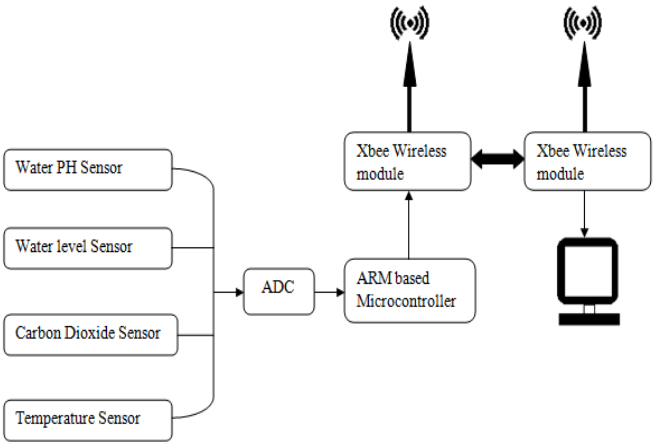

Figure 1. The block diagram of water quality monitoring system.

Design of an autonomous authentic-time invention to measure the physical and biochemical parameters of water such as water pH, water temperature, and water turbidity using ZigBee-wireless module and Arduino at mega microcontroller by Beri [14]. The investigation should be conducted for construction in many energy-constrained sensor connections in a remote locale. So, a low-horsepower, low-cost, single-chip fully desegregated self-governing Arrangement on- Chip based wireless sensor junction is compelled to resolve these difficulties. The smart water quality monitoring system consists of a combination of sensors to observe the diverse water parameters such as water pH, water temperature, carbon dioxide (CO2) present in water, water level. Originally, the sensors distinguish the various water parameters, then the data is measured on STM32 Nucleo is programmed in C programming language using the STM32CubeMX software.

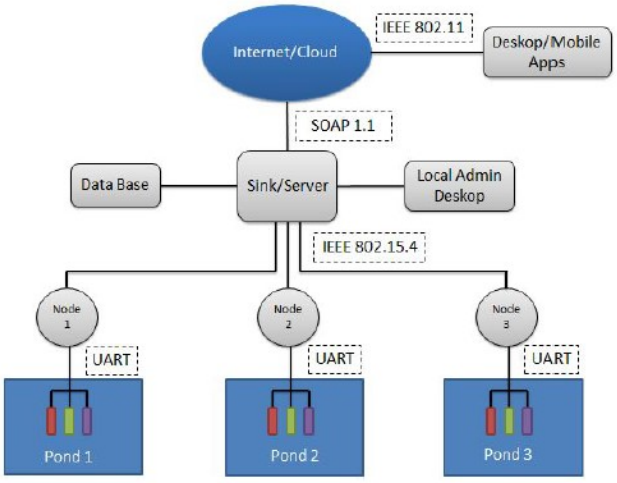

Figure 2. The block diagram of water quality monitoring system

Within the block diagram of the smart proposed water quality monitoring system is shown in Fig. 1. After that, the computed data is transported via ZigBee wireless transmission module to the terminal position where the user can procure and observe the water parameters. Fig. 2 represent the system architecture of water quality monitoring system used now a day.

II. RELATED WORK

Reviewing the associated works in the selected subject to identify the most significant point. Recognizing opportunity that is in the state of the art of this type of methods.

The work accommodated on the document designated as Design and deployment of wireless sensor networks for aquaculture monitoring and control based on virtual instruments [3] describing a system based on sensor interfaces and data directions for real-time aquaculture monitoring. The system comprises nodes that capture the water ph., water temperature and dissolved oxygen in the water. These nodes send the information to an administrator and this conveys the learning to a computer for visualization. This system helps to conquer the elevated risk of bion destruction through continuous monitoring of the water parameters.

Paper on water quality in aquaculture ponds is mentioned in the statement A Mobile Platform for Remote Monitoring of Water Quality on Live Fish Transport Containers [4]. The mobile sensor platform for monitoring millponds. This system consists of sensing node of each millpond connected to a cesspool; this sends the information to a mobile statement for visualization. This information is dispatched via GSM / 3G to the Internet, stored in a database. Monitoring displayed excellently. In future operations, it is intended to integrate artificial intelligence into the system to optimize and improve the functionality.

The author accomplished a work which is empowered Dynamic Monitoring Based on Wireless Sensor Networks of IoT [5]. The writing comprises a system that consolidates the Internet of Things(IoT) with aquaculture monitoring arrangements showing an algorithm for the sampling of information collected by the sensor in aquaculture and optimize the potential devastation in the networks of Sensors. An algorithm is implemented by simulation to protect energy when sampling the parameters of the pools. It is introduced as future work that it is required to update the algorithms for a numerous number of variables to be covered, to obtain a correspondence between warmth and moisture; this means more information, about the environment and allows conducting an analysis of exemplars and components using machine learning procedures.

The work completed on Wireless Sensor Network in Aquaculture [6] related to an intellectual system. The system is based on monitoring via wireless sensor networks. An architecture using diverse types of sensors, known as sensing junction, this node transmits through the ZigBee etiquette. Learning is taken to a server which uploads the learning to the cloud and is demanded by a computer user. This system has a hand-operated control system and a smart control arrangement. Achieving, a satisfactory monitoring, and control system for the monitoring and administration of aquaculture water quality was executed.

In the paper, Automated Monitoring and Control System for Shrimp Farms Based on Embedded System and Wireless Sensor Network [7] promulgated by Nguyen et. Introducing, a low-cost and archetype system to embellish a commercial outcome in aquaculture. A classified system was implemented using Cloud, MSP430, ZigBee, GSM, Cloud, MSP430 and Lab technologies. This system watches parameters such as pH quantity of water, Oxygen present in water, and Temperature in farms. It is concluded that the performed system is the scalable, spontaneous and low expense. We recommend adding more sensors to obtain more information on the position of the water quality and to be able to ship out the complete commentary and give more authenticity to the system through validation with commercial measurement apparatuses.

The work done on an examination project is entitled to Remote fish aquaculture monitoring system based on wireless transmission technology [11]. Description shares to an independent remote monitoring system in real time for aquaculture. This system administering the inventory network consolidated with mobile accessories and remote principles to incorporate real-time learning on aquaculture documents. The construction of the system is based on a wireless sensor network arrangement with the ZigBee protocol which interfaces and organizes learning to a server. Server

uploads the erudition to the internet which was demanded from the mobile accessories. The system designates the values of the determined variables with time as well as the date. The system presents different determination and monitoring systems to optimize sources and conquer expenses. Future work proposed to use various technologies to promote the system.

The author conducted a work which is entitled as Wireless Sensor Network System Design using Raspberry Pi and Arduino for -Environmental Monitoring Applications [13] reveals how wireless sensor networks are an extraordinary technology to innovate in different applicability. This research work channels on a monitoring system based on Raspberry Pi and Arduino for monitoring surroundings. The architecture incorporates sensing nodes through a wireless sensor network using the ZigBee protocol. These sensing nodes are correlated in a base position which sends the learning by an application to a database and to a server. The information is uploaded to the internet via a router which is deployed in devices similar cell-phones and processors. An extraordinary work on this synchronous work would be supplementing IoT to the system, so that other equipment that can control the environment and monitor it. Better warehouse of the information a server is used and the participating of this information to acknowledge other authorities.

The work on the evolution of Embedded Wireless Network and Water Quality Measurement Systems for Aquaculture [15] interprets the improvement and implementation of a system for the monitoring of water quality in millponds, which consists of buoys that have a system for capturing and broadcasting water values such as water pH, water temperature, dissolved oxygen and conductivity of water. Managed erudition is uploaded to the Internet and is displayed in a desktop application in Lab appearance. Notwithstanding, it does not have the use of a database for the warehouse of data in the mobile application or for erudition.

Associated with some of the above-mentioned works, this work has the multicultural and apprehension junction which authorizes the system to be changed to various ponds or rivers. They have desktop application since the software of this system represents information and graphical representation of data, storehouses it in a MySQL database. In appreciation for the development of this archetype, it is designed to get the water quality of ponds and to examine the data. This work takes the erudition to carry out a more particular analysis of the cases that transpire in the water due to the use of Internet of Things(IoT). These include optimization of stores, diminishing cost and interchange of information with other groups. All this is of great relevance for association and organizations, as this presents optimization of sources, efficient processes, reducing costs of production and products of the better essence.

III. PROPOSED SYSTEM

To subjugate arduous matters and to develop a low-dynamism, low-cost and configurable system to guarantee water quality for safe drinking water to the environment. The recommended system which can be used in a secluded location to collect the information about, water level, water PH, water temperature, and carbon dioxide quantity present in the water. we are executing a system for monitoring the water quality and accommodating new technologies such as IoT (Internet of Things), WSN's (Wireless sensor network) and communication norm. This reconfigurable water quality monitoring system lives of an ARM-based microcontroller (STM32 Nucleo), ZigBee communication module, water parameter Sensors, a personal computer. The ARM-based microcontroller board (STM32 Nucleo) is programmed in C programming language using the STM32CubeMX software. Coequally we are collecting four parameters of water such as Water temperature, Water PH, carbon dioxide in water and water level in real time [1]. ZigBee protocol is used for remote location data transfer from a microcontroller to personal computers, which will be represented in a graphical scheme.

The STM32CubeMX Software is the primitive STM32 Nucleo improvement tool, the STM32 Nucleo Software selected to create a software program. This programmable logic device design software is produced to display the obtained data of water parameters on personal computers, the C# codes are used to display data in graphical illustration with the help of Morris JavaScript. Once the water quality monitoring system is switched on, the data from each sensor node is obtained by our ARM-based microcontroller. Then, the data received from all sensors are switched to 8-bit binary. The acquired data is stored in the integrated interface device. The data is conveyed to ZigBee

transmitter and receiver with the help of USB UART module of ZigBee receiver.

IV. CONCLUSION

The proposed water quality monitoring system is a cost-effective solution to interface palpatory to sensor network using STM32 Nucleo board and ZigBee module is used for wireless data synchromesh. The system will achieve authenticity and workability and results will verify the same. The water temperature may vary from 0 to 0.5 Degree Celsius depending on air warmth cycles in the environment. The time interlude of data capturing and monitoring will be changed depending on the requirement. With the STM32 Nucleo board, the proposed system takes over offensive execution speed and reusable IP design. The proposed system will help in protecting the environment of water resources. The water quality monitoring system conquers the time and costs in detecting water quality as part of environmental management. The wireless sensor network will be developed in the future constitution of the additional number of nodes to extend the reportage scale.

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