LITERATURE SURVEY

1.IoT based real-time river water quality monitoring system -

Chowdury, Mohammad Salah Uddin, Talha Bin Emran, Subhasish Ghosh, Abhijit Pathak.

Current water quality monitoring system is a manual system with a monotonous process and is very time-consuming. This paper proposes a sensor-based water quality monitoring system. The main components of Wireless Sensor Network (WSN) include a microcontroller for processing the system, communication system for inter and intra node communication and several sensors. Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology. Data collected at the apart site can be displayed in a visual format on a server PC with the help of Spark streaming analysis through Spark MLlib, Deep learning neural network models, Belief Rule Based (BRB) system and is also compared with standard values. If the acquired value is above the threshold value automated warning SMS alert will be sent to the agent. The uniqueness of our proposed paper is to obtain a water monitoring system with high frequency, high mobility, and low power. Therefore, our proposed system will immensely help Bangladeshi populations to become conscious against contaminated water as well as to stop polluting the water.

The environment around us consists of five key elements e.g., soil, water, climate, natural vegetation, and landforms.Among these water is the utmost crucial element for human life. It is also vital for the persistence of other living habitats . Whether it is used for drinking, domestic use, and food production or recreational purposes, safe and readily available water is the need for public health .So it is

highly imperative for us to maintain water quality balance. Otherwise, it would severely damage the health of the humans and at the same time affect the ecological balance among other species. Water pollution is a foremost global problem which needs ongoing evaluation and adaptation of water resource directorial principle at the international level down to individual wells. It has been studied that water pollution is the leading cause of mortalities and diseases worldwide. The records show that more than 14,000 people die daily worldwide due to water pollution. In many developing countries, dirty or contaminated water is being used for drinking without any proper prior treatment. One of the reasons for this happening is the ignorance of public and administration and the lack of water quality monitoring system which makes serious health issues

In this paper, we depict the design of Wireless Sensor Network (WSN) that assists to monitor the quality of water with the support of information sensed by the sensors dipped in water. Using different sensors, this system can collect various parameters from water, such as pH, dissolved oxygen, turbidity, conductivity, temperature, and so on.The rapid development of WSN technology provides a novel approach to real-time data acquisition, transmission,and processing. The clients can get ongoing water quality information from far away. Now a day's Internet of things (IoT) is an innovative technological phenomenon. It is shaping today's world and is used in different fields for collecting, monitoring and analysis of data from remote locations. IoT integrated network if everywhere starting from smart cities, smart power grids, and smart supply chain to smart wearable. Though IoT is still under application in the field of environment it has huge potential. It can be applied to detect forest's fire and early earthquake;s, reduce air pollution, monitor snow level, prevent landslides, and avalanche etc. Moreover, it can be implemented in the field of water quality monitoring and controlling systems.

Water quality monitoring has gained more interest among researchers in this twenty-first century. Numerous works are either done or ongoing in this topic focusing on various aspects of it. The key theme of all the projects was to develop an efficient, cost-effective, real-time water quality monitoring system which will integrate wireless sensor networks and internet of things. In this research, we monitor the physical and chemical parameters of water bodies inside Chittagong city by using an IoT based sensor network.

Advantage

Shows accurate purity value

Disadvantage

Slow process

2.Real time water quality monitoring system for smart city in malaysia-*Amin, Mohd Hariz, Aznida Abu Bakar Sajak, Juliana Jaafar, Husna Sarirah Husin, and Salina Mohamad.*

Water is essential for life. Frequent water disruption in Malaysia caused turbulence in daily lives and livelihood of thousands of Malaysians. The water operators in Malaysia are facing serious challenges to ensure consumers have continuous access to clean water and to ensure a sustainable water future. River pollution in Malaysia has been identified to be one of the causes of the water crisis in Malaysia. Hence, a continuous monitoring system utilizing the concept of Internet of Things had been proposed in this paper.

Agile Model

The information that is needed in this project was gathered and analyzed based on the related project so that the project objective and scope can be determine this methodology had been chosen to be used in this project because the resource requirements are minimum, it is suitable for fixed or changing requirements, it delivers early partial working solutions, it is a good model for environments that change steadily and it have minimal rules hence documentation easily employed.

Hardware

Turbidity sensor

Turbidity sensor detects water quality by measuring level cloudiness/haziness in the water. It is able to detect suspended particles in water by measuring the light transmittance and scattering rate which changes with the amount of total suspended solids(TSS) in water.

Temperature sensor

The DS18B20 digital thermometer provides 9-bit to 12-bit Celsius temperature measurements and has an alarm function with non-volatile user programmable upper and lower trigger points.

Arduino uno

It is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller.

PH sensor

A PH sensor is a device to measure the level of acidity or alkalinity of a solution, the pH scale ranges from 0 to 14. The pH indicates the concentration of hydrogen [H] + ions present in certain solutions.

Software

-Blynk

-Arduino IDE

-DEV-C++

ADVANTAGE

Using real-time monitoring, instant data allows pre-cursors to potential issues (such as corrosion) to be flagged up and immediately be addressed before major issues occur. The ability to make real-time decisions during critical moments can be vital in preventing expensive repairs and breakdown.

DISADVANTAGE

Drawback is the high cost for smart sensors. This system uses wireless sensors for monitoring quality of water parameters monitored are ph, turbidity, conductivity,temperature. A micro controller has the task of signal digitizing, data transmission, and network management.

3.Real-time water quality monitoring system - *Das, Brinda, and P. C. Jain*

Water is the primary need of all living beings and living without water is impossible. With the advancement of technology and industrialization,

environmental pollution has become a major concern. Water pollution is one of the most serious types of this environmental pollution. Our lives depend on the quality of water that we consume in different ways, from juices which are produced by the industries. Any imbalance in the quality of water would severelyn affect the humans health and at the same time it would affect the ecological balance among all species. Water quality refers to the chemical, biological, radiological, and biological parameters of the water.

Advantage

The system was tested under different conditions and with different qualities of water. The output of the system was successful and in accordance with the research objectives. As mentioned, the sensor readings are obtained on an LCD screen on the device prototype itself. If there are any abnormal conditions found in the water, the buzzer will get an alarm sound and the lcd monitor will display water pH temperature, turbidity water level in tanks. Compared to the previous related works, the cost of the system prototype is considerably low.

Disadvantage

Due to the sharp increase in global industrial production, as well as the over-exploitation of land and sea resources, the quality of drinking water has deteriorated considerably.

4.An IoT based Real-Time Monitoring of Water Quality System - *Naj, Najiya, and Amogh Sanzgiri*

With the emerging technologies and new generation, each field is developing gradually, like IoT, Artificial Intelligence, Big Data, Cloud Computing, etc. Currently, the Internet of Things (IoT) has become the pillar of all connected

technologies, without which we can't imagine our single day. IoT is useful in every aspect of our life. Also, water is an essential component for all living beings, and monitoring of water quality and its parameter is a must to get safe water.The proposed model, water quality monitoring in Aquaculture based on IoT which is used to determine the different parameters of water like, pH value, turbidity, temperature, to detect the bad quality which may lead to any disease or adverse effect to a living being.

Methodology

The proposed model is an embedded system with hardware and software parts. As the embedded system is microprocessor-based it is the combination of hardware system with software programming. The system is based on IoT (Internet of Things) for designing an advanced and effective water quality monitoring system. The system consists of required sensors for collecting the environment data and sending it to a further layer where the observation of the data is done and sends the result to the ThingSpeak server.The embedded system is the main key of the system which includes NodeMCU as a Wi-Fi module. The main component of the system which is responsible for connecting all the hardware components to the software part. The Wi-Fi module is used with a 3.3v/5v power supply.

Advantage

No need for manual collection ,Ease of use ,Cheap and quick process

Disadvantage

Collect samples manually ,Complicated methodology, Time consuming Low measurement precision , High cost, Lack of real-time monitoring.

5.Real-time remote monitoring of water quality-*Glasgow, Howard B., JoAnn M. Burkholder, Robert E. Reed, Alan J. Lewitus, and Joseph E. Kleinman*

Recent advances in communication and sensor technology have catalyzed progress in remote monitoring capabilities for water quality. As a result, the ability to characterize dynamic hydrologic properties at adequate temporal and spatial scales has greatly improved. These advances have led to improved statistical and mechanistic modeling in monitoring of water quality trends at local, watershed and regional scales for freshwater, estuarine and marine ecosystems. In addition, they have greatly enhanced rapid (e.g., real-time) detection of hydrologic variability, recognized as a critical need for early warning systems and rapid response to harmful algal bloom events.

Methodology

The platform includes various sensors to measure multi water quality parameters such as turbidity, temperature, hydrological variability and sediment concentration near river bed. River water quality Monitoring Water Quality data is used to determine the water quality status whether in a clean, slightly polluted or polluted category and to classify the rivers in Class I, II, III, IV or V based on Water Quality Index.

Advantages

These advances have led to improved statistical and mechanistic modeling in monitoring of water quality trends at local, watershed and regional scales for freshwater. It led to the advent of real-time remote monitors for hydrologic

properties. Real-time remote monitoring (RTRM) and sensing technologies will become a progressively more important tool for evaluating water quality.

Disadvantages

The frequency of testing is very low.There is no continuous and remote monitoring, human resource is required, less reliable, no monitoring at the source of waters.

6.Real-time remote monitoring system for aquaculture water quality

-Hongbin, Luo, Li Guanglin, Peng Weifeng, Song Jie, and Bai Qiuwei.

A multi-parameters monitoring system based on wireless network was set up to achieve remote real-time monitoring of aquaculture water quality, in order to improve the quality of aquaculture products and solve such problems as being difficult in wiring and high costs in current monitoring systems. In the system solar cells and lithium cells were used for power supply. The YCS-2000 dissolved oxygen sensor, pH electrode, Pt1000 temperature sensor and ammonia nitrogen sensor were used to monitor the parameters of aquaculture water quality; STM32F103 chip was used for data processing; Zigbee and GPRS modules were used for data transmission to the remote monitoring center, where the data were stored and displayed. The system was connected with an aerator to realize automatic control of dissolved oxygen concentration.

Methodology

The system could fulfill the real-time remote monitoring of aquaculture water quality and had great practical significance in reduction of labor intensity, improvement of quality of aquatic products and protection of water environment.

Aerators are various devices used for aeration, or mixing air with another substance, such as soil or water. These devices are used to add oxygen to the water.

Advantages

It has great practical significance in reduction of labor intensity. It improves the quality of aquatic products and It gives the main protection of the water environment. The ability to make real-time decisions during critical moments can be vital in preventing expensive repairs and breakdown.

Disadvantages

The test results showed a high confidence level of data transmission with a packet loss rate of 0.43%. Operation and maintenance costs are greater.

7.Online drinking water quality monitoring-*Banna, Muinul H., Syed Imran, Alex Francisque, Homayoun Najjaran, Rehan Sadiq, Manuel Rodriguez, and Mina Hoorfar.*

Online drinking water quality monitoring technologies have made significant progress for source water surveillance and water treatment plant operation. The use of these technologies in the distribution system has not been favorable due to the high costs associated with installation, maintenance, and calibration of a large distributed array of monitoring sensors. This has led to a search for newer technologies that can be economically deployed on a large scale. This paper includes a brief description of important parameters for drinking water and current available technologies used in the field. The paper also provides a thorough review of the advances in sensor technology for measurement of common water quality parameters (pH, turbidity, free chlorine, dissolved oxygen, and conductivity) in drinking water distribution systems.

Methodology

Drinking Water Distribution Systems facilitate the carrying of portable water from water resources such as reservoirs, rivers, and water tanks to industrial, commercial and residential consumers through complex buried pipe networks.

Advantages

Water quality control and management in water resources are important for providing clean and safe water to the public. Fast response time. Not influenced by color turbidity.

Disadvantages

Low resolutions and accuracy . Subject to ionic interference.

8.A system for monitoring water quality in a large aquatic area using wireless sensor network technology-*Demetillo, Alexander T., Michelle V. Japitana, and Evelyn B. Taboada*

In this paper, a low cost, real-time water quality monitoring system which can be applied in remote rivers, lakes, coastal areas and other water bodies is presented. The main hardware of the system consists of off-the- shelf electrochemical sensors, a microcontroller, a wireless communication system and the customized buoy. To check the system effectiveness, the buoy's stability in harsh environmental conditions, system energy consumption, data transmission efficiency and web-based display of information were carefully evaluated. The experimental results prove that the system has great prospects and can be practically used for environmental monitoring.

Methodology :Sensor Node

A sensor node collects and pre-process data from the electrodes and sends data to the sink node making it the main building block of the water quality monitoring system (WQMS) prototype. On board, the sensor nodes are commercial electrodes, microcontroller, Zigbee transceiver, and power supply.

Sink Node

Sink node is basically a sensor node with the capability of sending data to long distance using a GSM module. To save energy for its long duration operation, sink nodes are always set in a sleep mode while waiting for the execution of pre-programmed activities like the data gathering, reception of data from sensor nodes, sending data to the base stations and accepting command from the administrator.

Advantages

Ease and convenience of usage. Instantaneous data. Improved accuracy of measurements. Contact Guardian Water Treatment today

Disadvantages

Low resolution and accuracy ,Subject to ionic interference

9.A Methodological Approach to Water Concentration toInvestigate the Presence of SARS-CoV-2 RNA in Surface Freshwaters -*Tesauro, Marina, Mara Terraneo, Michela Consonni, Clara Fappani, Daniela Colzani*

During the COVID-19 public health emergency, an increasing number of studies reported the occurrence of SARS-CoV-2 in wastewaters worldwide, but little is known about the presence of the virus in surface freshwaters. The aim of the current study was to develop and validate an appropriate and scalable methodological approach for the concentration and detection of SARS-CoV-2 from surface freshwater samples, collected within the Milan rural network subjected to flood spillways activity.The effects of pre-filtration and concentration on viral nucleic acid recovery were assessed through real time RT-PCR targeting SARS-CoV-2 and the internal viral control PMMoV. The proposed method will be used for the monitoring of surface waters in the Milan area.

Methodology

Experimental Contamination and Viral Inactivation of Water Samples:

All water samples were subjected to heat treatment (56 ◦C, 30 min) for viral inactivation to increase the safety of the analytical protocol for both laboratory personnel and the environment.

RNA Extraction:

Viral RNA was extracted from 1 mL of each aliquot collected during the sample concentration process using the NucliSENS® easyMAG™ automated platform (bioMérieux bv, Lyon, France) according to the standard protocol with off-board lysis. Statistical Analysis All tests were repeated twice, except for the final experiment in triplicate. Comparisons of means were accomplished with the

t-test and the ANOVA test. Two-sided p-values were considered statistically significant.

Advantages

The aim of the current study was to develop and validate an appropriate and scalable methodological approach for the concentration It is the detection of SARS-CoV-2 from surface freshwater samples, collected within the Milan rural network subjected to flood spillways activity.

Disadvantages

Patients infected with SARS-CoV-2 typically exhibit a wide range of symptoms including fever, coughing, dyspnea, sore throat and headaches.

10.On-line Measuring Sensors for Smart Water Network Monitoring -*AQUALIA, FCC, and E. S. Madrid*

Smart cities are becoming essential to drive economic growth, increase social prospects and improve high-quality lifestyles for citizens. To meet the goal of smart cities, Information and Communications Technology (ICT) have a key role. The application of smart solutions will allow the cities to use ICT and big data to improve infrastructure and services . In the water sector, the integration of smart meters and sensors coupled with cloud computing and the paradigm of "divide and conquer" introduces a novel and smart management of the water network allowing an efficient online monitoring and transforming the traditional water networks into modern Smart WaterNetworks (SWAN).

Methodology

Water Quality Sensors and Data in Water SystemsWater monitoring is a huge challenge and online sensor monitoring satisfies the growing need for effective solutions to control key parameters for everyday life e.g. drinkable water , for economies which depend on and for sustainable environment . There is an emerging need for sensitive, selective and field portable or autonomous devices for real-time or near real-time water quality monitoring, in order to provide more valuable information for stakeholders. Focusing on water quality, technologies integrating into a Smart Water System can range from overall quality to analytical measurements of specific chemical and biological parameters of the water. Therefore, there is a need for R&D in reducing the costs and plugging sensors into the Digital Single Market for Water Services as highlighted by the recent report of the ICT4D Water cluster.

Advantages

Improvement of maintenance,Management of water system

Disadvantages

Sensors are too expensive,Potential of data are under exploited

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