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AQUAWATCH: IOT AND AI FOR WATER QUALITY MONITORING

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Abstract: The "AquaWatch: IoT and AI for Water Quality Monitoring" project is designed to ensure real-time water quality assessment using IoT and AI technologies. The system uses pH, turbidity, and temperature sensors to gather essential water quality parameters, which are monitored via an Arduino microcontroller. Data is sent to the Thing Speak IoT cloud for storage and visualization. AI and machine learning models on a laptop retrieve this data to predict overall water quality, ensuring timely alerts and corrective actions. The solution is ideal for applications in drinking water supply chains, aquaculture, and environmental monitoring.

1. INTRODUCTION

Water quality monitoring is critical for maintaining public health, environmental balance, and industrial processes. Traditional monitoring methods are often labor-intensive, time-consuming, and lack real-time updates. This project leverages IoT for continuous data collection and AI for predictive analytics, providing an automated and efficient solution to monitor and analyze water quality.

Though 70 percent of the world is covered in water, only 2.5 percent of the water present can be consumed. Just 2.5 percent of the water needs to serve 7.5 billion people on the planet. With such staggering scarcity in resources, water needs to be used very wisely. Yet, with the present system major inefficiencies creep in which leads to either contaminating the supply or wastage of water due to leakage. According to WHO, globally, 2 billion people use contaminated water. Just because of the inefficiencies in the present pipeline system this contamination takes place. There is no automated process to check this contamination. Till the authorities come to know about such contamination in the water distribution system the damage is already done. Contaminant can be anyundesirable chemical, biological, physical, or radioactive substances which can adversely affect the water quality. These contaminants seep into the pipeline and degrade the water making it unconsumable. Every year 485000 deaths are caused due to diseases caused by consumption of contaminated water. These lives can be saved with just improving the standards of the present pipeline network. By saving water, this allows us to save more water, especially on our water bill. By practicing basic water conservation tips, you can save more than hundreds and thousands of water every year. Use less water, and you will be charged less money from the water company.

2. LITERATURE SURVEY

[1] A Zigbee Based Wireless Sensor Network is used to Monitor

Water Quality The application of a wireless sensor network (WSN) for water quality monitoring is composed of many sensor nodes with a networking capability that can be deployed for ad hoc or continuous monitoring purposes. The parameters involved in the water quality determination such as the pH level, Turbidity, and temperature are measured in real-time by the

sensors that send the data to the base station or control/monitoring room. In this paper, the fundamental design and implementation of WSN featuring a high power transmission Zigbee-based technology together with the IEEE 802.15.4 compatible transceiver are proposed.

[2] GSM-based self-monitoring system for water quality:

The Autonomous Live Response Monitor (ALARM) toxicity Biosensor was used to create this device, which was designed to be placed in the stream for continuous monitoring. The goal is to develop a low-cost, wireless water monitoring system that can track water conditions in real-time. Salinity, dissolved oxygen, temperature, intensity level, pH, electrical conductance, total dissolved solids, and redox potential are among the physicochemical parameters measured by the system in freshwater.

[3] The Image processing technology is being used in a water quality monitoring system:

In recent years the fish responding behavior has been considered as one of the approaches for water quality monitoring. The system was created utilizing image processing and auto-recognition of fish gestures in water bodies using fuzzy inference. The image background model was first made up using the W4 approach, and then the backdrop was deduced to detect the fish profile. Once the Centre-of- gravity position of the fish profile is found.

[4] ZigBee Smart Sensors for Real-Time Water Quality Monitoring:

The system is skilled to measure the physicochemical parameters of water quality, such as flow, temperature, pH, and conduction. Water contaminants in rivers, lakes, and other bodies of water are identified using these physiochemical criteria. The sensors are connected to a microcontroller-based data processing and evaluation node. In this scheme, ZigBee receiver and this system, ZigBee receiver, and transmitter modules are used forcommunicating among the measuring and notification nodes.

[5] Design of water management system:

Three wireless sensor sub-systems make up the system. All communicate with each other wirelessly and send information to a gateway connected to a computer that hosts the GUI. Data delivery is not always guaranteed due to wireless data transmission. There are chances of loss of data.

[6] WSN-Based Water Quality

Monitoring System: WSN-based water quality monitoring system was developed. This system is based on a wireless sensor network that consists of a wireless water quality monitoring network and a remote data center. The wireless sensor network is built on the Zigbee network protocol. WSN simply the water quality, and sends the data to the internet with the help of GPRS

[7] Using the internet of things to detect surface water contamination:

To record water quality parameters from a variety of sources in the study area via a prototype embedded in real-time, they have developed a real-time prototype. This hardware solution transmits data to the cloud for real-time processing and storage. The developed software solution, which comprises a mobile app and a dashboard, can monitor the data remotely and control water flow. These preliminary results have indicated a high degree of potential for scaling up this concept.

3. EXISTING SYSTEM

Conventional water quality monitoring systems are inadequate for providing real-time analysis and predictive insights. Manual testing is prone to errors and delays, leading to potential health risks and environmental degradation. There is a need for an intelligent, automated system to

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monitor water quality continuously and alert stakeholders about potential issues.

In the old water quality monitoring system, different instruments have been used to monitor the quality of water such as "Secchi disks (to measure the clarity of the water), probes, nets, gauges, meters", tc. In order to reduce the instruments , we have proposed our method. Measuring Parameters For WQ: In this system we measure five parameters such as:

Turbidity: It is the measure of relative clarity of water measured in NTU.
Total Dissolved Solids (TDS): Concentration of dissolved particles/solids in water measured in ppm.
Temperature: It is used in determining whether the water is acceptable for human body consumption and use.

pH: Used in determining whether the water is acidic/basic/neutral.

Conductivity: It is the measure of the concentration of ions measured in [S/m]

4. PROPOSED SYSTEM

This work proposes water quality monitoring and abnormality detection system using IoT. IoT is very useful in this a specters it replaces the conventional monitoring systems with a more efficient scheme. The proposed system of this project is shown in Fig 4.1.

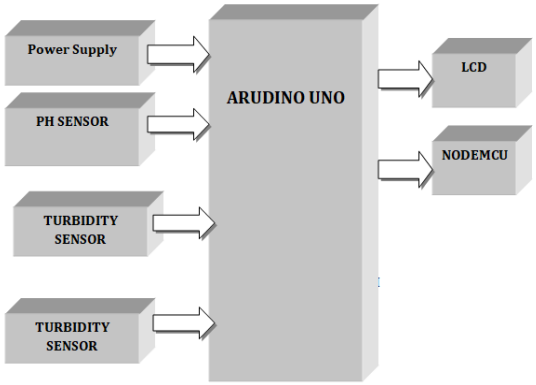

Fig1 Block Diagram

In this proposed system we are using UNO microcontroller and sensors. By using UNO microcontroller, we can eliminate ADC module which decreases complexity. we are using pH, Turbidity sensor, TDS Sensors to check the quality of water. Turbidity is mainly used for the detecting dust particles in the water. Based on the dust particles we can decide the water quality. pH Sensor is to know whether water is acidic, basic or neutral in nature. Sensor is to measure any harmful solutions present in water. The values are uploaded to cloud server and message will be sent if any sensor crosses the threshold value.

The system is completely self-sufficient, no need for charging, the batteries at the nodes are charged using water propelled dynamo. The system is completely wireless without the hassle of wires being laid underground. The system addresses al water needs and water problems to both water supply board and end citizens. Because of the node setup and highly modular design the system has high repairability and serviceability. Highly economical and water proof design of the system makes it easy to scale to a city level.

The system integrates sensors, IoT, and AI to monitor and predict water quality:

Sensors: Collect data on pH, turbidity, and temperature of water.

Arduino Microcontroller: Processes sensor data and transmits it to ThingSpeak via a Wi-Fi module.

ThingSpeak Cloud: Stores and visualizes sensor data in real-time.

AI Analysis: Retrieves data from ThingSpeak and applies machine learning algorithms to predict water quality.

Alerts: Notifies stakeholders through a buzzer and ThingSpeak for immediate action in case of anomalies.

Working Flow Steps

Data Collection:

Sensors measure water parameters continuously.

Arduino reads data from sensors and sends it to the Thing Speak cloud using a Wi-Fi module.

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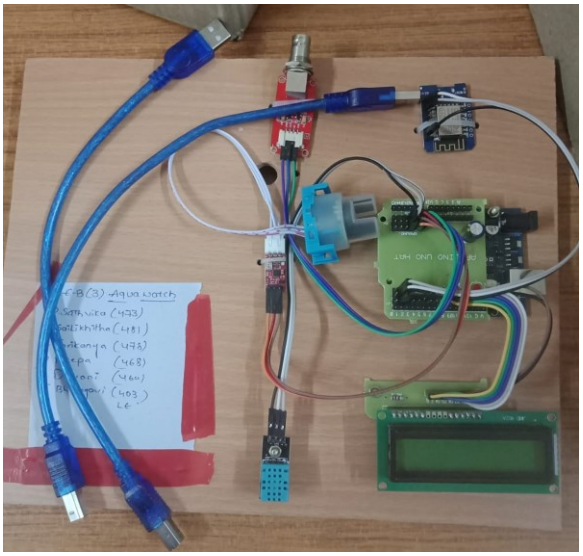
Data Visualization:
Sensor data is displayed on an LCD screen.
Data is stored and visualized in real-time on the Thing Speak IoT platform.
AI Integration:
Data from Thing Speak is retrieved to a laptop.
Machine learning models analyze the data to classify or predict water quality.
Alerts:
If water quality exceeds acceptable thresholds, a buzzer is triggered.
Notifications are sent via Thing Speak's alerting mechanism.

5. RESULTS



6. CONCLUSION

In this project, we are implementing smart water quality monitoring using an embedded system developed. In this, we use three modules. They are: Data Sensing Module: It will detect data from the sensors that we used in the project in data sensing. It will take data in both analog and digital. By connecting the sensors to the Arduino, the data is taken and displayed on the LCD panel The Aqua Watch system provides an efficient and automated solution for water quality monitoring using IoT and AI. By integrating real-time data collection with machine learning analytics, the project ensures prompt identification of water quality issues, enabling corrective actions. This scalable and adaptable system has the potential to revolutionize water quality management across various sectors.

REFERENCES

[1] Ashwini Doni, Chidananda Murthy. M.V, .Dr Mz Kurian, “Survey On Multi Sensor Based Air And Water Quality Monitoring Using Iot” Indian J.Sci.Res. 17(2): 147-153, 2018.
[2] Gurkan Tuna1,A, Bilel Nefzi2,B , Orhan Arkoc3,C And Stelios M. Potirakis, “Wireless Sensor Network-Based Water Quality Monitoring System”, April 2014
[3] Imran .B, Shakir Ahmed Sha Ks, Pavethra.M, Siva Sankari K, Kavitha, “Smart Tank Water Monitoring System Using Iot Cloud Server At Home/Office” Ijesc, Volume 8 Issue No.4. [4] Jayti Bhatt, 2jignesh Patoliya, “Iot Based Water Quality Monitoring System” International Journal Of Industrial Electronics And Electrical Engineering, Issn: 2347-6982 Volume-4, Issue-4, Apr.-2016.
[5] Tha. Sugapriyaa, S. Rakshaya, K. Ramyadevi, M. Ramya, P.G. Rashmi, “Smart Water Quality Monitoring System For Real Time Applications”, International Journal Of Pure And Applied Mathematics Volume 118 No. 20 2018, 1363-1369.
[6] Vennam Madhavireddy, B. Koteswarrao "Water Quality Monitoring System Using Iot Technology". In International Journal Of Engineering And Technology.
[7] DR MV SRUTHI, V SHANTHI, G PAVANI “DEVELOPMENT OF INDOOR AIR QUALITY SUPERVISION SYSTEMS USING ZIGBEE WIRELESS NETWORKS” in Turkish Journal of Computer and Mathematics Education.
[8] Osisiogu Ukachi, Williams Yohanna, Zishumba Kudzai, Okpanachi Victor,Maduakor Francis, Ashikwei Desmond "Pipeline Surveillance And Leakage Detection System With Iot And Uav " In 3rd Biennial Internati onal Conference On Toki 15-16 August 2019.

ISSN 2454-9940

www.ijasem.org

Vol 19, Issue 1, 2025

[9] Fatma Karray, Mariem Triki, Mohamed Wassim Jmal, Mohamed Ab id ,Abdulfattah M."Wirotip: An Iotbased Wireless Sensor Network For Water Pipeline Monitoring." In International Journal Of Electrical And Computer Engineering (Ijece)Vol. 8, No. 5, October 2018, Pp. 3250 – 3258

[10] Gowthamy J, Chinta Rohith Reddy, Pijush Meher,Saransh Shrivastava, Guddu Kumar "Smart Water Monitoring System Using Iot". Irjet Eissn: 2395-0056volume: 05 Issue: 10 | Oct 2018