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REAL TIME WATER MONITORING SYSTEM FOR VRISHABHAVATHI RIVER AT VRISHABHAVATHI BARRAGE USING INTERNET OF THINGS

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ABSTRACT

The quality of river water is a critical indicator of environmental health and public safety, especially in rapidly urbanizing regions. The Vrishabhavathi River in Bengaluru has experienced significant pollution due to industrial discharge, domestic wastewater, and urban runoff, making continuous monitoring essential. This project presents a Real-Time Water Monitoring System for the Vrishabhavathi River at the Vrishabhavathi Barrage using Internet of Things (IoT) technology. The system integrates sensors to measure key water quality parameters such as pH, turbidity and temperature. These sensors interface with a microcontroller-based IoT platform, which collects data and transmits it to a cloud server through Wi-Fi or GSM connectivity. The real-time data is visualized on a dashboard, enabling authorities and stakeholders to monitor pollution levels remotely and take timely corrective actions. The proposed system provides a cost-effective, scalable, and automated solution for continuous water quality assessment, contributing to better environmental management and supporting efforts toward river restoration and sustainable urban development.

KEYWORDS: Real-time monitoring, IoT, Water quality, Vrishabhavathi River, pH sensor, Turbidity, Microcontroller, Cloud computing, Environmental monitoring, Smart water management, Pollution detection.

1.INTRODUCTION

Water quality monitoring is essential for ensuring environmental safety and public health, especially in polluted urban rivers like the Vrishabhavathi River in Bengaluru. Due to continuous discharge of sewage, industrial effluents, and urban waste, the river's condition has deteriorated significantly. Traditional manual testing methods are slow and cannot provide continuous updates. To overcome this limitation, the use of Internet of Things (IoT) technology enables real-time monitoring of key water quality parameters such as pH, turbidity and temperature. This project aims to develop an IoT-based real-time water monitoring system at the Vrishabhavathi Barrage, providing instant data on river health and supporting timely decision-making for pollution control and environmental management.

2.Problem Statement and Literature Review

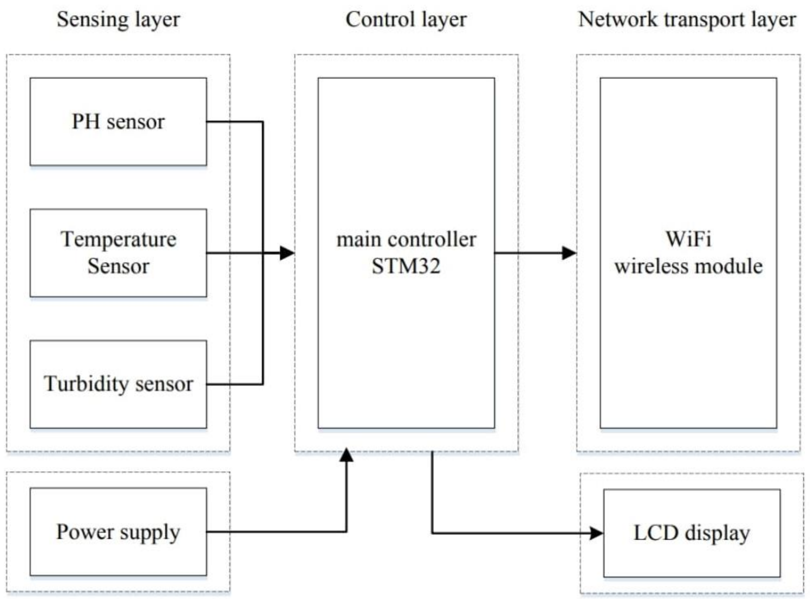
The Vrishabhavathi River experiences continuous pollution from domestic and industrial sources, but existing manual water quality monitoring methods are slow, infrequent, and unable to detect rapid changes. Therefore, there is a need for an IoT-based real-time water monitoring system at the Vrishabhavathi barrage that can continuously measure parameters such as pH, turbidity, DO, temperature, and conductivity, and transmit data instantly to a cloud dashboard for early pollution detection and timely decision-making.

Studies on IoT-based water monitoring systems highlight that traditional laboratory sampling provides accurate results but lacks real-time capability. Recent research shows that IoT devices with sensors for pH, turbidity and temperature can provide continuous, remote, and cost-effective monitoring. Authors such as Zhang et al. (2020) and Miller (2021) emphasize challenges such as sensor drift, biofouling, power management, and data reliability. Many systems use GSM, LoRaWAN, or Wi-Fi for data transmission and cloud platforms for visualization. Overall, the literature suggests that IoT-based systems significantly improve monitoring frequency, help detect sudden pollution events, and support effective water resource management.

3.Working Principle

The system uses water quality sensors placed in the Vrishabhavathi River to continuously measure parameters like pH, turbidity, DO, temperature, and conductivity. These readings are collected and processed by a microcontroller, which then sends the data to a cloud server through a wireless communication module. The cloud platform displays the data in real time on a dashboard, and automatic alerts are generated when any parameter crosses the preset safe limits. This enables quick detection of pollution and supports timely action.

4.Methodology



Sensing Layer:

- Contains the pH sensor, temperature sensor, and turbidity sensor.
- Each sensor is placed in the river water to continuously measure its respective parameter.

Control Layer:

- The STM32 main controller receives signals from all the sensors in the sensing layer.
- It processes the incoming data, performing analog-to-digital conversion if required, and applies logic like calibration, validation, and alert criteria.

Network Transport Layer:

- The WiFi wireless module (typically ESP8266) is interfaced to the STM32 microcontroller via serial communication (UART).
- This module uploads processed water quality data to cloud platforms, dashboards, or remote applications over the internet.

Power Supply and Data Display:

- The centralized power supply (5V) provides necessary operating voltage to all system components including sensors, STM32 board, WiFi module, and the LCD display.
- The LCD display is directly connected to the STM32, showing real-time water quality readings for on-site visualization.

This modular architecture makes the system robust and easy to expand additional sensors or communication modules (like GSM) can be added with minimal changes.

5.RESULT

The real-time water monitoring system successfully measured key water quality parameters—pH, turbidity and temperature—at the Vrishabhavathi barrage and transmitted the data to the cloud without interruption. The dashboard displayed live readings and graphs, allowing continuous tracking of river conditions. The system also generated instant alerts when parameters crossed preset limits, helping identify pollution spikes quickly. Overall, the IoT setup operated reliably, proved cost-effective, and demonstrated the effectiveness of continuous monitoring compared to traditional manual sampling.

6. CONCLUSION

The real-time water monitoring system developed for the Vrishabhavathi River at the Vrishabhavathi barrage effectively demonstrated how IoT technology can provide continuous, accurate, and timely water quality data. By integrating sensors, a microcontroller, and cloud-based monitoring, the system offered reliable updates on key parameters and enabled rapid detection of pollution events. This approach overcomes the limitations of manual sampling and supports better environmental management. Overall, the project proves that IoT-based monitoring is a practical and efficient solution for improving river health and supporting informed decision-making.

7. Applications

- River Pollution Monitoring: Continuously tracks water quality in the Vrishabhavathi River and helps detect pollution sources early.
- Environmental Management: Supports government agencies and environmental boards in making data-driven decisions for river restoration.
- Disaster & Safety Alerts: Provides real-time warnings during sudden pollution spikes, sewage discharge, or industrial effluent release.
- Public Health Protection: Helps identify contaminated water conditions that may pose health risks to nearby communities.
- Research & Data Analysis: Supplies continuous datasets for researchers studying water quality trends, seasonal variations, and ecological impacts.
- Smart City Applications: Integrates with smart city dashboards for improved urban water resource management.

- Regulatory Compliance: Assists authorities in monitoring adherence to water quality standards and detecting violations.
- Educational Use: Acts as a practical model for students and institutions studying IoT, environmental engineering, and river management.

8. REFERENCES

1. Zhang, C., Wu, J., & Liu, J. (2020). IoT-based Water Quality Monitoring System. Sensors, 20(23), 1–15.
2. Miller, M. (2021). IoT in Water Quality Monitoring: Challenges and Best Practices. Journal of Environmental Monitoring Technologies, 12(4), 45–53.
3. Chen, B., Li, X., & Zhao, Y. (2018). Real-time Environmental Monitoring Using Big Data and IoT Networks. Environmental Informatics Journal, 22(2), 101–110.
4. Kumar, A., & Singh, P. (2019). Design and Implementation of a Low-Cost Real-Time Water Quality Monitoring System Using IoT. International Journal of Advanced Research in Engineering and Technology, 10(3), 234–242.
5. Sharma, N., & Verma, S. (2021). Smart River Monitoring Using IoT and Cloud Integration. IEEE International Conference on IoT Systems, 56–62.
6. Patel, R., & Gupta, M. (2020). Analysis of Water Pollution Using IoT-based Sensor Networks. International Journal of Environmental Science and Technology, 17(8), 3571–3580.
7. BIS (Bureau of Indian Standards). (2012). IS 10500: Drinking Water Specification. Bureau of Indian Standards, New Delhi.
8. CPCB. (2022). Water Quality Criteria and Monitoring Guidelines. Central Pollution Control Board, Government of India.