AQUA INTEL

GROUP - 4

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Abstract

Real-Time Water Quality Monitoring and Predictive Detection of Contaminants

This project presents an innovative water tank monitoring system to improve water management and safety:

- **Real-Time Monitoring**: Tracks water levels and detects contaminants or pollutants instantly using IoT sensors.

- **Mobile Integration:** Sensor data is transmitted to a cloud server via Wi-Fi and accessed through a mobile app for remote monitoring and alerts.

Real-Time Water Quality Monitoring and Predictive Detection of Contaminants

- **Auto Classification**: Instantly categorizes water as Safe, Dangerous or Abnormal based on sensor data

- **Prevention & Intervention**: Helps identify potential health risks early, enabling timely treatment and improved public health outcomes.

Introduction

Why this project?

An innovative water tank monitoring system that leverages IoT and sensor technology to improve water management and ensure safety.

Why is it Important?

- Tackles water scarcity and contamination issues.
- Promotes efficient water usage and safety in daily life

TOI REPORT ON DEC 11

100 fall sick in I'puram after drinking contaminated water

Residents Complain Of Vomiting, Official Blames Construction Work

Abhijay.Jha@timesgroup.com

Ghaziabad: The residents of Angel Mercury society in Indirapuram have alleged that around 100 people have fallen sick after drinking contaminated water supplied by the Uttar Pradesh Jal Nigam.

...dents said that they ... issues such as ...

Elaborating on the issue, Avnish Jha, secretary of Angel Mercury society, told **TOI** that since they have a centralised RO plant, many residents do not use individual water filters RO in their houses. "We store the water that is supplied by the UP Jal Nigam in the society's over head tank and three days ago about 60,000 litres of contaminated ...

before releasing it the UP Jal Nigam did not care to flush out the waste from it. "Instead they straight away supplied water to our houses. This is a serious crime and action should be taken against the people responsible," Jha said.

He added that there are around 450 flats in the society and this could have ...

Mission

Developing an IoT-powered water tank monitoring system for real-time quality tracking, automation, and efficient water management.

Vision

Creating a future of smart, sustainable, and accessible water management, ensuring clean and safe water for healthier communities and a better planet.

Objectives

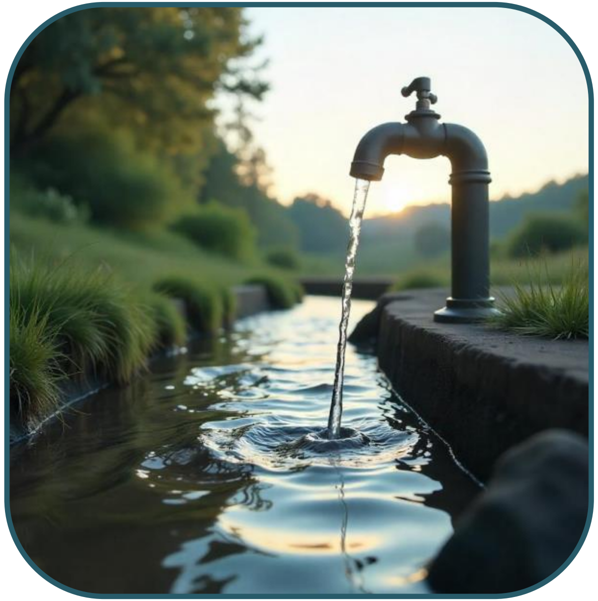
Real-Time Monitoring

Contaminant Perdition

User Empowerment

Remote Accessibility

AIM



"To create a smart, user-friendly, and sustainable solution for efficient water monitoring and management, ensuring consistent access to safe and clean water."

Literature Review

Comparison

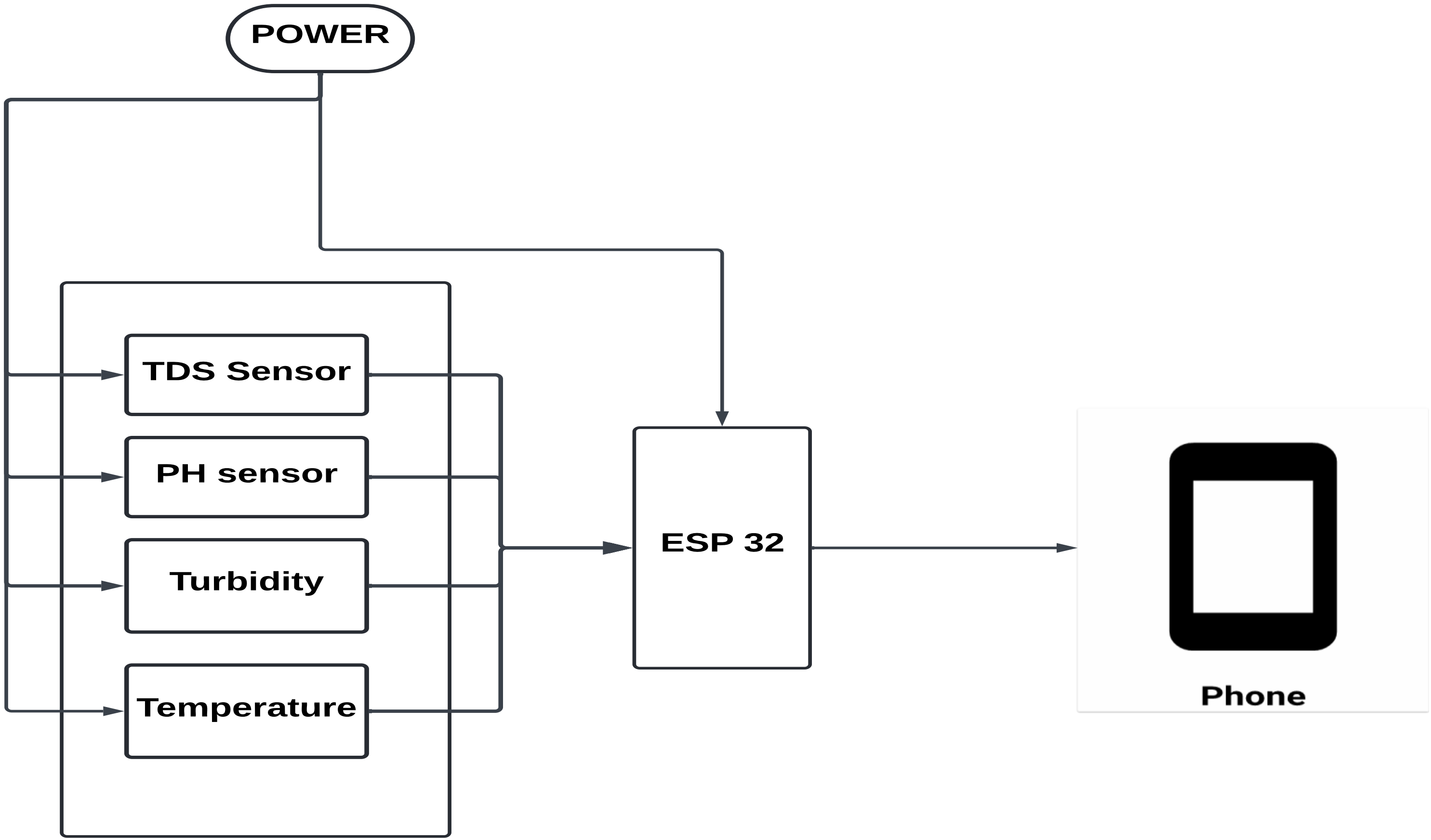
SI NO	Title	Authors	Year	Advantages	Disadvantages
1	Assessment Of Bacteriological Quality And Physico-chemical Parameters Of Domestic Water Sources In Samaru Community	Taiwo Adekanmi Adesakina, Abayomi Tolulope Oyewaleb, Umar Bayeroa	2020	1) Identification of Contamination Levels 2)Suitability Evaluation 3)Improved Water Management	1) Limited Scope 2) Labor-Intensive Data Collection: Possible 3) Inaccuracies in Data:
2	Real time monitoring of water Quality using IoT and Deep learning	Saloua Senhaji, Mohamed Hamlich And Mohammed Ouazzani Jamil	2021	1) Real-time Data Analysis & Transmission 2) Advanced Predictive Modeling with LSTM 3)Enhanced Public Health and Safety:	1) Initial Setup Costs 2) Complexity in Maintenance 3) Sensor Calibration Issues:

SI NO	Title	Authors	Year	Advantages	Disadvantages
3	A Scalable, Low-Maintenance, Smart Water Quality Monitoring System	Anastasios Malissovas, Nitin Narayan, Thijl Boonen and Shrishail Patki1	2022	1) Real-Time Monitoring 2) Low Maintenance 3) Anomaly Detection	1) Initial Setup Cost 2) Dependency on Sensors 3) Limited Parameter Coverage
4	Analysis Of Water Quality	K.Sreelatha, A.Nirmala Jyothsna, M.Saraswathi, P.Anusha, A. Anantha Lakshmi	2022	1) Comprehensive Water Quality Evaluation 2) Early Detection of Contaminants 3) Environmental & Health Protection	1) Time-Consuming Process 2) Resource-Intensive Testing 3) Data Interpretation Challenges

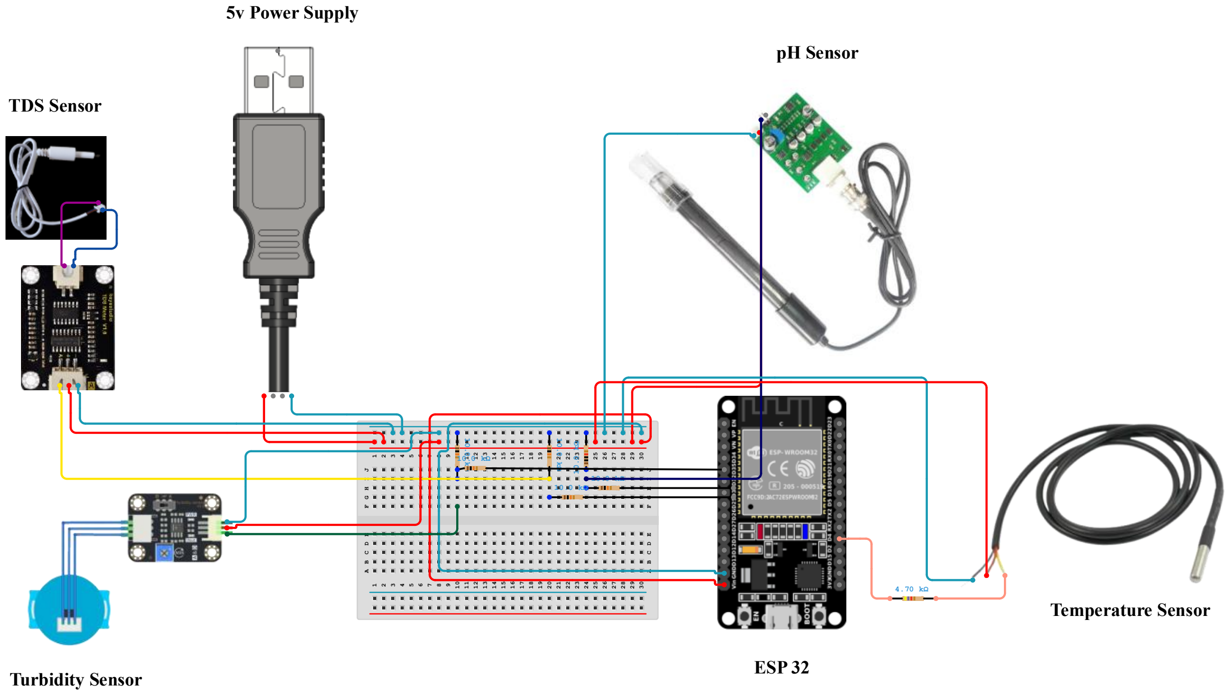
SI NO	Title	Authors	Year	Advantages	Disadvantages
5	Selection Of A Diagnostic Tool For Microbial Water Quality Monitoring And Management Of Faecal Contamination Of Water Sources In Rural Communities	Arinao Murei , Ilunga Kamika , Maggy Ndombo Benteke Momba	2024	1) Identification of Contamination Levels 2)Suitability Evaluation 3)Improved Water Management	1) Limited Scope 2) Labor-Intensive Data Collection: Possible 3) Inaccuracies in Data:

Proposed System

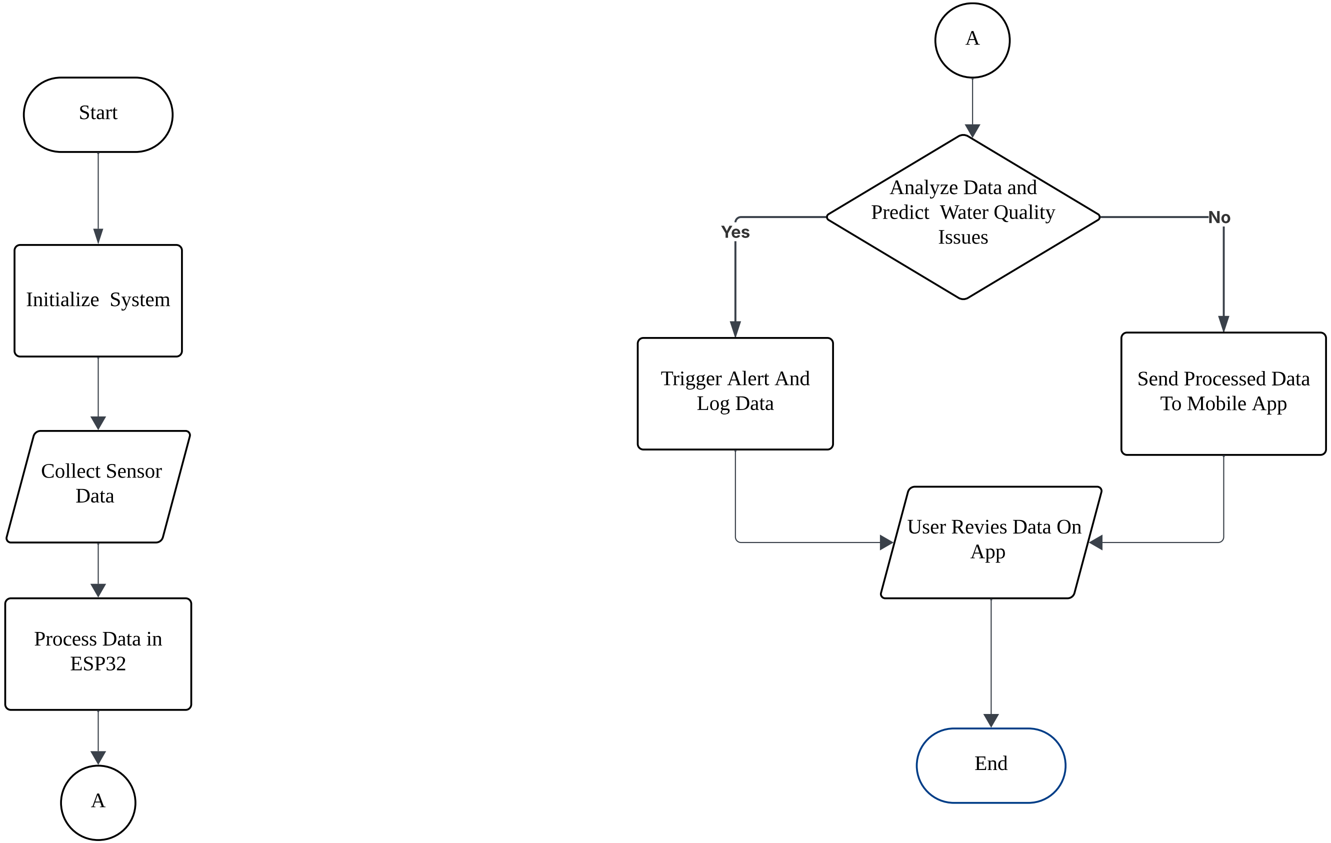
Block Diagram



Circuit Diagram



Flow Chart



Start
Initialize System
Collect Sensor Data
Process Data in ESP32
A
A
Analyze Data and Predict Water Quality Issues
Yes
No
Trigger Alert And Log Data
Send Processed Data To Mobile App
User Revies Data On App
End

Components

Components

ESP32

- **Dual-Core CPU:** 240 MHz for multitasking.
- **Wi-Fi + Bluetooth/BLE:** Wireless IoT connectivity.
- **34+ GPIO & Sensors:** Touch, temp, ADC/DAC.
- **Ultra-Low Power:** Deep sleep (μA) for battery projects.

Turbidity sensor

- **Model: QC277**
- Measures water "cloudiness" caused by suspended particles
- **Input voltage:** 5v
- **Output Type:** Analog
- **Measurement Range**: 0 – 1000 NTU
- **Operating Temperature: 0°C to 70°C**

pH sensor

- **Model**: SEN0161 (Analog)
- **Range:** pH 0–14
- **Output:** 3.3V
- **Glass Electrode**: Measures hydrogen-ion activity (pH 0 – 14) by generating a voltage proportional to pH.
- **Output:** Voltage decreases linearly as pH increases (e.g., 3.3V = pH 0, 0V = pH 14).

TDS sensor

- **Model: Gravity Analog TDS Sensor**
- **Working Principle :** Measures electrical conductivity of water (higher TDS = higher conductivity).
- Converts conductivity to ppm (parts per million) via analog voltage.
- **Underwater Use:** Waterproof probe (submerge only the electrode).

Temperature sensor

- **Model:** Waterproof DS18B20 (1-Wire Digital Sensor)
- **Working Principle**: Thermistor-based, measures temperature (55°C to +125°C).
- **Digital output.**
- **Underwater Use:** Fully waterproof probe.

Power supply

- **Power Source :**Converts AC to regulated 5V DC for stable operation.
- **Voltage Regulator :**Maintains constant 5V output, preventing fluctuations.

Result

- **Accurate Water Quality Monitoring** – Successfully detected water parameters like pH, turbidity, and contaminants.
- **Bacteria Prediction** – Identified potential bacterial presence, preventing health risks.
- **Real-Time Data & Remote Access** – Allowed continuous monitoring and alerts via IoT integration.
- **Efficient & Automated System** – Reduced manual testing efforts and improved response time.

Advantages

- **Smart Water Conservation –** Prevents water wastage with real-time monitoring.
- **Automated System –** Detects & responds to changes without manual effort.
- **Energy & Cost Efficient** – Uses low power and reduces operational costs.
- **Remote Monitoring –** Control & track data from anywhere via IoT integration.

Future Scope

AI-Based Predictive Analysis

Use machine learning to predict water contamination trends.

IoT & Cloud Integration

Enable real-time remote monitoring via cloud platforms.

Automated Water Treatment

Trigger filtration or purification systems when contamination is detected.

Solar-Powered Operation

Use renewable energy to make the system self- sustaining.

Cost Analysis

COMPONENT	COST
ESP 32	400
Ph Sensor	1500
TDS Sensor	600
Turbidity Sensor	700
Temperature Sensor	150

Timeline

Phase	Tasks	Duration
Planning & Design	Define project scope, components, and circuit design.	3 weeks
Component Sourcing	Purchase necessary components.	2 days
Assembly	Connect components.	5 days
Coding	Write and upload firmware for system operation.	3 days
Testing & Debugging	Test system functionality, fix errors, optimize performance.	2 days

Conclusion

The Aqua Intel Project provides real-time water quality monitoring and bacteria detection using IoT and sensors. It ensures accurate tracking, early contamination alerts, and remote access, reducing manual testing efforts. Future enhancements with AI and advanced sensors can further improve efficiency and scalability.

Reference

- **Assessment Of Bacteriological Quality And Physico-chemical Parameters Of Domestic Water Sources In Samaru Community (2021)** – *Taiwo Adekanmi Adesakina, Abayomi Tolulope Oyewaleb, Umar Bayeroa*

- **Real time monitoring of water Quality using IoT and Deep learning (2021)-** *Saloua SENHAJI, Mohamed HAMLICH and Mohammed OUAZZANI JAMIL*

- **A Scalable, Low-Maintenance, Smart Water Quality Monitoring System(2022)-** Anastasios Malissovas, Nitin Narayan, Thijl Boonen and Shrishail Patki

- **Analysis Of Water Quality(2022)** – *K.Sreelatha, A.Nirmala Jyothsna, M.Saraswathi, P.Anusha, A. Anantha Lakshmi*

- **Selection Of A Diagnostic Tool For Microbial Water Quality Monitoring And Management Of Faecal Contamination Of Water Sources In Rural Communities (2024)**- *Arinao Murei , Ilunga Kamika , Maggy Ndombo Benteke Momba*

Thank you