24CYS333 – Internet of Things

Lab 1: Fine-Tuning Project Topic, Hardware Resource Mapping, and Literature Survey

- ***IoT#3***

Agil Prasanna P
(CB.EN.U4CYS22003)
Amal Ritessh A P
(CB.EN.U4CYS22005)
Ananth R *(CB.EN.U4CYS22006)*

1. Fine-Tune Project Topic

- Our topic at first was *"Real-Time pH and Contaminant Monitoring System for Drinking Water".*
- After our team discussion, we modified it as ***"IoT-Based Real-Time Monitoring and Analysis of pH Levels and Contaminant Concentration in Drinking Water for Quality Assurance and Public Health Safety."***
- The refined topic clearly specifies the IoT component and highlights role of real-time monitoring.
- Also, the refined topic specifics both pH levels and contaminants for water quality assessment.
- It is relevant to real-world scenarios, such as municipal water supply, industrial settings, or household systems.
- It addresses the global need for clean, safe drinking water. So the focus on the problem is clear.

2. Hardware Resource Mapping

The hardware components required for the project are listed below:

1. pH Sensor

Function: Measures the acidity or alkalinity of the water.

Necessity:

- pH is a critical indicator of water quality.
- Ensures the water is safe for consumption (acceptable range: 6.5 to 8.5).

2. Turbidity Sensor

Function: Detects the cloudiness or haziness of water caused by suspended particles. Works by measuring the amount of light scattered by particles in the water.

Necessity:

- High turbidity indicates the presence of contaminants, including bacteria or organic material.
- Helps in identifying water filtration needs.

3. TDS (Total Dissolved Solids) Sensor

Function: Measures the concentration of dissolved solids like salts, minerals, and metals in water.

Necessity:

- High TDS levels may affect water taste and indicate contamination.
- Ensures water meets the standard TDS limits for drinking water (below 500 ppm).

4. Temperature Sensor

Function: Measures water temperature.

Necessity:

- Sensor readings like pH and TDS are influenced by temperature, so compensation is essential for accuracy.
- Tracks water temperature trends, which can indirectly indicate contamination.

5. Microprocessor with Built-in Wi-Fi (ESP32)

Function:

- Collects, processes, and transmits sensor data to a cloud or server in real-time.
- Enables wireless monitoring of water quality.

Necessity:

- Serves as the central controller for the system.
- Built-in Wi-Fi allows for seamless IoT integration without additional communication modules.

3. Literature Survey

Intelligent IoT-Based Real-Time Water Quality Monitoring and Pollution Detection System - Binu K. Mathew, Fossy Mary Chacko, Nikhil A., Shabin Kandisseril Shilu, Sreelakshmi S.

Real Time Monitoring System of Drinking Water Quality Using Internet of Things - Zainul Abidin, Eka Maulana, Muhammad Yogi Nurrohman, Fitri Candra Wardana, Warsito

These were the 2 research paper we found related to our project.

Findings from these papers are summarized below:

1. Existing Solutions

- **Technologies**: Current systems use sensors (pH, TDS, turbidity, temperature) connected to microcontrollers like Arduino or ESP32 with Wi-Fi for real-time data sharing. Platforms like ThingSpeak handle visualization.
- **Protocols**: Data transmission commonly uses HTTP or MQTT for cloud integration.
- **Implementations**: Examples include systems monitoring water parameters in universities and automated setups that adjust pH or turbidity to safe levels

2. Research Gaps

- Limited use of AI for prediction or contamination trends.
- Focus only on basic parameters; advanced contaminants like microbes or heavy metals are often ignored.
- Energy efficiency and scalability issues. Only few systems are energy-efficient or designed for large-scale environments.
- IoT Security. Data transmission security is underexplored in most implementations

3. Relevance

- Real-time monitoring with advanced IoT technologies and predictive analytics.
- Broader contaminant detection and scalable design for urban and rural applications.
- Improved energy efficiency and secure data handling.

- The project addresses clean water accessibility, aligning with UN Sustainable Development Goal 6.
- It ensures early detection of contaminants, enhancing health and safety.