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Project Preliminary Investigation Report

Name of Department:

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Title of the Project:

Design of a cloud-based IoT system for real-time monitoring of wastewater

Area of Project Work:

Internet of things (IoT), Cloud-based IoT

Problem Statement:

1. To create a small, economical, flexible, easily configurable, and portable System.

2. This system could monitor, and control wastewater discharged into wastewater treatment plants and prevents damage in the treatment process

Prior Art (Patent Search):

Patent Application No.	Title of Patent	Existing Solutions (Abstract of Patent)
CA2532079A	Remote monitoring system for water supply network	A water quality detection system for distributed water supply network. The system comprises a multiplicity of detectors where in each detector of the detectors is capable of monitoring at least one attribute of water and providing a signal 5 related to the attribute. A controller is provided which is capable of receiving each signal and comparing the signal to a control signal for the attribute. A response mechanism is responsive to the controller and activated when at least one signal matches the control signal. An access gate limits access to at least one of the detectors, the controller or the response mechanism. An access key is provided for 10 comparing a user attribute with a stored attribute wherein

		when the user attribute matches the stored attribute access is provided into the access gate.
KR20210003603A	IoT water quality monitoring system for aquaculture	Typhoons in summer and cold snaps during winter in Taiwan often cause huge aquaculture losses. Simultaneously, the lack of human resources is a problem. Therefore, we used wireless transmission technology with various sensors to transmit the temperature, pH value, dissolved oxygen, water level, and life expectancy of the sensor in the fish farm to the server. The integrated data are transmitted to mobile devices through the Internet of Things, enabling administrators to monitor the water quality in a fish farm through mobile devices. Because the current pH sensors cannot be submerged in the liquid for a long time for measurements, human resources and time are required to take the instrument to each fish farm for testing at a fixed time. Therefore, a robotic arm was developed to complete automatic measurement and maintenance actions. We designed this arm with a programmable logic controller, a single chip combined with a wireless transmission module, and an embedded system. This system is divided into control, measurement, server, and mobility. The intelligent measurement equipment designed in this study can work 24 h per day, which effectively reduces the losses caused by personnel, material resources, and data errors.
)150073604A	Water quality monitoring devices with Internet capabilities things	The present invention relates to a water quality monitoring apparatus capable of real-time monitoring and management of a measurement-related, measurement-related, and abnormality-related relation in real time through an administrator's and a management apparatus through an object Internet function, And an object of the Internet of Things to enable real-time interactive communication using a management device and the Internet or a mobile communication network in order to manage abnormality signals, contrast judgment values, automatic and manual, Internet water quality sensor and water quality measurement sensor which

		measures various characteristics of water quality are connected to provide real-time conversation using management device and Internet or mobile communication network for measurement value of water quality characteristics, abnormality signal, contrast judgment value, (Internet of Things) to enable communication between the Internet and things The Internet water quality sensor can be used solely by using the Internet object function or can be connected to the Internet object water temperature sensor or the water quality measurement sensor in the internet wall ; It has the effect of easy management and crisis management by improving the control management ability through real-time communication with sensors by diverting various water quality measurement sensors that measure water quality characteristics from the M2M method.

Literature Review:

Title of Paper	Details of Publication with Date and Year	Literature Identified for Project
An Industrial Cloud-Based IoT System for Real-time Monitoring and Controlling of Wastewater	11 January 2022	New sensors can be easily added to the proposed IoT system, which increases the reliability and the scalability and of the system.
IoT- based Water Monitoring System	10 November 2022	In the creation of intelligent water quality solutions utilizing cutting-edge technology that provide real-time data access is essential for the management of water resource.
Water Quality Monitoring System based on IoT	5 November 2017	Monitoring of Turbidity, PH & Temperature of Water makes use of water detection sensor with unique advantage and existing GSM network.
Renovation of Automation System based	12 April 2020	This study proposes an IoT-based framework for checking ICU patients, which is able to dramatically

on Industrial Internet of Things		decrease the chance of human mistakes.
IoT Based Drainage and Waste Management Monitoring and Alert System for Smart City	3 March 2021	The Under-ground monitoring is a challenging problem. This project proposes different methods for monitoring and managing underground drainage systems.

Current Limitations

1. Costs: Cloud services can become expensive, especially when dealing with large amounts of data and real-time processing. Managing costs while ensuring the required performance can be challenging
2. Interoperability: IoT devices from different manufacturers might use different protocols or data formats. Ensuring interoperability and integration can be complex.
3. Environmental Factors: Sites for wastewater monitoring may be in difficult locations, like underground or far away. It is important to take into account the durability and resilience of IoT devices in these circumstances.

Proposed Solution

1. Costs: Make the most of capabilities, use edge computing, monitor and control expenses.
2. Interoperability: Put middleware to work translating them, and provide APIs for smooth integration to achieve interoperability.
3. Environmental Factors: Create robust enclosures, use effective power management, allow for remote repair, and take longer battery life into account.

Objectives and Scope of Work

Objectives:

1. A cloud-based IoT system monitors and controls wastewater discharged into treatment plants.
2. It uses sensors, a gateway device, cloud platform, and web interface.
3. An SMS warning and sound alarm activate if wastewater is detected.
4. The system will be effective, providing quick reports, remote control, alerts, and accuracy.
5. The proposed system will monitor pH and temperature of wastewater to prevent any harmful wastewater from being processed

Scope of Work:

1. Sensor deployment within the wastewater network, data collection.

2. placement of sensors within the real-time processing, analytics.
3. It visualized on cloud platform.
4. The system complies with relevant environmental regulations.
5. It standards for wastewater management.

Feasibility Assessment:

I. Expected Outcomes of the Project

- Our main intentions of this project is to create a small, economical, flexible, easily configurable, and portable system.
- This system will monitor and control wastewater discharged into wastewater treatment plants and prevent damage in the treatment process and equipment and also protect the workers which are not qualified to deal with such type of water.
- The system can achieve reliability and feasibility in the monitoring processing by verifying the parameters of water and the warnings notifications which made the system more flexible and controllable.
- It will help in keeping the water bodies clean and it will avoid the mixing of unwanted elements into the water bodies. This will help to protects the natural ecosystem of aquatic flora and fauna.

II. Innovation Potential

- The proposed system can provide an efficient IoT-based dynamic, continuous, and real-time online monitoring of the wastewater discharged into wastewater treatment plants.
- This system will remotely control the water's path to avoid all forms of damage.
- The system will be designed for low cost, small size, easily operation and lightweight system .

III. Task Involved

Automatically adjust processes to changes in chemical volume, water chemical requirements, changing water contamination and flow rate and other factors.

IV. Expertise Required

- Analog pH electrode
- pH transmitter with display
- Node MCU Esp8266

V. Facilities Required

The Hardware Components

- GSM Module SIM 800L
- DS18B20 Temperature Sensor
- ADS1115 4-Channel 16-Bit ADC Module

The Software Components

- Arduino IDE - It provides a code editor that includes syntax highlighting, brace matching, and automatic indentation, as well as the ability to compile and publish programs.
- Visual Studio -_The proposed system uses the Visual Studio platform to develop a web form for monitoring real-time data and controlling the equipment remotely via the cloud, as well as building reports for data analysis.

Milestones and Time Plan

	Task	JULY 2023	AUG 2023	SEP 2023	OCT 2023	NOV 2023	DEC 2023	JAN 2024	FEB 2024	MAR 2024	APR 2024
Design	Conceptual Design	✓									
	Detailed design	✓									
	Design Modifications		✓								
	Final Design			✓							
Develop	Procurement (If any)				✓						
	Prototyping					✓					
	Modifications					✓					
Deliver	Testing and Validation							✓			

	Final Modifications								✓		
	IPR / patent draft										
	Thesis and Poster										✓