



Online System for Monitoring water Quality, Leaks, contamination and Managing Pipeline Network

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ABSTRACT

Worldwide, drinking water is an important need for people of all the countries. With such universal necessity, distribution of drinking water has not been streamlined. With the present manual techniques to prevent leaks, contamination, and managing pipeline network there are lots of inefficiencies in the system which leads to wastage of water. To prevent this wastage of water and to make a better system which not only prevents leaks in the pipeline but also detects water contamination and helps the authorities manage the pipelines better an IoT based system is proposed. The proposed system provides a complete solution for a city's drinking water pipeline needs. The proposed system can save on manpower and money for the government. The proposed system is self-sufficient in power and batteries do not need to be manually charged as it uses a dynamo setup for charging the by converting the kinetic energy into electrical energy.

Keywords: Arduino uno, Microcontroller, Cloud Server, LCD, TDS Sensor, Moisture Sensor, pH Sensor, Flow Sensor, Turbidity Sensor, GSM/GPRS, Web page, Threshold.

I INTRODUCTION

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 any undesirable 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.

II 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 for communicating 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.

[8] An Optimal Method for identifying and estimating groundwater pollution sources:

An optimization model involving flow and transport equations is used as a constraint in the proposed methodology. For determining the best estimates of unknown source characteristics, we use a nonlinear programming algorithm. It incorporates measurements of pollutant concentrations gathered at observation sites. Even when the aquifer parameters are unknown, the proposed methodology successfully identifies the locations, determines the magnitudes, and specifies the duration of ground-water pollution sources.

[9] The Design and Implementation of an evaluation system that is cost-effective:

An innovative microcontroller-based system for water quality monitoring with a high degree of accuracy and the ability to measure several parameters of water such as temperature, turbidity, and pH are presented in this paper. As water sources are becoming tainted due to excessive pollution, those parameters must be detected to lead a healthy life. Simple devices that track out water parameters unerringly do not need to be modeled. Sensors that measure various parameters send the data to a microcontroller, and finally, the LCD display the results.

[10] Monitoring Waste Water Quality with wireless sensor networks for smart environments:

The purpose of this study was to develop a wastewater monitoring system using a wireless sensor network with a

wasp mote main board as a microcontroller, plus a smart water sensor connected to a pH sensor, Conductivity sensor, Dissolved oxygen sensor, and water temperature sensor. To communicate with the server, we used a 3G module. The data from the sensors is collected in real-time and saved in a database before being visualized in a graphical format on the web-based dashboard.

[11] A Drinking Water Distribution System Security Early Warning Detection System (EWDS):

The creation and use of a methodology for determining the ideal configuration of a detection system, taking explicit account of unsteady hydraulics, as well as the dilution and decay qualities of water quality constituents as distributed with the flow, are discussed in this study. The detection system's output is a network of monitoring stations tasked with capturing pollutant entry while maintaining a pre-determined level of service. The methodology is implemented in an EPANET-specific algorithm framework.

[12] A Smart Sensor Network for Monitoring Sea Water Quality:

In this research, they offer a network of smart sensors for in situ and continuous space-time monitoring of water surface bodies, particularly seawater, based on the ISO suite of standards. The system is intended to be a useful tool for assessing water quality and a reliable source of information for strategic decisions about major environmental issues. The suggested system's goal is to catch potential extreme occurrences and collect data over long periods.

[13] Water quality monitoring in real-time in an IoT Setting:

In this study, we propose the design and implementation of a low-cost system for real-time water quality monitoring in the IoT. The system, which consists of multiple sensors, is used to measure the water's physical and chemical characteristics. Temperature, pH, Turbidity, Conductivity, and dissolved oxygen can all be detected in the water. The core controller can process the measured values from the sensors. As a core controller, the raspberry pi B+ model can be used. Finally, using cloud computing, the sensor data may be seen on the internet.

[14] A Machine Learning-based Smart Real-Time Monitoring System for Drinking Water:

The goal of this research is to use wireless sensor networks to control the quality of drinking water. To detect chemical, physical, and microbiological water characteristics, this architecture employs a new generation of wireless sensors. Then we create a new water anomaly detecting model. Our machine learning-based technology detects irregularities and harmful behaviors in real-time. A data aggregation strategy is used in our solution to reduce the amount of data and processing time.

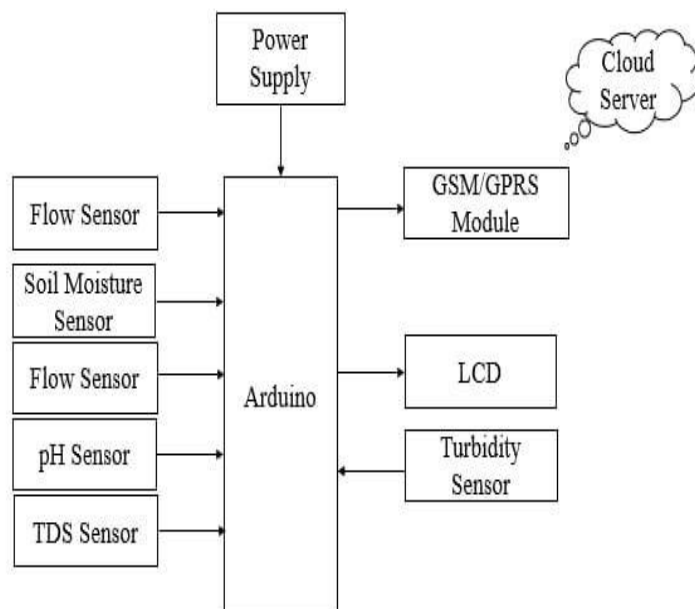
[15] Water Contamination Detection using a Remote Sensing Kit:

Here, they present an IoT-enabled remote sensing kit for multiparameter water quality monitoring and contamination event detection. The proposed kit may gather real-time data monitor from domestic reservoirs, evaluate them and present it on a simple platform for monitoring. Temperature, pH, Conductivity, and Turbidity are all key indicators of water quality. It can also use the onboard processor to process data before sending it to the cloud to determine the water quality. They proposed that a remote sensing kit be smoothly incorporated into the metropolitan area's water management system

III PROPOSED SYSTEM

In this proposed system we are using Arduino uno as microcontroller and sensors. By using Arduino 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. TDS 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 all



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 reparability and serviceability. Highly economical and water proof design of the system makes it easy to scale to a city level.

Figure 3.1 Block Diagram

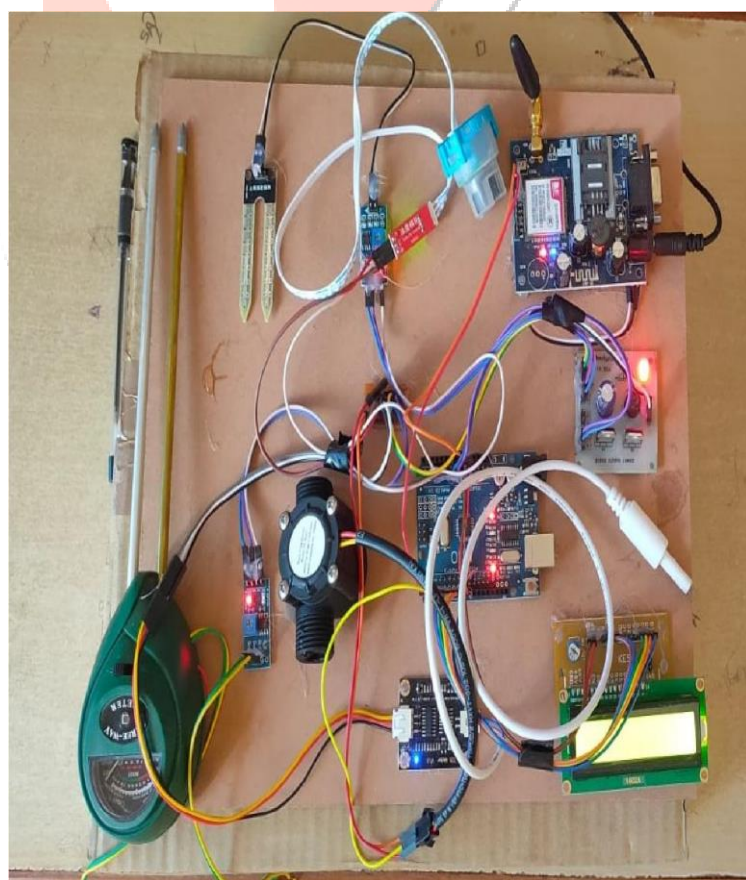


Figure 3.1 Connection Diagram

IV EXPERIMENTAL RESULTS

Execution procedure:

1. Placing all sensors such as pH, TDS, and Turbidity, moisture sensor in the sample water and as well as Flow Sensor to the pipe line network.
 2. All the components are connected as given in the connection diagram.
 3. Switch on the power supply.
 4. The parameter values will be displayed on the LCD screen.
5. In the source code set some threshold value for all the parameters if any of the parameter values exceed the threshold value then it indicates that water is polluted.
- **TDS Sensor value**(If temperature is 50-150 then the water quality is good).
 - **TDS Sensor value**(If temperature is 50-150 then the water quality is good).



Figure 4.1 TDS and Temperature values



Figure 4.2 Turbidity sensor value

Figure 4.3 pH sensor value



Figure 4.4 Moisture sensor value

6. Then with the help of GSM, the user will receive the message that includes all values.
7. The same data will be stored in the cloud server. It is used to monitor or read the values for every day from the server.
8. The same steps will be repeated every day to monitor the water quality in the pipeline.



Figure 4.5 Flow sensor value

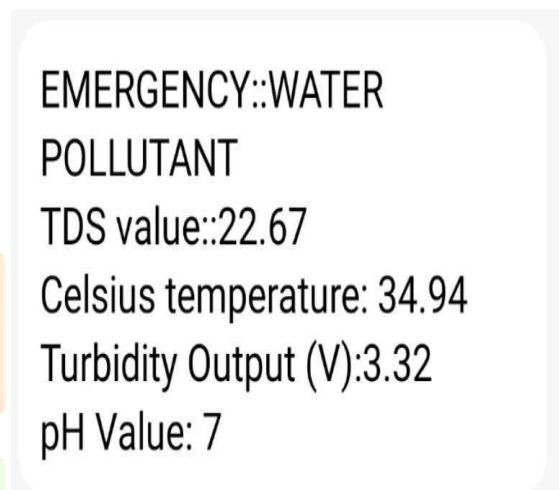


Figure 4.6 Message received by user

V 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.

Server Module:

Server modules store the data that is obtained from the microcontroller in the cloud. A Mobile device or PC can be used to view the data. If there is an internet connection available to the microcontroller, it will connect to the server.

User Module:

The user module will use GSM/GPRS to communicate with sensors and a server containing the sensing data. This server module sends data to the server module, which stores and backups the data continuously and allow us to monitor the data using a laptop or Mobile device.

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