

Water Quality Monitoring System Based on IOT

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Abstract – Water Pollution is the one of the biggest fears for the green globalization. In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. In this paper we present a design and development of a low cost system for real time monitoring of the water quality in IOT(Internet of Things). The system consists of several sensors is used to measuring physical and chemical parameters of the water. The parameters such as temperature, PH, turbidity, of the water can be measured. The measured values from the sensors can be processed by the core controller. The Arduino model can be used as a core controller. Finally, the sensors data can be viewed on internet using WI-FI system.

Key Words: pH sensor, Turbidity sensor, Temperature sensor, Arduino model, WI-FI module .

1. INTRODUCTION

In the 21st century, there were lots of inventions, But at the same time were pollutions, global warming and so on are being formed, because of this there is no safe drinking water for the world's pollution. Nowadays, water quality monitoring in real time faces challenges because of global warming limited water resources, growing population, etc. Hence there is need of developing better methodologies to monitor the water quality parameters in real time The water quality parameters pH measures the concentration of hydrogen ions. It shows the water is acidic or alkaline, Pure water has 7pH value, less than 7pH has acidic, more than 7 pH has alkaline. The range of pH is 0-14pH. For drinking purpose it should be 6.5-8.5pH Turbidity measures the large number of suspended particles in water that is invisible. Higher the turbidity higher the risk of diarrhea, collera. Lower the turbidity then the water is clean. Temperature sensor measures how the water is, hot or cold. The traditional methods of water samples from different locations.

The rest of this paper is organized as follows: section II review the related work of this project, section III describes the proposed system with the module explanation, section IV provides the schematic circuit with it working, section VI the conclusion with future scope.

2. LITERATURE REVIEW

Nikhil Kedia's paper titled "*Water Quality Monitoring for Rural Areas – A Sensor Cloud Based Economical Project,*" presented at the 2015 1st International Conference on Next Generation Computing Technologies (NGCT-2015), Dehradun, India, discusses comprehensive approaches to water quality monitoring in rural regions. The study explains various monitoring techniques, sensor technologies, embedded system architecture, and mechanisms for information dissemination. It also outlines the responsibilities of government authorities, network providers, and local communities in ensuring effective communication of water quality information. Furthermore, the paper introduces the concept of Sensor Cloud technology. Although automatic purification of water is not yet practically achievable, the author emphasizes that cost-effective technological solutions and efficient management practices can significantly enhance water quality awareness and monitoring.

Jayti Bhatt and Jignesh Patoliya, in their paper "*Real Time Water Quality Monitoring System,*" propose an Internet of Things (IoT)-based approach to ensure safe drinking water. Their system continuously monitors water quality parameters such as pH, turbidity, conductivity, dissolved oxygen, and temperature using multiple sensors. The collected sensor data is processed through a microcontroller and transmitted via the Zigbee communication protocol to a Raspberry Pi, which acts as the central controller. The processed information is then uploaded to a cloud platform, enabling users to access real-time data through a web-based interface. The study highlights the importance of continuous monitoring to maintain water safety standards.

Michal Lom, Ondrej Pribyl, and Miroslav Svitek, in “*Industry 4.0 as a Part of Smart Cities*,” examine the relationship between the Smart City initiative and the Industry 4.0 framework. The concept of smart cities gained prominence after the 2008 financial crisis, with the objective of developing sustainable urban environments while maintaining citizens’ quality of life. The authors argue that smart city development must integrate technical, economic, legal, and social dimensions. Industry 4.0 leverages IoT to create intelligent products equipped with embedded intelligence throughout their lifecycle. Additional components such as the Internet of Services (IoS) and Internet of Energy (IoE) support smart mobility, logistics, and efficient resource utilization. Together, IoT, IoS, Internet of People (IoP), and IoE create a strong link between Industry 4.0 and the broader Smart City ecosystem.

Sokratis Kartakis and colleagues, in “*Adaptive Edge Analytics for Distributed Networked Control of Water Systems*,” propose a method for detecting and localizing bursts in water distribution networks. Their approach integrates lightweight data compression, anomaly detection, and graph topology analysis to reduce communication overhead between sensor nodes and central servers. By analyzing differences in vibration signal arrival times across sensor locations, the system can accurately identify and localize water burst incidents. Experimental findings indicate that this technique can reduce communication requirements by up to 90% compared to traditional periodic reporting systems.

In the paper “*QOI-Aware Energy Management in Internet-of-Things Sensory Environments*,” Zhanwei Sun and co-authors introduce an energy management framework designed to maintain Quality of Information (QoI) in IoT-based sensing environments. Unlike earlier approaches, the proposed framework remains compatible with lower-level communication protocols while optimizing long-term energy efficiency without compromising QoI standards. The authors present the idea of “sensor-to-task relevancy,” which matches sensor capabilities with specific task requirements. They also introduce the concept of a “critical covering set” to determine the optimal selection of sensors for servicing tasks over time. The system dynamically adjusts energy management decisions based on long-term traffic patterns and service delay constraints.

3. PROPOSED SYSTEM

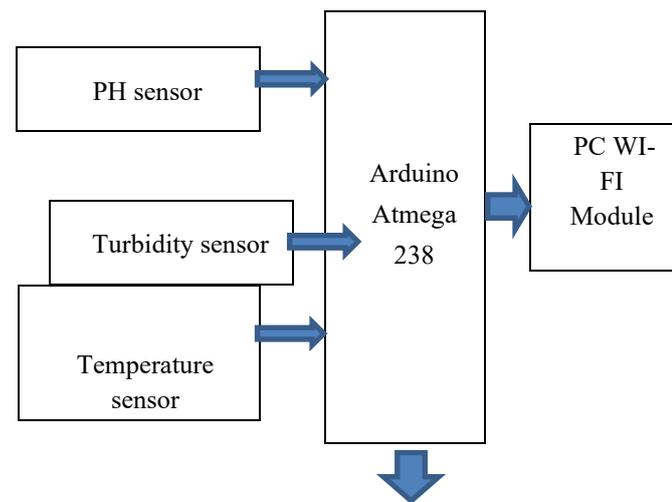


Fig.1 Block Diagram

In this, we present the theory on real time monitoring of water quality in IoT environment. The overall block diagram of the proposed method is explained. Each and every block of the system is explained in detail.

In this proposed block diagram consist of several sensors (temperature, pH, turbidity) is connected to core controller. The core controller are accessing the sensor values and processing them to transfer the data through internet. Arduino is used as a core controller. The sensor data can be viewed on the internet wi-fi system.

1. pH Sensor:

The pH of a solution is the measure of the acidity or alkalinity of that solution. The pH scale is a logarithmic scale whose range is from 0-14 with a neutral point being 7. Values above 7 indicate a basic or alkaline solution and values below 7 would indicate an acidic solution. It operates on 5V power supply and it is easy to

Interface with arduino. The normal range of pH is 6 to 8.5.



Fig 2. pH Sensor

2. Turbidity Sensor:

Turbidity refers to how clear or unclear water appears due to the presence of tiny suspended particles such as silt, clay, or organic matter. When turbidity levels increase, the water becomes less transparent, which often signals changes in water quality. Cloudy water prevents sunlight from reaching underwater plants, reducing their ability to produce food through photosynthesis. Moreover, particles floating near the surface absorb heat from sunlight, which can cause the temperature of the water to rise. These changes can disturb aquatic life and negatively impact the overall health of the ecosystem.



Fig 3. Turbidity Sensor

3. Temperature Sensor:

Water temperature indicates how water is hot or cold. The range of DS18B20 temperature sensor is -55 to +125 °C. This temperature sensor is digital type which gives accurate reading.



Fig 4. Temperature Sensor

4. Arduino Uno:

Arduino is a microcontroller board based on the Atmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connections, a power jack, an ICSP header and a reset button It contains everything needed to support the microcontroller. Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.



Fig 5. Arduino uno

5. WI-FI Module:

The ESP8266 WiFi module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an applications or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware. The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.



Fig.6. Wi-Fi Module

4. SCHEMATIC CIRCUIT WITH ITS WORKING

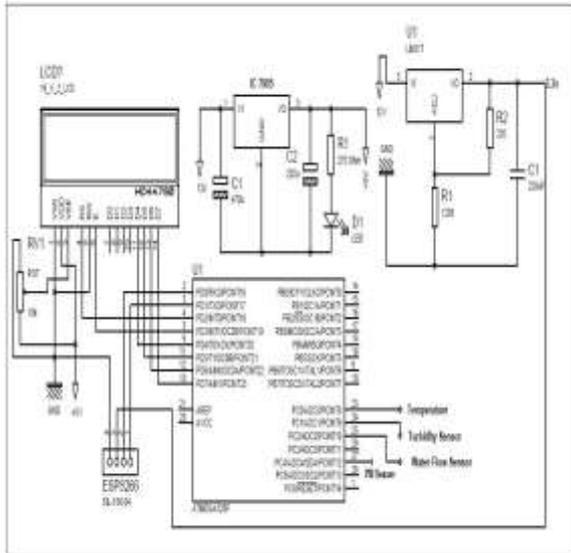


Fig.7. Schematic Diagram

The whole design of the system is based mainly on IOT which is newly introduced concept in the world of development There is basically two parts included, the first one is hardware and second one is software. The hardware part has sensors which help to measure the real time values, another one is arduino atmega328 converts the analog values to digital one, & LCD shows the displays output from sensors, Wi-Fi Module gives the connection between hardware and software. In software we developed a program based on embedded c language.

The PCB is design at first level of construction and component and sensors mounted on it. BLYNK app is installed in the android version to see the output. When the system get started dc current gives to the kit and arduino and Wi-Fi gets on. The parameters of water is tested one but one and their result is given to the LCD display. The app went provided with hotspot gives the exact value as on LCD display shows on kit. Thus like this when the kit is located on any specific water body and Wi-Fi is provided we can observe its real time value on our android phone anywhere at any time.

5. CONCLUSION AND FUTURE SCOPE:

CONCLUSION:

Water quality can be checked by measuring turbidity, pH, and temperature using special water sensors. These sensors are connected to a GSM network, which helps send the data automatically. The system works without needing a person to watch it all the time. Because it runs automatically and uses an existing network, it saves money and gives quick results.

The system is flexible and easy to use. If needed, we can change the sensors and update the software to measure other water quality factors. It can also be used in other areas like checking river levels, air pollution, farming, and industrial activities. This makes the system useful in many different situations. When these small sensor devices are placed in the environment, they collect information regularly. The data is then sent through Wi-Fi so users can see the results easily. This helps people monitor and protect the environment in a smarter way.

FUTURE SCOPE:

- In future we use IOT concept in this project
- Detecting the more parameters for most secure purpose
- Increase the parameters by addition of multiple sensors
- By interfacing relay we controls the supply of water

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