Advanced Water Quality Monitoring with IoT

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Abstract - *Water covers over 70% of the Earth's surface* **and is a very important resource for people and the environment. The polluted water affects drinking water, rivers, lakes and oceans all over the world. To prevent this, necessary steps are to be taken. This system is based on detecting the change in water quality parameters in real time, quantify its importance and determine the most appropriate actions to be taken to limit its effects. First, the proposed approach starts with estimating the water parameters like pH, water flow, etc., as the variations in the values of these parameters point towards the presence of pollutants. Later, the processing of Sensor values is done. Finally, a water quality monitoring and management system is proposed based on the IOT concept and which use different sensors to manage the water.**

Key Words: Internet Of Things, pH Sensor, Flow Sensor, Ultrasonic Sensor, ESP8266, Cloud Data Storage

1. INTRODUCTION

Water is one of the most important basic need for all living beings, but unfortunately, a huge amount of water is being wasted because of uncontrolled use and due to which a very small amount of drinkable water is available. According to [1], in 2018, 2,439 people died because of four major water-borne cholera, acute diarrhea diseases (ADD), typhoid and viral hepatitis. Overall, more than 1.3 crore people were diagnosed with these diseases. ADD is known to affect children below 5 years the most and was the biggest killer, accounting for 1,450 (60%) of the 2,439 deaths in 2018. In the previous five years, 11,768 individuals have passed on due to these illnesses, while 7.6 crore individuals were determined to have them during a similar time. Hepatitis killed 584 people in 2018. One of the reason for the water shortage is poor management of water. Overflowing water tanks in residents, schools, colleges, Municipal overhead tanks, etc. can contribute to the large amount of water wastage. If we can control this we can save large amount of water. Conventional water tanks can neither monitor nor control the water level in the tank. As of now, the water level has to be manually checked. So, this paper will solve all the above mentioned problems with automatic detection of water level and sensors with the help of Internet of Things (IoT).

The Internet of Things, can be defined as billions of interrelated physical gadgets all over the globe that are presently associated with the web, gathering and sharing information. There are several methods of IoT communication available. According to [2], device-to-device and device-to-cloud are the two types of communication that are applied in IoT system.

1.1 Problem statement:

To develop an IOT system with the help of a Controller[ESP8266] which address all water distribution and monitoring problems and reduce man power as well as consume less time and energy.

2. LITERATURE REVIEWS

This system reviews the relevant works of water quality monitoring and management system using the IoT platform.

A. **The real time monitoring of water quality in IoT environment.**

The work of [3] studied the development of low cost system for real time monitoring of water quality in IoT environment. The parameters measured in the system are pH, temperature, turbidity, conductivity, dissolved oxygen which are present in the water. And later, the sensor data can be viewed on the internet using cloud computing.

B. **Smart Water Monitoring System using IoT**

Gowthamy J [4] studied the theory of real time monitoring of water quality and quantity using IoT. The system consists of Arduino microcontroller, different type of sensors. Arduino is the main controller of the system which control and process the data generated by the sensors. A Wi-Fi module is connected to the Arduino controller which help to transfer the data to the cloud over internet. The ultrasonic sensor assists with estimating the water level when the water stream arrive at certain level then the water flow can be halted automatically by turning the motor off.

C. **IoT Based Low Cost System for Monitoring of Water Quality in Real Time**

The work of [5] studied the estimation of the water parameters like pH, turbidity, temperature and TDS. The measured values from the sensors can be processed by the controller i.e. the Raspberry Pi. The Raspberry Pi model is used as a core controller. Finally, the sensor data can be viewed on internet using ThingSpeak API.

D.   **Internet of things enabled real time water quality monitoring system**

The work of [6] presents a detailed overview of recent works carried out in the field of smart water quality monitoring. The model that is developed is used for testing water samples and the data uploaded over the Internet are analyzed. The system also provides a notification alert to a remote user, when there is a deviation of water quality parameters from the predefined set of standard values.

E.   **Smart Water Distribution Management System Architecture Based on Internet of Things and Cloud Computing**

The work of [7] presents efficient water management and treatment is necessary to keep water quality and availability. Information and Communications Technologies (ICT) is combined with the Internet of thing (IoT) to facilitate water management and provide efficient operation of water resources, water distribution, and water quality. It presents an architecture for Smart Water Distribution System.

F.   **A Novel Smart Water-Meter based on IoT and Smartphone App for City Distribution Management**

M Suresh [8] studied a novel approach to performing automated Water meter reading for update of consumption

information from field to the Utility office. This approach reduces overheads on Utilities in handling meter reading and billing for water distribution in metropolitan and large urban conglomerates.

3. SYSTEM ARCHITECTURE

The proposed block diagram consist of several sensors which is connected to core controller. The main controller is accessing the sensor values and processing them to transfer the data through internet. ESP8266 is used as a core controller. The sensor data can be viewed on the internet using the built in Wi-Fi module on ESP8266. The architecture contains the following components:

- **pH Sensor**

- **Flow Sensor**

- **Ultrasonic Sensor**

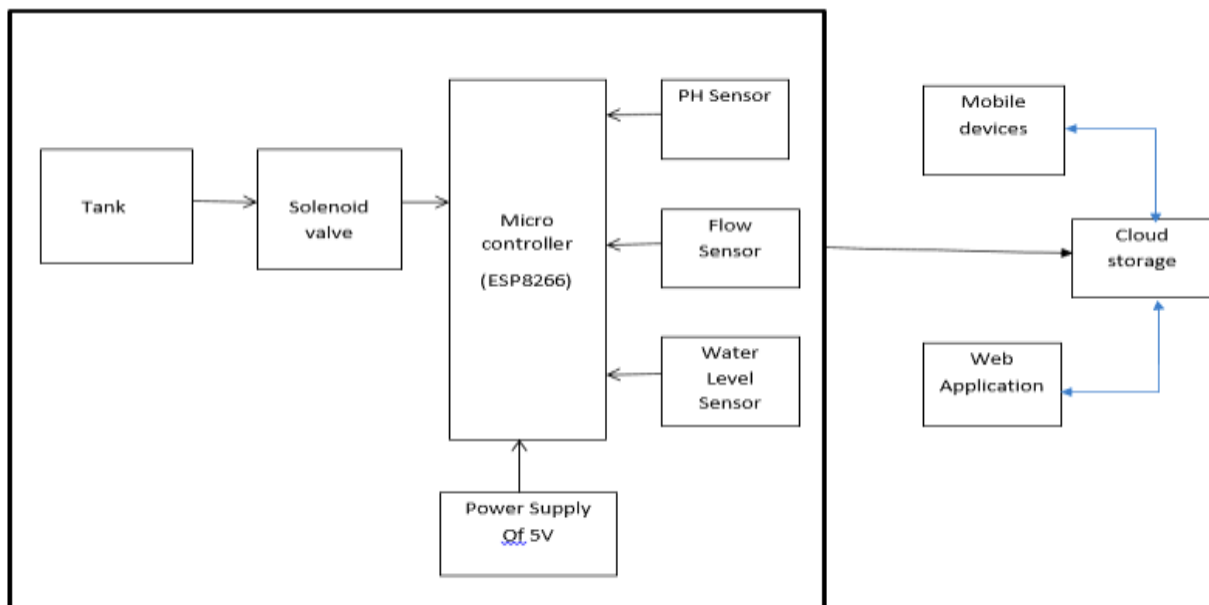- **ESP8266**

- **Solenoid Valve**

Fig -1: Block Diagram

4. ALGORITHM STEPS

Algorithm: A pseudo code for core controller is given below.

1. **While (True):**

2. **Read control valve value**

3. **Is Control Valve Open = true**

4. **Read water level sensor value, flow sensor value, bill generate amount and.**

5. **Water quality value != okay**

6. **Turn off control valve**

7. Generate warning message

8. Calculate pressure from water flow

9. **Transfer sensor value, flow sensor value, bill generate amount value to hosted database or local cloud.**

3. CONCLUSION

The intention of this work was to establish a low cost, efficient, real-time, flexible, easily configurable and most importantly, a portable system which can control the number of water-borne diseases as well as solve the water wastage problem. It comes under Internet of Things (IoT). The objective was to design a smart system for monitoring the water quality and approximating the water level in the tank and prevent the overflow. The sensors are used for monitoring and management of water. The gathered information from every one of the sensors are utilized for investigation reason for better arrangement of water issues. The data is sent to the cloud server via Wi-Fi module. Using the smart system we can monitor the sensor values and analyze the usage of water.

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