

Smart Water Monitoring System using IoT

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Abstract:- Water is one of the essential parts of life. Water pollution is one of the big problems to the world. In order to ensure the safe supply of the drinking and useful water for different purposes like agricultural, the water should be monitored. This paper presents a design of a low cost system for real time monitoring of the water quality and quantity of water in IOT (internet of things). The system having of several sensors is used to measuring physical of the water. The parameters flow sensor of the water can be measured. The measured values from the sensors can be processed by the controller. The Arduino model can be used as a controller. Finally, the sensor data can be shown on internet using WI-FI system. A cloud server was configured as data saving and analysis. This data can be used in future research and development.

Key Words: Internet Of Things, IoT, Monitoring, Temperature sensors, Cloud computing, Real-time systems

1. INTRODUCTION

Currently drinking water is very prized for all the humans. In recent times water levels are very low and water in the lakes are going down. So its too important to find the solution for water monitoring & control system. IoT is a solution. In recent days, development in computing and electronics technologies have triggered Internet of Things technology. Internet of Things can be describe as the network of electronics devices communicating among them by the help of a controller. The IoT is a collection of devices that work together in order to serve human tasks in a efficient manner. It combine computational power to send data about the environments. These devices can be in form of sensors, appliances, embedded systems, and data analysis microchips. This paper present a low cost water monitoring system, which is a solution for the water wastage and water quality. Microcontrollers and sensors are used for that system. Ultrasonic Sensor is used to measuring water level. The other parameters like pH, TDS, and Turbidity of the water can be calculated using different corresponding sensors. This system use the flow sensor which can measure the water flow and if the necessary quantity of water flow through the pipe then water flow can be stopped automatically. The calculated values from the sensors can be processed by the Microcontrollers and uploaded to the internet through the Wi-Fi module (ESP 8266). Analysis we can do by this process, how much water is used in certain time, in a day or in a month. Alerts messages and data

generated by the sensors are transmitted over the Internet to a cloud server and can be received by user terminal owned by consumers. The data which is obtained from the sensors can be shown on the internet and provides facilities for screening the data on mobile phones or web application.

2. RELATED WORKS

In the studies from [1] the author proposed that an IoT based water monitoring system that measures water level in real-time. The model is based on idea that the water level can be very important parameter when it comes to the flood occurrences especially in disaster prone areas. A water level sensor is used to detect the desired parameter, and if the water level reaches the parameter, the signal will be feed in real time to social network like Twitter.

In the [2] the author proposed that in recent times, tremendous growth of Internet of Things applications is seen in smart homes. The large variety of various IoT applications generally leads to interoperability requirements that need to be fulfilled. Current IoT project is achieved using physical platforms that lack intelligence on decision making. A architecture that implement Event-Condition-Action (ECA) method is proposed to solve the management of heterogeneous IoTs in smart homes. The proactive architecture, developed with a core repository stores persistent data of IoTs schema, proved to be an ideal solution in solving interoperability in smart homes.

In [3] the paper proposed that 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 comprises of many sensors is used to measuring physical and chemical parameters of the water.

In [4] the author shown how to monitor the water level of water systems such as water tanks, rivers, ground water table, and bore wells remotely. They also shown that how to control the working of pump automatically and remotely. It can be used to remotely monitor the flood affected areas wirelessly and information can be sent to mobile wirelessly. This system is designed to monitor the level of water with the help of water level sensors.

3. MOTIVATION

Water Pollution and water scarcity is a global problem, which requires ongoing modification of water resource guiding principle at the levels of international down to individual wells. It has been surveyed that water pollution is

the leading cause of diseases worldwide. The records show that more than 10000 people die daily worldwide. In India predictable 500+ people die of water pollution related problems every day. Research has shown that after few years the quantity of useful water will be goes down to minimum level. In many developing countries, dirty or contaminated water is being used for drinking without any proper former using it. One of the reasons for this happening is the unawareness of public and administration and the lack of water quality monitoring system which creates serious global issues. Also natural effects such as volcanoes, algae tints, and earthquakes also change the quality and ecological status of water.

4. PROPOSED SYSTEM

4.1. System Overview

In this, we present the theory on real time monitoring of water quality and quantity using IoT. The system consists of Arduino, microcontroller, different type of sensors like water flow sensor, pH and turbidity sensor and ultrasonic sensor. The Arduino is the main processor of the system which control and process the data generated by the sensors.

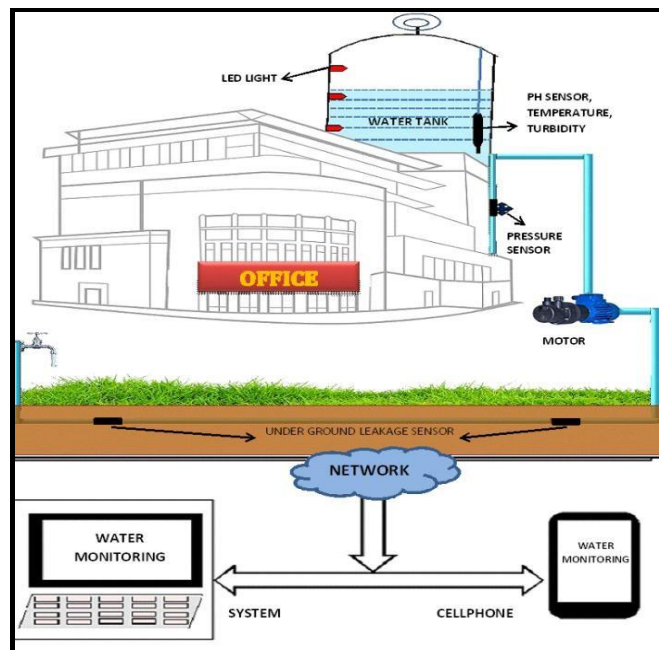


Fig-1: Water monitoring system

A Wi-Fi module is connected to the Arduino device which help to transfer the data to the cloud over internet. The ultrasonic sensor helps to measure the water level when the water flow reach certain level then the water flow can be stopped automatically by turning the motor off or close the water flow in pipe by the help of Arduino. The water flow sensor measure the quantity of water flow through the pipe in a given time, this data will be sent to cloud for storage and analysis purposes. The other sensor like temperature, pH and turbidity sensor measure the water quality and help to

determine whether the water is useful for drinking or any agricultural purposes.

4.2 System Architecture

Taking about this proposed system, it is clearly shown that it has several component which help to build a water monitoring system. The essential component of the system of smart home automation are:

- **Arduino Uno:** Arduino is a microcontroller board based on the ATmega328P. It has 14 digital input and output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.



Fig-2: Arduino

It contains everything need to support the microcontroller. Arduino Software (IDE) were the reference versions of Arduino, now evolved to new releases. The Uno board is the first in a series of USB Arduino board, and the reference model for the Arduino platform.

- **Wi-fi module:** The ESP8266 WiFi Module is a self SOC with integrated TCP/IP protocols that can give any microcontroller access to your WiFi network.



Fig-3: Wifi module

The ESP8266 is capable of hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module come pre-programmed with an AT command set firmware. The ESP8266 module is an extremely cost effective.

- **Flow sensor:** sensor is used to measure the flow of water.



Fig-4: flow sensor

This sensor basically consists of a plastic body, a rotor and a sensor. The pinwheel rotor rotates when water / liquid flows through the pipe and its speed will be directly proportional to the flow rate. The Hall Effect sensor will provide an pulse with every revolution of the pinwheel rotor.

- **Cloud-Based Server:** Cloud goes about as a database to store every data generated by the sensors installed in the home. This cloud server help to send email alert about different situation in home to the client.
- **Sensors:** A sensor is a electronic device that detects and responds to some type of input from the physical environment. In this different type of sensors are used like temperature sensor, pH sensor, turbidity sensor, ultrasonic sensor which detect the change in environmental phenomena.
- **Ultrasonic sensor:** Transmitters convert signal into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound. This helps to measure the water level.

4.3 Network Architecture

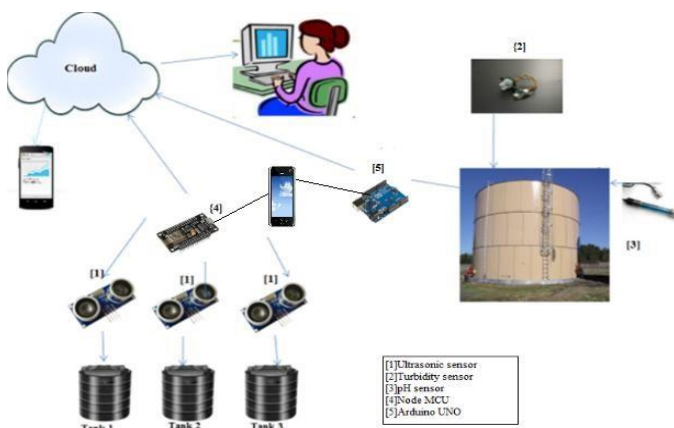


Fig-5: Architecture diagram

4.4. HOW TO USE CLOUD?

This system is using Wi-Fi module (Esp8266) to send the sensor data to the cloud. All the sensors are connected with Wi-Fi module. Wi-Fi module needs the internet. So here Mobile data or Wi-Fi is the access point for the internet. And after all this data sends to the cloud. The following figure show the data stored in cloud

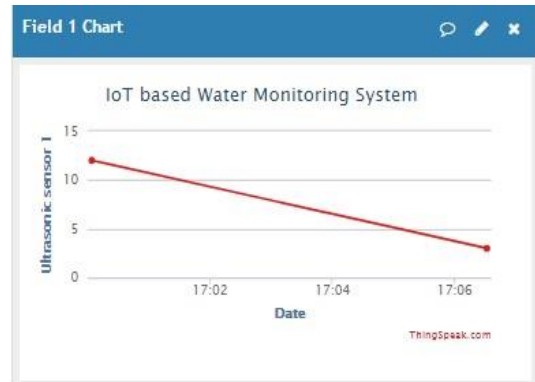


Fig-6: Data of ultrasonic sensor

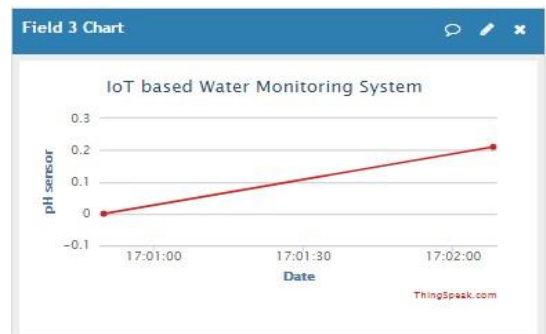


Fig-7: Data of pH sensor

5. CONCLUSION & FUTURE SCOPE

In this paper, a prototype water monitoring system using IoT is presented. For this some sensors are used. The collected data from the all the sensors are used for analysis purpose for better solution of water problems. The data is sends to the cloud server via Wi-Fi module ESP8266. So this application will be the best challenger in real time monitoring & control system and use to solve all the water related problems.

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