

Water Quality Analyzer using IOT

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Abstract - During the past decade, water needs have increased unpredictably in India. Increasing demand of water supply has become a major challenge for the world. Wasteful usage of water, climatic changes and Urbanization has further depleted the resource. Conservation and management of the resource must be given utmost importance. In this paper, we present an IoT design for water monitoring and control approach which supports internet based data collection on real time bases. The system addresses new challenges in the water sector -flow rate measuring and the need for a study of the supply of water in order to curb water wastage and encourage its conservation. We also measure the quality of water distributed to every household by deploying pH and conductivity sensors. The traditional water metering systems require periodic human intervention for maintenance making it inconvenient and often least effective. For shortcoming of the existing models for a ubiquitous usage of wireless systems for smart quality monitoring and communicate data wirelessly. The need for user involvement in maintaining water quality and looking at other aspects like hygiene, environment sanitation, storage and disposal are critical elements to maintain the quality of water resources.

Key Words: Water Quality Measurement, PH sensor, temp Sensor, Pic16f886, IOT web server.

1. INTRODUCTION

Water quality is affected by both point and non-point sources of pollution, which include sewage discharge, discharge from industries, run-off from agricultural fields and urban run-off. Other sources of water contamination include floods and droughts and due to lack of awareness and education among users. The need for user involvement in maintaining water quality and looking at other aspects like hygiene, environment sanitation, storage and disposal are critical elements to maintain the quality of water resources.

Water is an important resource for all the livings on the earth. In that, some people are not getting sufficient amount of water because of unequal distribution. We can use this approach so that everyone gets the equal amount of water. It is also used to avoid the wastage of water during the distribution period. In the previous method, the employee will go to that place and open the valve for a particular duration, then again the employee will go to the same place and close the valve, it is waste of time. The proposed system is fully automated. Here human work and time are saved. To ensure the safe supply of drinking water the quality should be monitored in real time for

that purpose new approach IOT (Internet of Things) based water quality monitoring has been proposed.

In this project, we will implement the design of IOT base water quality monitoring system that monitors the quality of water in real time. This system consists some sensors which measure the water quality parameter. The real-time monitoring of water resources information will benefit the water resources management department and the public. The primary concept of real-time IOT based water resources information system is to provide comprehensive and accurate information. The system is developed through defining some explicit water resource parameters then, Water level and flow parameter are defined for water measure & management, followed by a sensor network for water resources information monitoring is constructed based on IOT.

Before explaining the proposed system let us give how water flows into the taps in houses. Cities usually source water from rivers, lakes, and ground water reservoirs. From these water sources, the water is pumped from pump houses into treatment plants through pipes. Water is cleaned at the treatment plant and from there it is piped into reservoirs. The reservoir is the storehouse for the treated water. Water is pumped from these reservoirs to the overhead tanks spread across the city. The water then gets distributed to houses and factories through a network of pipes working on gravitational force. In some cases, the water is directly supplied from the reservoirs to the houses. As all the cities are working on a smart city concept, our system focus on, Internet of things which is new scenario to make city as a smart city with different application.

1.2. LITERATURE REVIEW

[1]Nikhil Kedia entitled "Water Quality Monitoring for Rural Areas-A Sensor Cloud Based Economical Project." Published in 2015 1st International Conference on Next Generation Computing Technologies (NGCT-2015) Dehradun, India. This paper highlights the entire water quality monitoring methods, sensors, embedded design, and information dissipation procedure, role of government, network operator and villagers in ensuring proper information dissipation. It also explores the Sensor Cloud domain. While automatically improving the water quality is not feasible at this point, efficient use of technology and economic practices can help improve water quality and awareness among people.[1]

[2]Jayti Bhatt,Jignesh Patoliya entitled "Real Time Water Quality Monitoring System".This paper describes to ensure the safe supply of drinking water the quality should be

monitored in real time for that purpose new approach IOT (Internet of Things) based water quality monitoring has been proposed. In this paper, we present the design of IOT based water quality monitoring system that monitor the quality of water in real time. This system consist some sensors which measure the water quality parameter such as pH, turbidity, conductivity, dissolved oxygen, temperature. The measured values from the sensors are processed by microcontroller and these processed values are transmitted remotely to the core controller that is raspberry pi using Zigbee protocol. Finally, sensors data can view on internet browser application using cloud computing.[2]

[3]Sokratis Kartakis, Weiren Yu, Reza Akhavan, and Julie A. McCann entitled “Adaptive Edge Analytics for Distributed Networked Control of Water Systems” This paper presents the burst detection and localization scheme that combines lightweight compression and anomaly detection with graph topology analytics for water distribution networks. We show that our approach not only significantly reduces the amount of communications between sensor devices and the back end servers, but also can effectively localize water burst events by using the difference in the arrival times of the vibration variations detected at sensor locations. Our results can save up to 90% communications compared with traditional periodical reporting situations.[3]

2. PROPOSED SYSTEM

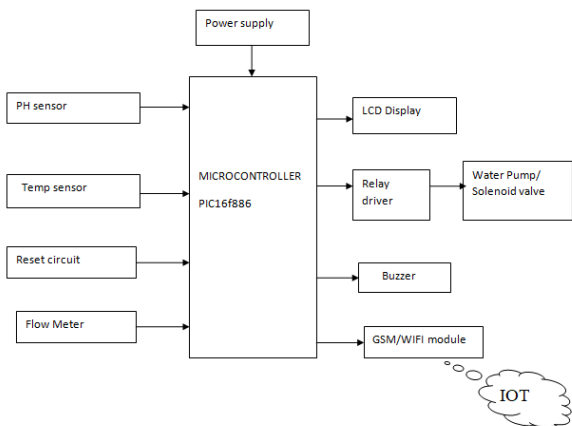


Fig -1: Block Diagram

In this, we present the theory on real time monitoring of water quality & supply management 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 (pH, ultrasonic, RTC) is connected to microcontroller. The controller are accessing the sensor values and processing them to transfer the data through internet. The sensor data can be viewed on the internet web server.

Main objective to implement this project is to design and develop a low cost reliable and efficient technique to make proper water distribution by continuous monitoring and also

controlling it from a central server so that we can solve water related problems. Proposed system consist of a PIC microcontroller used as minicomputer, different sensors such as water level sensor, flow sensor, and PH sensors are used. The real time monitoring of water resource information will benefit the water resource information will benefit the water resource management department and the public. The primary concept of real time IOT based water resource information system is to provide comprehensive and accurate information.

2.1 PIC 18f886 microcontroller:

This powerful yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC® architecture into a 28 pin package. The PIC16F886 features 256 bytes of EEPROM data memory, self-programming, an ICD, 2 Comparators, 11 channels of 10-bit Analog-to-Digital (A/D) converter, 1 capture/compare/PWM and 1 Enhanced capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire Serial Peripheral Interface (SPI™) or the 2-wire Inter-Integrated Circuit (I²C™) bus and an Enhanced Universal Asynchronous Receiver Transmitter (EUSART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances or consumer applications.



Fig -2: PIC16f886Microcontroller

2.2 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 controller. The normal range of pH is 6 to 8.5.



Fig -3: PH Sensor

2.3 Temperature sensor (LM35):

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of $\pm 1/4^\circ\text{C}$ at room temperature and $\pm 3/4^\circ\text{C}$ over a full -55 to $+150^\circ\text{C}$ temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

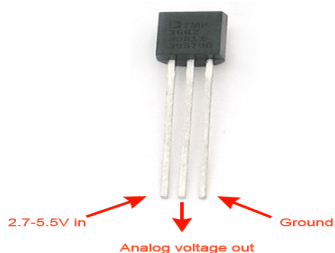


Fig -4: LM35 Temp Sensor

2.4. GSM module:

This GSM modem has a SIM800A chip and RS232 interface while enables easy connection with the computer or laptop using the USB to Serial connector or to the microcontroller using the RS232 to TTL converter. Once you connect the SIM800 modem using the USB to RS232 connector, you need to find the correct COM port from the Device Manager of the USB to Serial Adapter. Then you can open Putty or any other terminal software and open a connection to that COM port at 9600 baud rate, which is the default baud rate of this modem. Once a serial connection is open through the computer or your microcontroller you can start sending the AT commands.

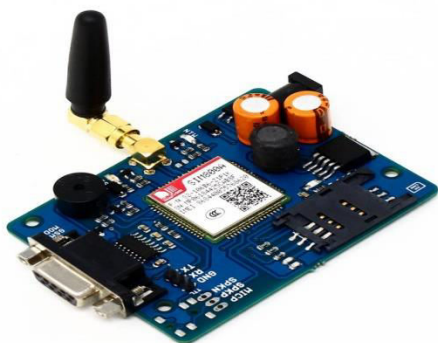


Fig -5: GSM Module

2.6. LCD display:

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed

in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.

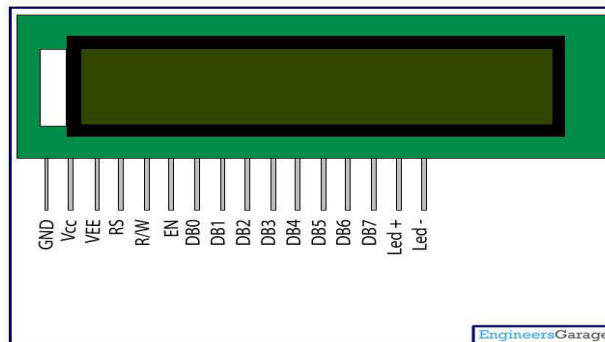


Fig -6: LCD Display

2.7. Relay Driver Circuit:

A relay driver circuit is a circuit which can drive, or operate, a relay so that it can function appropriately in a circuit. The driven relay can then operate as a switch in the circuit which can open or close, according to the needs of the circuit and its operation. Now that we're using a transistor to drive the relay, we can use considerably less power to get the relay driven. Because a transistor is an amplifier, we just have to make sure that the base lead gets enough current to cause a larger current to flow from the emitter of the transistor to the collector. Once the base receives sufficient power, the transistor will conduct from emitter to collector and power the relay.

With no voltage or input current applied to the transistor's base lead, the transistor's emitter-to-collector channel is open, hence blocking current flow through the relay's coil. However, if sufficient voltage and input current are applied to the base lead, the transistor's emitter-to-collector channel will close, allowing current to flow through the relay's coil.

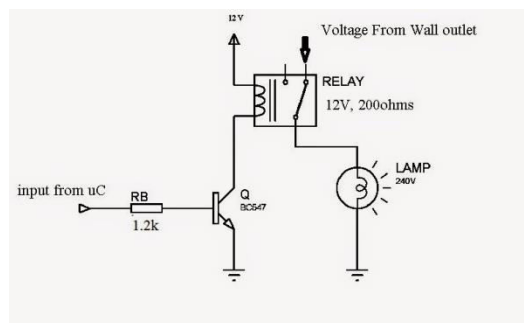


Fig -7: Relay Driver Circuit

2.8. Flow meter:

Magnetic flow meters measure the speed of a fluid passing through a pipe using a magnetic field to measure the volumetric flow. They are based on the principle of Faraday's Law of Electromagnetic Induction, according to which liquid generates voltage when it flows through a magnetic field.



Fig -8: Flow sensor

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3. CONCLUSIONS

The proposed system is created with the use of different sensors, PIC16f886 as controller and GSM module to access internet. Using this this system secure and continuous monitoring is possible No need to go on field for monitoring so manual work has reduced it makes system more efficient, reliable, low cost and accurate we can Data monitored from anywhere controlling is possible from a remote server it is Economical in development.

The generated data can be viewed using web interface all over the city. The advantage of the system is to provide the adequate water supply with good quality water to each house, industry, and others. The proposed model can be implemented as a part of the smart city. The system can monitor water quality automatically, and it is low in cost and does not require people on duty.

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