WATER QUALITY MEASUREMENT DEVICE

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Abstract

Smart solutions for water quality monitoring are gaining importance with advancement in communication technology. Also, a power efficient, simpler solution for in-pipe water quality monitoring based on Internet of Things technology is presented. The model developed is used for testing water samples and the data uploaded over the Internet are analyzed. The system also provides an alert to a remote user, when there is a deviation of water quality parameters from the pre-defined set of standard values**.**Introduces evolves of the idea names Water Quality Measurement Device. It briefly explains the drawbacks of the existing system and survey results of how the water quality of the water bodies which is the most problematic issue in our daily lives.

1. INTRODUCTION

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 7pH has alkaline. The range of pH is 0-14 pH. 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 diarrheoa, collera. Lower the turbidity then the water is clean. Temperature sensor measures how the water is, hot or cold. Flow sensor measures the flow of water through flow sensor. The traditional methods of water quality monitor involves the manual collection of water samples from different locations.

1.1 INTRODUCTION TO TEXAS INSTRUMENTS

Texas Instruments Incorporated engages in the design and manufacture semiconductor solutions for analog and digital embedded and application processing. It operates through the following business segments: Analog & Embedded Processing. The Analog segment semiconductors change real-world signals such as sound, temperature, pressure or images, by conditioning them, amplifying them and often converting them to a stream of digital data that can be

processed by other semiconductors, such as embedded processors. Embedded processing segment designed to handle specific tasks and can be optimized for various combinations of performance, power and cost, depending on the application

1.3 MOTIVATION

Water is one of the most important resources required to sustain life and the quality of drinking water plays a very important role in the well-being and health of human beings.

Water should be clean and in proper form to ensure that it is useful various purposes such as drinking, irrigation and many more.

1.2 OBJECTIVE

In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. In this 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 consist of several sensors is used to measuring physical parameters of the water. The parameters such as , PH, turbidity, of the water can be measured. The measured values from the sensors can be processed by the core controller. Finally, the sensor data can be viewed on internet using wi-fi module

1.4 SCOPE OF THE PROJECT

Nowadays Internet of Things (IoT) and Remote Sensing (RS) techniques are used in different area of research for monitoring, collecting and analysis data from remote locations. Due to the vast increase in global industrial output, rural to urban drift and the over-utilization of land and sea resources, the quality of water available to people has deteriorated greatly. The high use of fertilizers in farms and also other chemicals in sectors such as mining and construction have contributed immensely to the overall reduction of water quality globally. Water is an essential need for human survival and therefore there must be mechanisms put in place to vigorously test the quality of water that made available for drinking in town and city articulated supplies and as well as the rivers, creeks and shoreline that surround our towns and cities. The availability of good quality water is paramount in preventing outbreaks of water-borne diseases as well as improving the quality of life. Fiji Islands are located in the vast Pacific Ocean which requires a frequent data collecting network for the water quality monitoring and IoT and RS can improve the existing measurement. This project presents a smart water quality monitoring system, using IoT and remote sensing technology.

2. LITERATURE SURVEY

- 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 informationdissipation.
- 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 consists some sensors which measure the water quality parameter such as pH, turbidity, conductivity, dissolved oxygen,temperature

Michal Lom, Ondrej Pribyl, Miroslav Svitek entitled “Industry 4.0 as a Part of Smart Cities”. This paper describes the conjunction of the Smart City Initiative and the concept of Industry 4.0. The term smart city has been a phenomenon of the last years, which is very inflected especially since 2008 when the world was hit by the financial crisis. The main reasons for the emergence of the Smart City Initiative are to create a sustainable model for cities and preserve quality of life of theircitizens..

3. OVERVIEW OF THESYSTEM

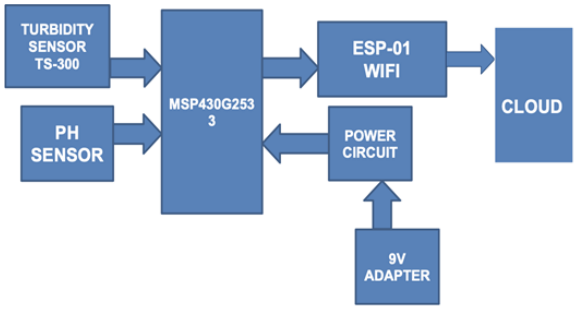

FIG 3.1 BLOCK GIAGRAM OF THE CONNECTIONS

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 (pH, turbidity) is connected to core controller. The core controller are accessing the sensor values and processing them to transfer the data through internet. MSP430G2553 is used as a core controller. The sensor data can be viewed on the internet wi-fi system.

3.1 EXISTING SYSTEM

The conventional technique of measuring the quality of water is to gather the samples manually and send it laboratory for analysis, but this technique is time overwhelming and not economical.

Since it’s not feasible to take the water sample to the laboratory after every hour for measuring its quality.

Beyond measuring water quantity and quality conditions, the other parameters concerned with are the processing, storage, analysis, reporting and dissemination of hydrologic data. Developing an HIS involves careful consideration of the purpose; network design, data collection, quality checking and storage and dissemination to end users.

Extensive documentation has been developed on the designing, sampling methodology and procedures, as well as institutions of HIS and instrumentation. Though available, the information is disseminated among a large number of manuals and presentations, making it difficult to readily take in.

3.2 PROPOSED SYSTEM

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3.3 APPLICATION

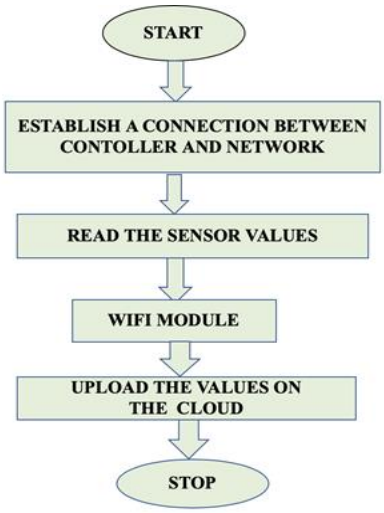
- Water plants
- Water tanks College
- Schools
- Publics bus stands waters
- Malls etc.

3.4 ADVANTAGES

- Ph Measuring
- Measuring of the suspends present in the water
- Monitoring of Turbidity
- Treating water and making it useful for different purposes

4. SYSTEM DESCRIPTION

Flow Diagram



DESIGNING AND FUNCTION

TURBIDITY SENSOR(TS-300)

Turbidity is a measure of the cloudiness of water. Turbidity has indicated the degree at which the water loses its transparency. It is considered as a good measure of the quality of water. Turbidity blocks out the light needed by submerged aquatic vegetation. It also can raise surface water temperatures above normal because suspended particles near the surface facilitate the absorption of heat from sunlight.

Working Principle

The sensor uses the optical principle to comprehensively determine the turbidity by the transmittance and scattering rate in the solution. Inside the sensor is an infrared pair tube. When light passes through a certain amount of water, the

amount of light transmitted depends on the degree of contamination of the water. The dirtier the water, the less light is transmitted. The light receiving end converts the transmitted light intensity into a corresponding current magnitude, and the transmitted light is large, and the current is large, and the transmitted light is small, and the current is small. The turbidity sensor module converts the current signal output by the sensor into a voltage signal, and performs AD conversion data processing by the single chip microcomputer.

Function

The module has an analog and digital output interface. The analog quantity can be sampled by the microcontroller A/D converter to know the current water contamination. The digital quantity can be adjusted by the potentiometer on the module. When the turbidity reaches the set threshold, the D1 indicator will be illuminated, the sensor module output will change from high level to low level, and the microcontroller will monitor the level change.

WIFI MODULE(ESP8266)-01

There are three modes of Wi-Fi Operation in the ESP8266 Wi-Fi Module.

They are:

- Station Mode (STA)
- Soft Access Point (AP)
- Soft AP + Station

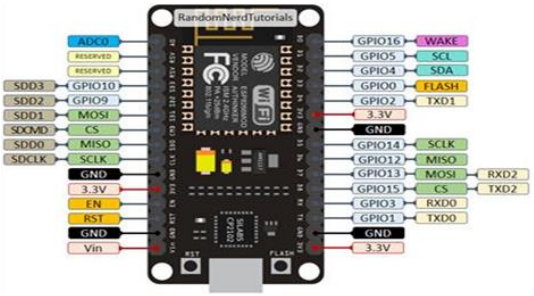


FIG 4.2 WI-FI MODULE DECRIPTION

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application 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.

WIFI- MODULE ESP8266-01

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.

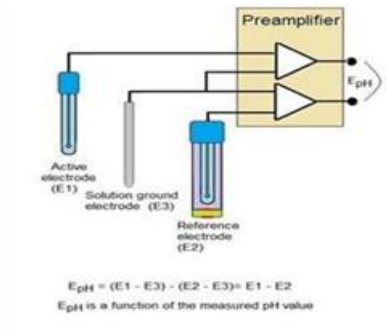


FIG4.4 ANALYZER

PRINCIPLE OF PH SENSOR

pH sensor basically works on the fact that interface of two liquids produces a electric potential which can be measured. In other words when a liquid inside an enclosure made of glass is placed inside a solution other than that liquid, there exists an electrochemical potential between the two liquids.

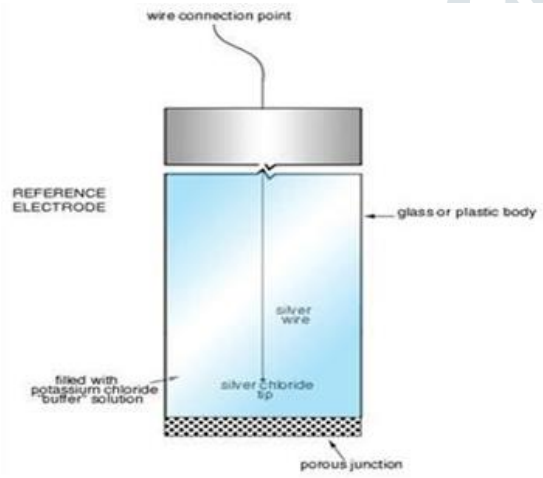


FIG 4.3 A REFERENCE ELECTRODE

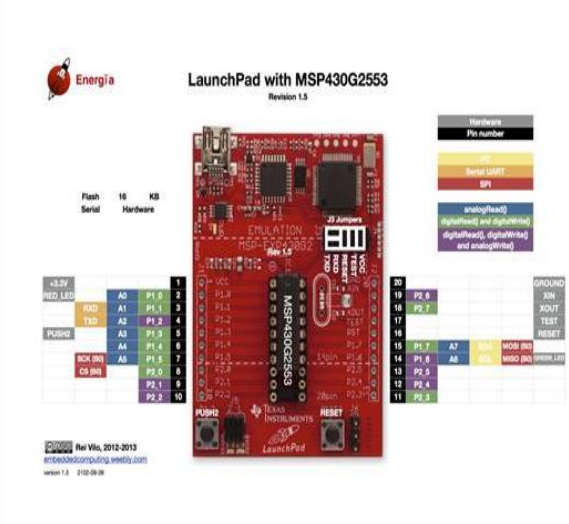
A measuring electrode:

It is a tube made up of glass and consists of a thin glass bulb welded to it, filled up with Potassium Chloride solution of known pH of 7. It also contains a block of silver chloride attached to a silver element. It generates the voltage used to measure pH of the unknown solution.

WORKING OF PH SENSOR

The electrode is placed inside the beaker filled with a solution whose pH is to be measure. The glass bulb welded at the end of the measurement electrode consists of lithium ions doped to it which makes it act as an ion selective barrier and allows the hydrogen ions from the unknown solution to migrate through the barrier and interacts with the glass, developing an electrochemical potential related to the hydrogen ion concentration. The measurement electrode potential thus, changes with the hydrogen ion concentration. On the other hand, the reference electrode potential doesn't change with the hydrogen ion concentration and provides a stable potential against which the measuring electrode is compared. It consists of a neutral solution which is allowed to exchange ions with the unknown solution through a porous separator, thus forming low resistance connection to complete the whole circuit. The potential difference between the two electrodes gives a direct measurement of the hydrogen ion concentration or pH of the system and is first reamplified to strengthen it and then given to the voltmeter. pH measurement plays an important role in many industrial applications like controlling chemicals in industrial scrubbers, measuring sulfur

dioxide in sugar refineries, and optimizing coagulation in water clarification. It provides a control point for neutralizing acids and bases.



Range	pH	Example:
Acidic	0	Battery acid
	1	Gastric acid
	2	Lemon juice
	3	Soda
	4	Tomato juice
	5	Black coffee
	6	Milk
Neutral	7	Pure water
Basic	8	Sea water
	9	Baking soda
	10	Milk of magnesia
	11	Ammonia solution
	12	Soapy water
	13	Bleach
	14	Liquid drain cleaner

FIG 4.5 PH LEVEL TABLE

MSP430G2553 Launchpad

The Texas Instruments MSP430 family of ultra-low-power microcontrollers consists of several devices featuring different sets of peripherals targeted for various applications. The architecture, combined with five low-power modes, is optimized to achieve extended battery life in portable measurement applications. The device features a powerful 16-bit RISC CPU, 16-bit registers, and constant generators that contribute to maximum code efficiency. The digitally controlled oscillator (DCO) allows wake-up from low-power modes to active mode in less than 1 µs and capability using the universal serial communication interface.

MSP430G2553 LAUNCHPAD

5. CONCLUSION&FUTURE SCOPE:

5.1 CONCLUSION:

Water quality monitoring is of vital imperativeness as it gives particular data about the nature of water. Different sorts of physical, substance and organic data are joined to determine at a differing qualities list.

This paper presents a detailed survey on the tools and techniques employed in existing water quality measuring device. Also, a low cost, less complex water quality monitoring system is proposed. The implementation enables sensor to provide online data to consumers. The experimental setup can be improved by incorporating algorithms for anomaly detections in water quality.

5.2 FUTURE SCOPE:

The future Scope of this project is, we can also remove hardware and we can receive the emergency alerts to mobile phone from cloud server through internet due to his cost is reducing and hardware also reduced.

It can further enhance with cloud IOT technology to achieve high performance to current technology, we can also develop android application for the user to make it more easy operation side part.

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