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Water Quality Monitoring System Based on IOT

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ABSTRACT: Water pollution is 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 consist of several sensors is used to measuring physical and chemical parameters of the water. The parameters such as temperature, pH, turbidity, flow sensor 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 sensor data can be viewed on internet using WI-FI system.

KEYWORDS: pH sensor, Turbidity sensor, Temperature sensor, Conductivity sensor, Arduino 2560 model, GSM Module (SIM 900) WI-FI module, LCD Display (16*2), Signal Conditioning, Power Supply (LM78XXA).

I. INTRODUCTION

In the 21st century, there were lots of inventions, but at the same time, 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 measure 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 diarrhoea, cholera. Lower the turbidity then the water is clean. Temperature sensor measures how the water is, hot or cold. Conductivity signifies the ionic strength of solution. In other words it is the ability of solution to conduct electricity with the typical unit for measurement being micro-Siemens per centimetres (µS/cm). As the dissolved ions increases in the water, conductivity increases . The traditional method of water quality monitor involves the manual collection of water samples from different locations.

II. RELATED WORK

"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.
After applying all these 4 steps, we get a filtered image that contains only text regions.

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"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. The measured values from the sensors are processed by microcontroller and this 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.

"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 their citizens.

The topic of the smart city cannot be seen only as a technical discipline, but different economic, humanitarian or legal aspects must be involved as well. In the concept of Industry 4.0, the Internet of Things (IOT) shall be used for the development of so–called smart products. Sub-components of the product are equipped with their own intelligence. Added intelligence is used both during the manufacturing of a product as well as during subsequent handling, up to continuous monitoring of the product lifecycle (smart processes). Other important aspects of the Industry 4.0 are Internet of Services (IOS), which includes especially intelligent transport and logistics (smart mobility, smart logistics), as well as Internet of Energy (IOE), which determines how the natural resources are used in proper way (electricity, water, oil, etc.). IOT, IOS, IOP and IOE can be considered as an element that can create a connection of the Smart City Initiative and Industry 4.0 – Industry 4.0 can be seen as a part of smart cities.

III. WORKING

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

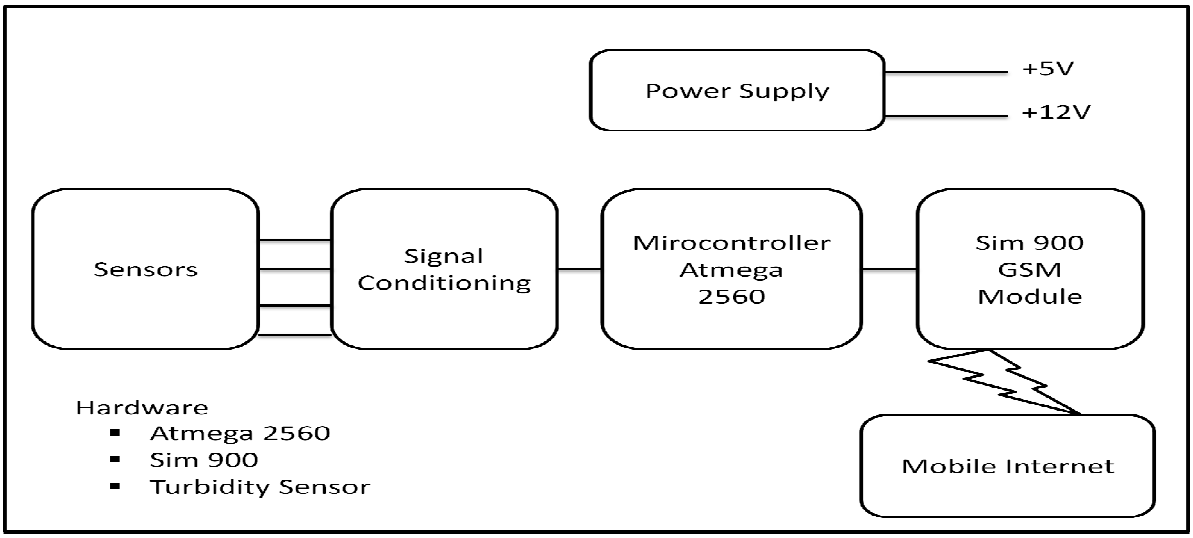

Fig1: Block Diagram of Water Quality Monitoring System

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pH Sensor:

pH sensor can measure the pH of water .if the pH of water is less than 7 then the solution is acidic in nature and if pH value is above the 7 then the solution is alkaline. pH should be 6.5-09 for drinking water

Temperature sensor:

Water Temperature indicates how water is hot or cold. It is important to record temperature alongside the other parameters as this will be useful in behaviour analysis of the parameters being measured. Relating to temperature-relation theories, pH and conductivity have an undesirable effect with large temperature changes.

Turbidity Sensor:

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.

Conductivity Sensors:

Conductivity signifies the ionic strength of a solution. In other words it is the ability of a solution to conduct electricity with the typical unit for measurement being micro-Siemens per centi-meter (us/cm). As the dissolved ions increase in the water, conductivity increases. Therefore, the conductivity of tap water is perceptibly low at around 100 uS/cm.

Signal conditioning:

Signal conditioning is used to convert the analog signal into digital signal. The another use of the signal conditioning is to amplify the weak signal

Microcontroller Atmega:

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

GSM module:

GSM module is used to take the values received from microcontroller on mobile or computer by using internet and then we can analyse the result.

IV. RESULTS

Water Quality Monitoring System Consist of pH, Turbidity, Conductivity, Temperature sensor. In this implementation model we used ATMEGA 2560 with GSM and Signal Conditioning to convert analog data to digital form. After sensing the data from different sensor devices. The sense data will be automatically sent to the web server, when a proper connection is established with the server.

Table I: Summarized Result

Source	Reading			
	Temperature	pH	Conductivity	Turbidity
Pure Water	20°C	6.8 pH	350 µS/cm	6.5 NTU
Impure Water	40°C	9 pH	900 µS/cm	8 NTU

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V. CONCLUSION

From the above experiment we have monitoring Turbidity, pH, Conductivity and Temperature of Water. The temperature relation with pH and conductivity were also observed for all the water samples. We can observe the values of pH, Turbidity & Temperature on the display as well as send on mobile or computer by using GSM.

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