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Water quality monitoring system Using Arduino UNO

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Abstract: Water pollution is one of the biggest threats for the green globalization. Water pollution affects human health by causing water borne diseases. To prevent the water pollution, necessary steps are to be taken. First step is to estimate the water parameters like pH, turbidity, conductivity etc., as the variations in the values of these parameters point towards the presence of pollutants. In the present scenario, water parameters are detected by chemical tester laboratory test, where the testing equipment 's are stationery and samples are provided to testing equipment's. Thus, it is a manual system with tedious process and is very time consuming. In order to minimize the time and to make the system automated, the testing equipment's can be placed in the river water and detection of pollution can be made remotely. To ensure the safe supply of drinking water, the quality should be monitored in real time for that purpose Arduino based water quality monitoring has been proposed. In this report, the design of Arduino based water quality monitoring system that monitors the quality of water in real time is presented. This system consists of different sensors which measures the water quality parameter such as pH, conductivity, muddiness of water, temperature. The measured values from the sensors are processed by microcontroller and the processed values are transmitted using GSM to the concerned authority.

Keywords: Arduino, sensors, GSM, Water quality

I. INTRODUCTION

The quality of water has an impact on the living beings. Water quality testing is an important part of environmental monitoring. Water quality refers to the chemical, physical, biological, an radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose. In this project, the main parameters s that define water quality are monitored and observed. To monitor the parameters different sensors like pH, IR, Temperature and Conductivity sensors are used. All the measured parameter are compared with the threshold value that defines the purity. Once the parameter is measured, they are sent to authority in the form of alert messages.

II. WATER QUALITY MONITORING SYSTEM IN UDAIPUR:

The present study analyses the existing water sources, water supply, water usages and problems of water in Udaipur city. The study is based on primary data collected by field survey through the direct questionnaire to the respondents during 2014 in Udaipur city. The study shows that the main source of water supply in the city is surface and ground water to fulfil the daily water needs.

Surface water quality status and trend of Udaipur's main lakes namely, Fateh Sagar Lake, Pinhole and Jaisamad and mansiwakal dam are main sources of water for residents of Udaipur city. Water quality data was collected for the parameters like Boa D, DO, pH, Conductivity, NN, Fecal coliform, Total coliform to determine the water pollution level and water treatment requirements. Overall water quality status has been improved during 2016 to 2019 due to waste water treatment plant. Udaisagar is most polluted lake among three lakes. Fecal coliform was suddenly increased in 2018 due to leakage of sewage line near the Pichola Lake. These lakes are interconnected and very useful for drinking, industrial, agricultural and tourism purpose and proper maintenance will be helpful for all dimensional growth of the city.

The study area Udaipur district in Rajasthan is located between 23°46' & 25°05' North latitude and 73°09' & 74°35' East longitude covering an area of 13419 sq. km. Udaipur gets an annual rainfall 640 mm. Established some 425 years ago Udaipur's system of lakes was considered a role model of rainwater management [1]. Pichola lake, DoodhTalai, Goverdhan Sagar, Badi, Rang Sagar, SwaroopSagar and Udaisagar are major lakes in Udaipur [2]. It is the good model of rainwater harvesting of all the lakes in Udaipur. Lakes are interconnected, overflow from one goes to the next and they are the major source of drinking water of the city [3]. The aim of this study is to determine the status and trend of surface water quality in previous 10 years of Pichola lake, Udaisagar lake, Fateh Sagar Lake for multi-criteria decision like for provisioning of safe drinking water for increasing population, development of industries, tourism, and agriculture activities in Udaipur as Smart city.

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There are 8 quality parameters in this study temperature, dissolved oxygen, pH, conductivity, BOD, Nitrate Nitrite, fecal coliform, and total coliform [9] [10] [11]. A regression model for Biochemical Oxygen Demand (BOD) is developed for surface water of Pichola Lake, Fatehsagar Lake and Udaisagar of Udaipur [12]. BOD is the rate of oxygen utilization in a watercourse. It is affected by a number of variables like temperature, pH, the existence of microorganisms and type of organic and inorganic matter in water.

PROPOSEDSYSTEM

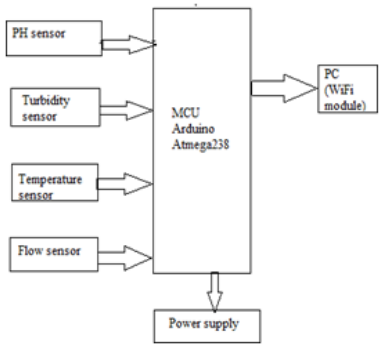

Fig: Block diagram of our project

In this, we present the theory on real time monitoring of water quality in Io Environment. The overall block diagram of the proposed method is explained. Each block of the system is explained in detail.

In this proposed block diagram consist of several sensors (temperature, pH, turbidity, flow) is connected to core controller. The core controller is accessing the sensor values and processing them to transfer the data through internet. Arduino is used as a core controller. The sensor data can be viewed on the internet wi-fi system.

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 7would indicate an acidic solution. It operates on 5V power supply and it is easy to inter face with Arduino. The normal range of pH is 6 to 8.5.

Fig : pH Sensor

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. It also can raise surface water temperatures above normal because suspended particles near the surface facilitate the absorption of heat from sunlight.

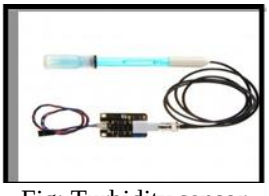

Fig: Turbidity sensor

A. Temperature sensor: Water Temperature indicates how water is hot or cold. The range of DS18B20 temperature sensor is -55 to +125 °C. This temperature sensor is digital type which gives accurate reading.

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Fig: Temperature Sensor

B. Flow sensor: Flow sensor is used to measure the flow of water through the flow sensor. This sensor basically consists of a plastic valve body, a rotor and a Hall Effect sensor. The pinwheel rotor rotates the valve and its speed will be directly proportional to the flow rate. The Hall Effect Sensor will provide an electrical pulse with every revolution of the pinwheel rotor.

C. Arduino uno: Arduino is a microcontroller board based on the ATmega328P. It has 14 digital inputs/ output pins (of which 6 can be used as PWM outputs), 6 Analog inputs ,a 16 MHz quartz crystal , a USB connection, a power jack, an ICSP header and a button. It contains everything needed to support the microcontroller. Arduino software(IDE) were the reference version of Arduino , now evolved new releases. The Uno board is the first in a series of USB Arduino boards , and the reference modal for the Arduino platform; for the extensive list of current, past or out date boards see the Arduino index of boards.

Fig: Arduino Uno

Wi-Fi module:

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi 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.

Fig: Wi-Fi module

III. SCHEMATIC CIRCUIT WITH ITS WORKING

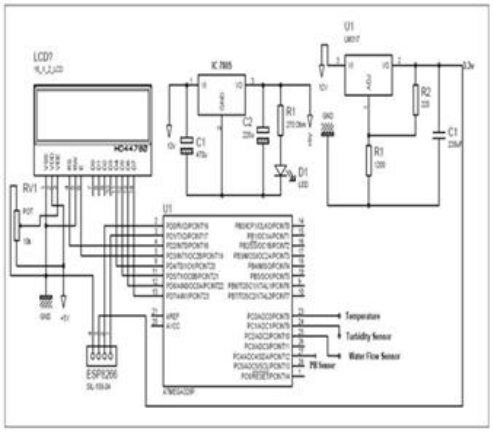

Fig: schematic circuit

The whole design of the system is based mainly on IOT which is newly introduced concept in the world of development. There is basically two parts included, the first one is hardware & second one is software. The hardware part has sensors which help to measure the real time values, another one is Arduino atmega328 converts the analog values to digital one, & LCD shows the displays

output from sensors, Wi-Fi module gives the connection between hardware and software. In software we developed a program based on embedded c language.

The PCB is design at first level of construction and component and sensors mounted on it. BLYNK app is installed in the android version to see the output. When the system gets started dc current given to the kit and Arduino and WIFI gets on. The parameters of water are tested one but one and their result is given to the LCD display. The app went provided with hotspot gives the exact value as on LCD display shows on kit. Thus, like this when the kit is located on any specific water body and WIFI is provided we can observe its real time value on our android phone anywhere at any time.

Befits of IOT based water quality system

1. In future we use IOT concept in this project
2. Detecting the more parameters for most secure purpose
3. Increase the parameters by addition of multiple sensors
4. By interfacing relay, we control the supply of water

IV. RESULT

We have identified a suitable implementation model that consists of different sensor device sando the modules, their functionalities are shown in figure. In this implementation model we used ATMEGA 328 with Wi-Fi module. Inbuilt ADC and Wi-Fi module connects the embedded device to internet. Sensors are connected to Arduino UNO board for monitoring, ADC will convert the corresponding sensor reading to its digital value and from that value the corresponding environmental parameter will be evaluated. After sensing the data from different sensor devices, which are placed area of interest. The sensed data will be automatically sent to the web server, when a proper connection established with server device.

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