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# WATER QUALITY MONITORING SYSTEM USING IOT

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***Abstract*— As water is one of the basic needs for humans and other organisms' survival, it is very important to incorporate mechanism to monitor the quality of the water time to time. It is observed that around 40%of the death is caused due to the unhygienic water condition in the world. Hence, there is necessity to ensure supply of purified drinking water for the people.* In this paper we are proposing a water quality monitoring system using IoT. It consist of several sensors to measure various parameters of water such as Ph value, turbidity in the water, level of water and temperature. The microcontroller unit is interfaced with sensors, the obtained data is sent to the cloud using an IoT based application called BLINK application to monitor the quality of the water.**

***Keywords—IOT , Water quality , Sensors***

## I. INTRODUCTION

Water has been a long standing problem in our country,the rapid increase in population and ageing infrastructure of water distribution system in the country is the cause of increasing water contamination even when water reaches from source body to end user.In past few decades, the problem aggravated largely due to negligence of the government.The older methods are unable to monitor water quality in real time so it is necessary to develop a real time water quality monitoring system which gives the result in no time and save the precious health of human beings by alerting them in real time. The proposed system is cost effective and give real time informations which use four sensors for measuring water quality parameters like pH, turbidity, water level and temperature.Also a filter is used to purify the water.As pH sensors are expensive, to reduce the cost of the system we use rain senor for measuring pH. In the microcontroller unit(MCU) we set threshold values for each parameters . All the sensors are connected to the MCU.As it is an online project we use another component called node MCU .Firstly the sensors detect the water parameters and when these values exceed the threshold value, MCU send the measured values to the node MCU from the node MCU we get these values in our devices like smartphones by using an IoT based application called BLINK

## II. LITERATURE SURVEY

There are lots of papers related to this subject. But the content in the all papers are the same.

1. Lake water quality classification with airborne multichannel spectrometer

The main remote sensing instrument in this study is the Airborne Imaging Spectrometer . Airborne remote sensing is quite expensive and the testing process is difficult also it will not give real time data.

2. Real-time embedded system for assessment of potable water quality

The proposed system consist of a wireless , serial protocol , different types of sensors and notification module and GSM modem for SMS alert. Wireless module is formed by using a Zig-bee transmitter-receiver which helps in transmitting and receiving data to the computer system which is quite expensive , low data rates and star network is limited.

3. Reconfigurable smart water quality monitoring system in IOT environment

This system consist of field programmable gate array design board , sensors , zig-bee based wireless communication module and personal computer. It collect parameters namely pH , waterlevel , turtbidity and temperature. The main disadvantage of the system is the use of FPGA board and zig-bee for wireless communication.

## III. WATER QUALITY MONITORING SYSTEM

*A. Existing system*

It is based on GSM technology and use different sensors for measuring water quality parameters namely pH , turbidity , water level , temperature etc. when these values crosses a certain undesired threshold a predefined SMS will be send using GSM modem so live values cannot be obtained .Also the sensors used are complicated and we will not get output messages properly.

*B. Proposed system*

In the proposed system we determine water quality by measuring parameters namely Ph, temperature, turbidity and water level .we use ATMEGA328P Arduino board as microcontroller unit which is a 28 pin integrated circuit . Node mcu which is a microcontroller having Wi Fi module is also used. Different sensors are interfaced with the microcontroller.

The ultrasonic sensor is used to check the water level. It has 4 pins, Vcc pin, trigger pin, echo pin and ground pin. The turbidity sensor has 3 pins, Vcc pin, data pin and ground pin. The temperature sensor has 3 pins, ground pin, data pin and Vcc pin the data pin, sensor used to check acidity of water also have 3 pins ground pin, these sensors are connected to the main board.When the board and sensors are powered the values from the sensors reaches the MCU. In the MCU we set thresholds for each the parameters we are measuring. When the measured values exceed these threshold value MCU send the measured values to the Node MCU. From Node MCU we get these values on our devices like smartphones by using BLINK application

## IV. BLOCK DIAGRAM

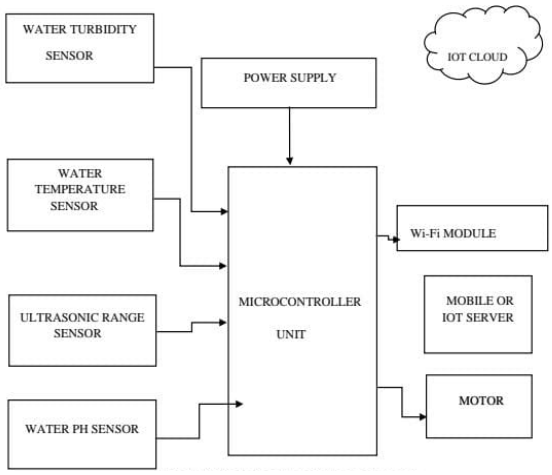


**Fig 1 Block Diagram**

## V. CIRCUIT DIAGRAM AND COMPONENTS

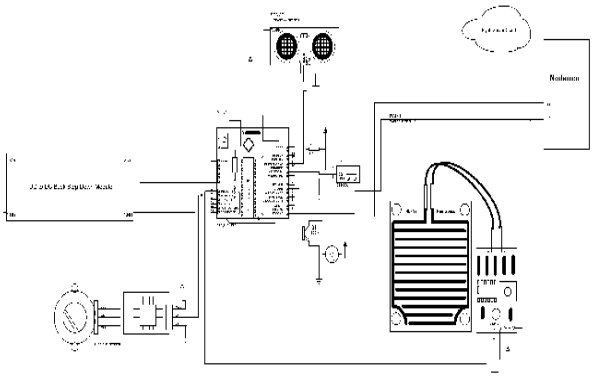

**Fig 3 Circuit Diagram**

1. ARDUINO UNO

It consists of an open-source microcontroller Arduino uno board, based on ATmega 328p. It has 14 digital I\O ports, 6 analog ports. The power is supplied through GND and VCC. And it can be powered by 5v to 12v dc supply.

2. NODE MCU

For Iot projects Nodemcu ESP8266 is perfect. L, especially other wireless project as Arduino does not work wirelessly. Here in this NodeMCU ESP8266 development board comes with ESP 12E module containing the ESP8266 chip having Tensilica Xtensa 32 bit LX106 RISC microprocessor. It has 128 KB RAM and 4MB flash memory to storing of data and programs. It is powered using a Micro USB jack and VIN pin. It support UART, SPI, Aland 12C interface

3. SUBMERSIBLE MINI WATER PUMP

This is a low cost , small size submersible pump motor which can be operated from a 3~6v power supply.It can take up to 120 liters per hour with very low current consumption of 220mA.Just connect the pipe to the motor outlet,submerge it in water and power it .Make sure that the water level is always higher than the motor.Dry run may damage the motor due to heating and it will also produce noise.

4. TURBIDITY SENSOR

Turbidity sensor measures the amount of light scattered by suspended particles in water. The amount of total suspended solids in water increases the turbidity of water also increases. The turbidity sensor detects the quality of water by measuring level of turbidity.

5. RAIN SENSOR

A rain sensor is a switching device and it is used to detect the pH level. It contains electronic module as well as PCB, therefore this module is similar to LM393 IC. PCB is used for collection of water drops. When the water falls on sensor board, it creates a parallel resistance path for the calculation through

the operational amplifier. Here the sensor is resistive dipole. It shows less resistance when it wet and shows high resistance when it dry. Using this resistance values we can identify the conductivity. We know conductivity is proportional to pH level. From this we can find out the pH values of the water.

6. TEMPERATURE SENSOR

The working principle of temperature sensor is the voltage across the diode terminals. When the voltage increases the temperature also rises, it is followed by voltage drop in between the base and emitter of a diode

7. ULTRASONIC RANGE FINDER

Ultrasonic range finder is used to identify the distance of a object. The amount of time taken to reach the object will calculate the distance between the sensor and object. Here the sensor uses sound waves by concept of non contact technology. Using of these sensor can identify the distance that required for our target without any damage and gives accurate readings.

## VI. WORKING METHODOLOGY

The project concentrates on monitoring water quality my measuring parameters like pH, temperature, turbidity along with water level by using different sensors connected to the Arduino board.

The power pins of the Arduino board are connected to power supply through a DC to DC buck converter.

- We get a total of 12v in the adapter which is connected to the power socket.
- This adapter is connected to the DC to DC buck.
- The buck converter steps down the input voltage into the 5v which is the operating voltage of Arduino board. This 5v is the operating voltage of the Arduino board and is provided at the its input.
- All the sensors work at 5v volts which is provided through the digital pins of Arduino board.
- Node MCU works at 3.3v which is provide via 1st and 2nd pin of the Arduino board.

The A0 pin of the Arduino is connected to the OUT pin of pH sensor (rain sensor).

The pH sensor gives notification as

- Normal water for a threshold of greater than or equal to 160 to less than 700.
- Alkaline water for a threshold of greater than 130 and less than 145.
- Acid water for a threshold of less than 100.

The A1 pin of the Arduino board is connected to a turbidity sensor.

- If the value of the threshold is less than or equal to 470 the motor turns High and starts working

The 11th pin and 12th of the Arduino board is connected to Ultrasonic sensor.

- The 11th pin is connected to the ECHO pin of the Ultrasonic sensor.
- The 12th pin is connected to TRIGGER pin of the Ultrasonic sensor.

The Ultrasonic sensor provides live value in the gauge provided in the Blynk application

The 6th pin of the Arduino board is connected to the DS18B20 sensor.

- It provides live temperature values in the gauge provide it the Blynk application.

The 1st and 2nd pin of the Arduino board is connected to the Node MCU

- 1st and 2nd pin the provides operating voltages to the Node MCU which is 3.3v.
- The Node MCU connects the board into Blynk server.

The 6th pin is connected to a submersible mini water pump which works according to the values from the turbidity sensor

## VII. CONCLUSION

The system checks water quality by measuring parameters namely pH, temperature, water level and turbidity. It can monitor water quality automatically, and it is low in cost and does not require people on duty. So, the water quality testing is likely to be more economical, convenient and fast. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters.

It has widespread application and extension value. By keeping the embedded devices in the environment for monitoring enables self-protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By developing sensor devices in the environment, we can bring the environment into real life. That is it can interact with other objects through the network. Then the collected data and analysis results will be available to the end user through the Wi-Fi.

Using real time monitoring ,instant data allows pre cursors to potential issues to be flagged up and immediately be addressed before major issues occur

## VIII. RESULTS AND DISCUSSIONS

### 1. WATER QUALITY MONITORING SYSTEM


### 2.PARAMETER MEASUREMENTS


### 3.pH MEASUREMENTS



### 3.TURBIDITY MEASUREMENTS


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