REAL TIME MONITORING OF WATER QUALITY USING SMART SENSOR

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Abstract— Real time water quality monitoring is essential for building healthy environment. Monitoring of contamination in drinking water, agriculture suppliable water and water treatment plants is major requirement. Evolution of sensor technology will help in measuring physical quality parameters of water. Wireless communication provides flexibility in locating and installing sensors. Data acquisition and processing of sensed information will be carried out. Entire information flows to set users through GPRS. Furnishing of data is useful in major decision making tasks in real world applications.

Index Terms— sensors,water quality,water parameters,temperature,turbidity,pH, arduino uno,thingspeak.com, bouy setup.

I. INTRODUCTION

With two thirds of the earth's surface covered by water and the human body consisting of 75 percent of it, it is evidently clear that water is one of the prime elements responsible for life on earth. Water is limited resource and is essential for agriculture, industry and for creature's existence on earth including human beings. Water quality monitoring is essential to control the physical, chemical and biological characteristics of water. Real time water quality monitoring provides information about the current health of water body, whether the water body meets the designed use and how it has changed over time.

BUOY is fixed at one point or location. A smallest sized buoy can be deployed by one person and the buoy is anchored directly to the bottom of water floor. A buoy can house from one sensor to hundreds of sensors, in accordance with the user. Usually, the GPS and water quality sensors are attached to the buoy to locate its coordinate and to measure the water quality. There are several techniques that have been proposed to measure water quality wirelessly including using Global System for Mobile Communications (GSM). The system was tested in a lake to investigate the viability of the project. The result was obtained and analyzed.

Arduino is an open source hardware and software platform for prototyping hardware solutions. It consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on computer, used to write and upload computer code to the physical board. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason.

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. The Arduino IDE uses a simplified version of C++, making it easier to learn to program. Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

Cloud computing is a new form of Internet-based computing that provides shared computer processing resources and data to computers and other devices on demand.

ThingSpeak is an open source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates. ThingSpeak has integrated support from the numerical computing software MATLAB from MathWorks. Allowing ThingSpeak users to analyze and visualize uploaded data using Matlab.

A Sensor is an electronic component, module, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. Sensors are used in everyday objects with advances in micro machinery and easy-to-use microcontroller platforms, the uses of sensors have expanded beyond the traditional fields of temperature, pressure or flow measurement. Moreover, analog sensors such as potentiometers and force-sensing resistors are still widely used. Applications include manufacturing and machinery, airplanes and aerospace, cars, medicine, robotics and many other aspects of our day-to-day life. A sensor's sensitivity indicates how much the sensor's output changes when the input quantity being measured changes.

II. LITERATURE SURVEY

Mobile Buoy for Real Time Monitoring and Assessment of Water Quality

The buoy moves to the desired coordinate that relies on Global Positioning System (GPS) current reading. Sets of data of PH, Oxidation Reduction Potential (ORP) and temperature sensors reading is taken from sensors attached at the buoy. The data and the coordinate of the buoy location is uploaded and mapped via Google Map. The Google Map is integrated into the GUI to display the buoy position. The user can freely monitor real-time water quality information and the buoy will go to any location coordinated by the user's command.

Design of Smart Sensors for Real-Time Water Quality Monitoring

This paper describes work that has been done on design and development of a water quality monitoring system, with the objective of notifying the user of the real-time water quality parameters. The system is able to measure the physiochemical parameters of water quality, such as ow, temperature, Ph, conductivity, and the oxidation reduction potential. These physiochemical parameters are used to detect water contaminants. The sensors, which are designed from rst principles and implemented with signal conditioning circuits, are connected to a microcontroller-based measuring node, which processes and analyzes the data. In this design, ZigBee receiver and transmitter modules are used for communication between the measuring and notication nodes.

Development of Unmanned Surface Vehicle for Smart Water Quality Inspector

The overall system consists of water quality sensors, wireless communication system and mobility platform. The water sensors include temperature, pH, dissolved oxygen (DO), oxidation reduction potential (ORP) and electrical conductivity (EC). Software was developed using open source technology aiming at providing continuous and autonomous water quality measurement at substantially reduced cost. The integrated sensorized USV was tested to perform an autonomous mission for water quality assessment in a lake.

An IoT based 6LoWPAN enabled Experiment for Water Management .

Here they have proposed IPv6 network connected IoT design for Real-time water flow metering and quality monitoring. prototype implementation uses CoAP for monitoring and control approach which supports internet based data collection. The system addresses new challenges in the water sector - ease of billing, fair billing and the need for a study of supply versus consumption of water in order to create awareness to curb water wastage and encourage its conservation. Automatic detection of leakage through any of the outlets is notified to the user. Here they also measure the quality of water distributed to every household by deploying pH and ORP sensors.

III. SYSTEM FUNCTIONAL SPECIFICATION

Functions Performed

- We interface the sensors (Temperature, pH, Turbidity) and WIFI module to the arduino board (to upload the sensed values to ThingSpeak).
- The code is written in arduino IDE (software) and uploaded to arduino board.
- The setup is deployed in water. Sensor senses the values and uploads to ThingSpeak using WIFI module in it.
- Thingspeak is an API, to upload the sensed values to cloud. We create a channel ID in ThingSpeak. Users can access the information using the channel ID which is created by admin.

User Input Specification

- Input design shows the interfacing of the sensors with arduino board. Input design is the part of overall system design, which requires careful attention while interfacing.
- Designing the code for implementation using arduino IDE software and uploading the code to an arduino board with USB cable. After compiling, the setup which consists of sensors is deployed into water.

User Output Specification

- The output design is an ongoing activity almost from the beginning of the project. The primary considerations in the design of output is the sensed values of water parameters like temperature, pH and turbidity.
- A major form of output is the graph obtained when values generated from the arduino is uploaded in ThingSpeak. Users can access this information using a channel ID created by the admin.

IV. SYSTEM DESIGN

System consists of electronic devices, sensors, communicating devices and communicating medium. The whole system is shown below in schematics.

System Architecture

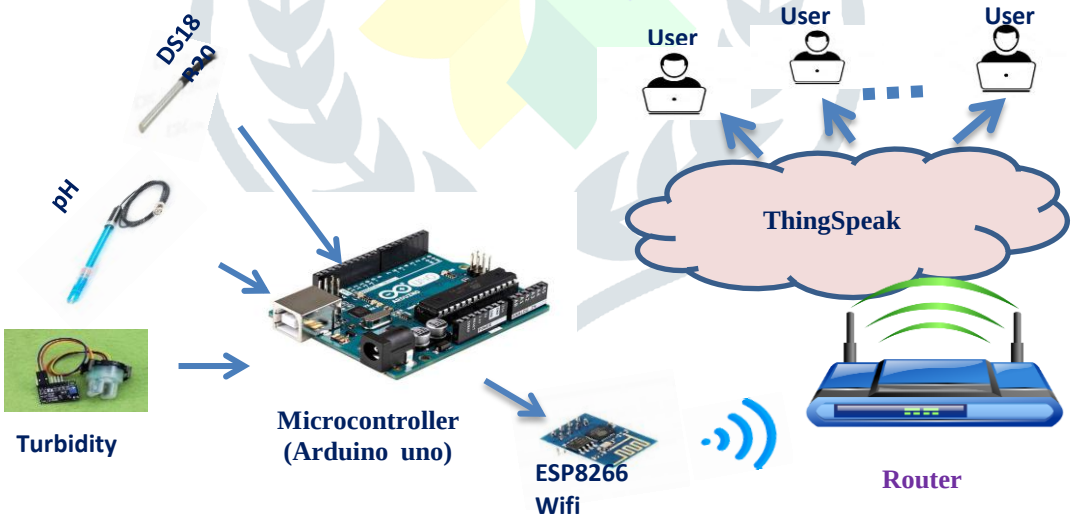

Fig 1. System Architecture

Subsystem Architecture

Turbidity sensor is used to determine whether water is clear or polluted.

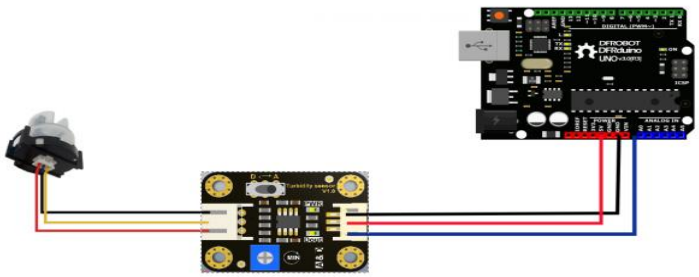

Fig 2. Turbidity sensor

The pH value is generated by this sensor. If the value obtained is less than 7 is acidic else it is Alkaline.

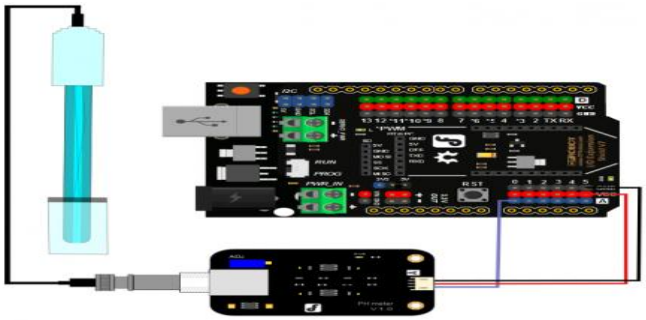

Fig 3. pH sensor

Temperature sensor(DS18B20) generates the temperature of water.

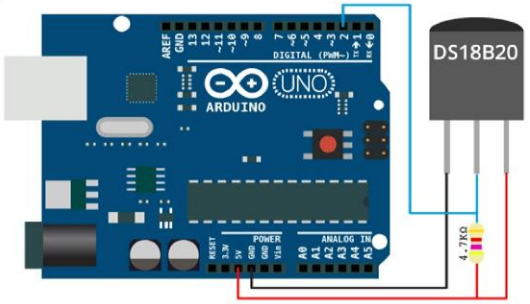

Fig 4. Temperature sensor

This module is used to transmit the sensor values from arduino to mobile, laptop or tablet.

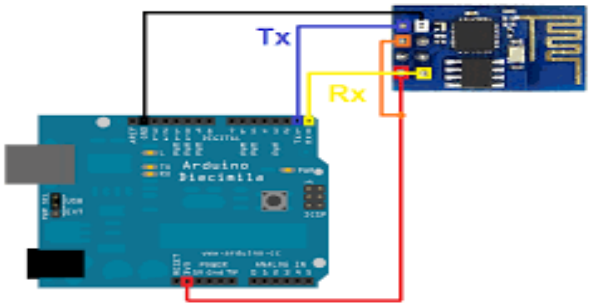

Fig 5. Wifi module(ESP8266)

System circuit diagram

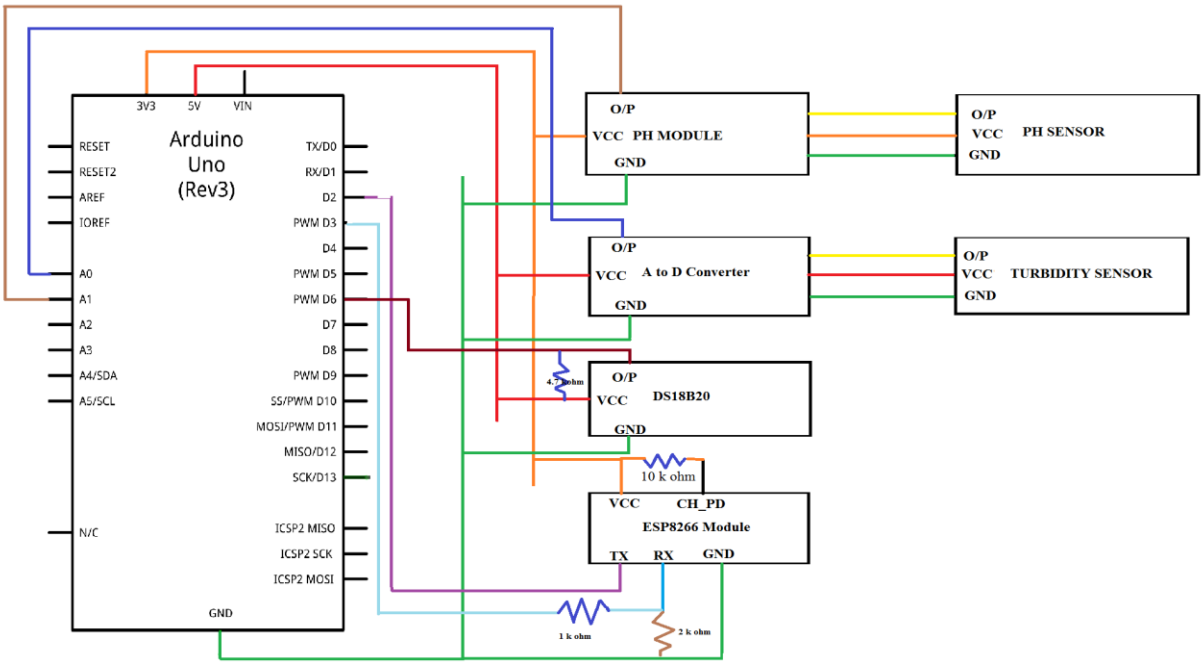

Fig 6. Schematic Diagram

V. WORKING MODEL

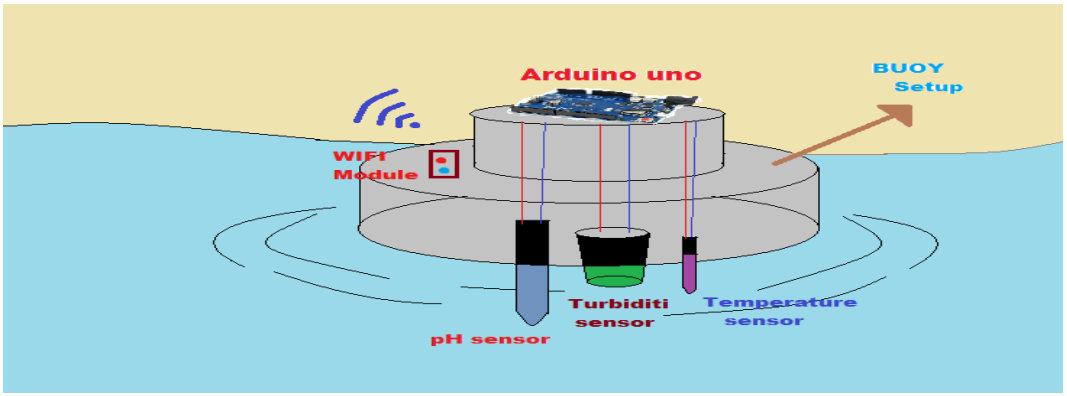

Fig 7. BOUY Setup

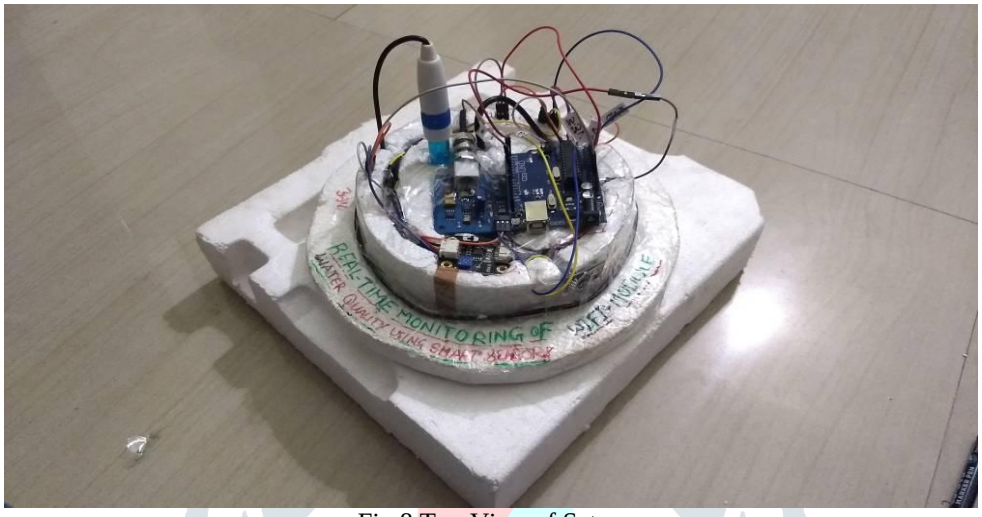

Fig 8.Top View of Setup

Fig 9. Bottom View of Setup

VI. RESULTS

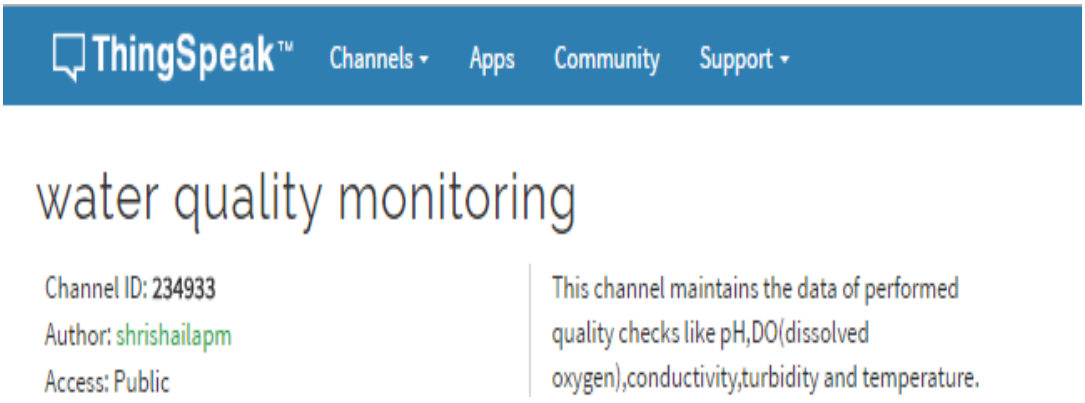

Fig10. ThingSpeak Channel Details

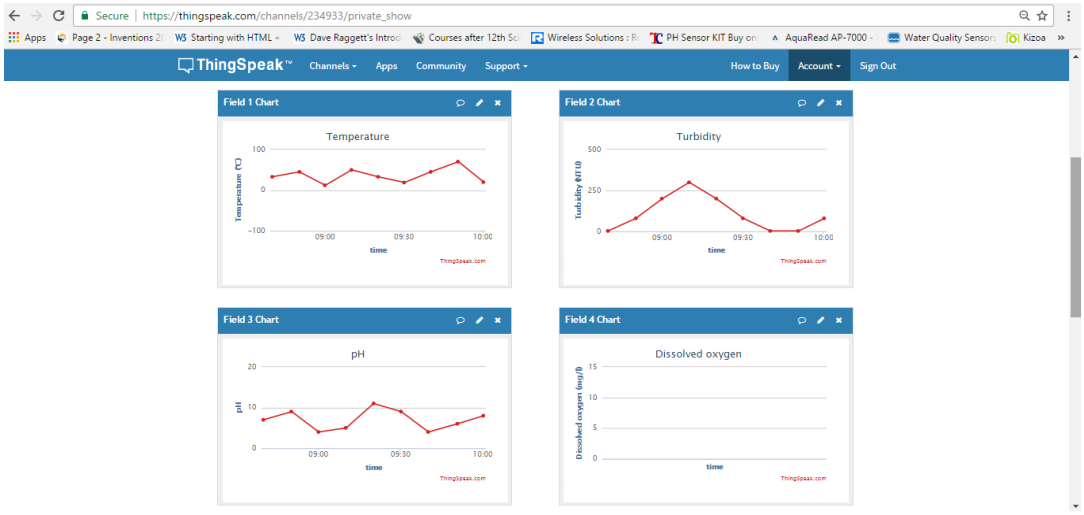

Fig11. Output in the form of Graphs on ThingSpeak

Table 1 Output results in the form .CVV Format

Entry ID	Parameters of Water		
	Temperature	*Turbidity*	*pH*
1	33	3	7
2	45	80	9
3	12	200	4
4	50	300	5
5	33	200	11
6	19	80	9
7	45	3	4
8	70	3	6
9	20	80	8

VII. CONCLUSION

Summary

- We deploy the buoy setup in the water, the buoy setup consisting sensors of parameters like temperature, turbidity, pH which senses the water parameters and uploads the values to ThingSpeak.
- In ThingSpeak we create a channel ID to store the data and represent the values in the form of graphs. This information can be viewed by the users using a channel ID.

Suggestions for Future Extensions to Project

- It can be adopted in real time monitoring of water quality in reservoirs, rivers and other water sources.
- It can also be used as a product to predict the purity of water for further water treatment in purification of water in chemical industries.
- It can also be deployed for industry waste to ensure that certain percentage of water to be recycled.
- It can also be used as a device to measure water parameters in water purifier plants.

VIII. INSTALLATION AND EXECUTION STEPS

- Interface the water sensors(Turbidity, pH, Temperature) and WIFI(ESP8266) module with the arduino UNO board.
- Create a ThingSpeak channel ID on www.ThingSpesk.com.
- Develop the code with ThingSpeak channel ID and ThingSpeak API Key and upload it to the Arduino UNO board using arduino IDE (Integrated Development Environment) Software.
- Deploy the BUOY Setup in to the water.
- The sensor senses the values of water parameter and uploads to ThingSpeak,
- User can monitor water quality parameters on ThingSpeak.

REFERENCES

[1] Anjana S, Sahana M N, Ankith S, K. Natarajan, K. R. Shobha and A. Paventhan, "An IoT based 6LoWPAN enabled experiment for water management," 2015 IEEE International Conference on Advanced Networks and Telecommuncations Systems (ANTS), Kolkata, 2015, pp. 1-6.doi: 10.1109/ANTS.2015.7413654.

[2] Srisruthi, N. Swarna, G. M. S. Ros and E. Elizabeth, "Sustainable agriculture using eco-friendly and energy efficient sensor technology," 2016 IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology(RTEICT),Bangalore, 2016,pp.1442-1446. doi:10.1109/RTEICT.2016.7808070.

[3] A. Cloete, R. Malekian and L. Nair, "Design of Smart Sensors for Real-Time Water Quality Monitoring," in IEEE Access, vol. 4, no. , pp. 3975-3990, 2016. doi: 10.1109/ACCESS.2016.2592958

[4] H. M. A. Helmi, M. M. Hafiz and M. S. B. S. Rizam, "Mobile buoy for real time monitoring and assessment of water quality," 2014 IEEE Conference on Systems, Process and Control (ICSPC 2014), Kuala Lumpur, 2014, pp. 19-23.doi: 10.1109/SPC.2014.7086223

[5] Mithila Barabde1, Shruti Danve ME Student, Dept. of E&TC, MITCOE, Savitribai Phule Pune University, Pune, India Assistant Professor, Dept. of E&TC, MITCOE, Savitribai Phule Pune University, Pune, India." Real Time Water Quality Monitoring System"2015.

[6] Pradeepkumar M , Monisha J , Pravenisha R , Praiselin V , Suganya Devi K UG Student, Department of Electronics and Communication Engineering, Anna University, Sri Eshwar College of Engineering, Coimbatore, Tamil Nadu, India Assistant Professor, Department of Electronics and Communication Engineering, Anna University, Sri Eshwar College of Engineering, Coimbatore, Tamil Nadu, India." The Real Time Monitoring of Water Quality in IoT Environment"2017.

[7] www.arduino.cc

[8] www.thingspeak.com