



Department of Electronics & Communication Engineering

GOVERNMENT POLYTECHNIC FOR GIRLS, SURAT

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EC TRENDS

E-Newsletter



Vision:

Be an excellent department for girls to empower them in the field of Electronics and Communication engineering to excel in industry and serve society.

Mission:

- To prepare professionally competent students and staff through academic excellence.
- To create a conducive environment in the department for exchange of ideas and knowledge.
- To provide opportunities in the department for skill development and innovation.
- To provide resources and infrastructure for best learning experience in the department.

Message from Head of Department



Dr. S. N. Sampat
Head of the Department Electronics and communication
Engineering. ,
(I/C principal ,GPG .surat)

Dear students,

Due to Corona Covid-19 pandemic, the whole world is facing various critical problems and challenges in different sectors like healthcare, manufacturing, tourism and travels, fast moving consumer goods, aviation and education etc. It has affected overall economy. New online working norms and trends are imperative. The life of every human being is changed and in long run everybody has to adopt new life style and challenges. This will offer new opportunities and avenues to us. Hence to all my young students, I insist that improve your immune system, skills and be mentally strong to face challenges and grab every single opportunity.

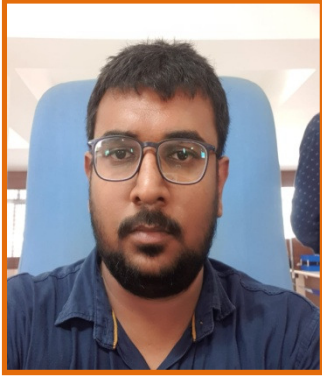
The whole purpose of this quarantine time is to keep as many of us safe and healthy as possible. So teachers want students to know that they should stay home and stay safe so that everything can return to normal as quickly as possible.

The whole world is praising the efforts that are being made by corona warriors to ensure everyone's safety everywhere. These people have been tirelessly working to deliver essential services.

The community of these workers should be given applause for the work. From the rag pickers to the nurses and security personnel standing on all fronts are working for the people.

Thank you for helping us, Your work deserves appreciation. Thank you!

Implementation of IoT for Drinking Water Quality



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Abstract—

The need for user involvement in maintaining drinking water quality and other aspects like hygiene, environment sanitation, storage, diseases and disposal are critical elements to maintain and improve the quality of drinking water resources. It is also expected that by around 2020, India will be a 'water stressed' state with per capita availability declining to 1600 cu m/person/year. At present scenario due to sewage discharge, discharge from industries, run-off from agricultural fields and urban run-off, over population and scarcity of drinking water is primary concern for this thesis. In addition, uncertain quantity of certain parameters in drinking water like; PH, TDS, turbidity, temperature, as well as due to conventional method of testing, quality may not be tested on real time basis. Advancement in Internet of things (IoT), sensors, wireless communications, microcontrollers (Arduino), mobile application(android), internet availability leads to focus this thesis on testing, monitoring, record keeping, alarming and suitable action can be suggested in improvement of drinking water quality. At the end this system would be simple, user friendly, flexible, low cost, highly efficient, reliable, robust and easily available at user end.

Keywords— Internet of Things (IoT), Arduino, Drinking Water, Ubidots, Cloud Computing

I. INTRODUCTION

“Inadequate water quantities or bad quality water can be a limiting factor in poverty alleviation and economic recovery, resulting in poor health and low productivity, food insecurity and constrained economic development.” (Niyi Gbadegesin and Felix Olorunfemi, 2007)

Water contamination sources are pollution, run-off from agriculture, industries, and urban areas. Water contamination occurs due to draughts as well floods. In addition to maintain the water quality following elements: storage, hygiene, sanitation, cleanliness, and disposal are critical and needs to be maintain.

About 5 million people of global ailments die with aquatic diseases due to poor quality of water. Industrial waste, agricultural waste is dumped in rivers, sea and lakes. Such vulnerabilities spoiled the food chain and increase poisonous levels, and then kill birds, mammals and fish. Chemical plants also dump waste in water. Factory Plants use water from rivers to cooling machine and powering them. Reduces the dissolved oxygen levels and

increases water temperature, which causes imbalance life expectancy in water. With the usual water testing methods, the real-time quality of water quality cannot be verified, which leads to the implementation of the IoT. All the above-mentioned factors need to be monitor for the quality of water.

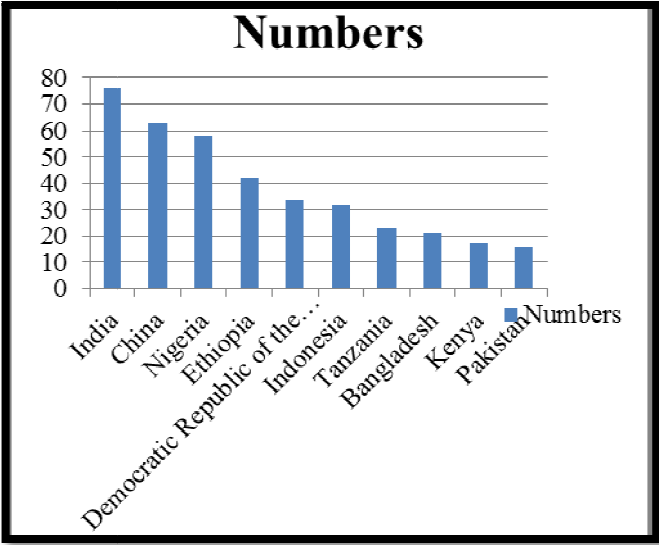


Fig. 1: worst Access to safe drinking water

Around the world India Has the Worst Access to Safe Drinking Water, the country has approximately 76 million people, at least 5.5% of its 1.35 billion population, without access to safe drinking water, a report released to mark World Water Day showed Tuesday 6th March-2018. The report by WaterAid, a water and sanitation nonprofit headquartered in London. [18]

A. Water Quality Standards

In recent scenario there is no place where safe and hygiene drinking water is available. Several types of pollutants are melted in the drinking water. These pollutants are melted extreme quality which leads to various water borne diseases, these are spreading at very fast rate around t globe. Approximately 60 % sicknesses are produced by water borne disease. Because of that the WHO has been separated the standard of contamination in drinking water quality using extensive testing at laboratories. The local water supply is well-thought-out to be most critical use of water in direct consumption by human beings.

Characteristics	World Health Organization (WHO)		Ministry of Works and Housing (MWH)	
	Highest desirable	Maximum Permissible	Acceptable	Cause of rejection
1	2	3	4	5
Turbidity (J.T.U.)	5.0	25.0	2.5	10.0
Colour (Pt-Scale)	5.0	50.0	5.0	25.0
Taste and odour	Nothing	Disagreeable	Unobjectionable	Unobjectionable
pH	7.0-8.0	6.5-9.2	7.0-8.5	6.5-9.2
Total Solids	500	1500	500	1500
Total hardness	100	500	200	600

Fig. 2: drinking water standards (Note: All the values are in mg/l, except pH) (Source: Indian Counsel of Medical Research (ICMR), & Bureau of Indian Standards (BIS))

In India the agencies like Bureau of Indian Standard (BIS), Indian Council of Medical Research (ICMR), and Ministry of Works and Housing (MHW) have expressed certain drinking water standards which are being followed by several authorities. The World Health Organization has provided standard of drinking water which has to be accepted internationally.

In 2015, seven out of ten people used a safely managed drinking water service “Safely managed” water services represent an ambitious new rung on the ladder used to track progress on drinking water. 5.2 billion persons used carefully accomplished facilities, i.e. available when required and free from pollution, accessible on spots, in addition to that 1.3 billion persons used a ‘basic’ water service, i.e. far away about 30minutes round trip. Around 258 billion used a ‘limited’ service i.e. far away more than 30minutes round trip. In most nations women and girls have major problems in water collection.

B. Health Risk

1) Total Dissolve Solids (TDS):

These substances are dissolved in the rock and other compounds from the earth. High TDS water is low thirst satisfying. Some of distinct mineral salts which are accountable for TDS causes different health problem. Most problematic are Copper, Sodium, Fluoride, Nitrates, Barium, and Sulfate. Quantity of TDS is 500 mg/l is generally considered fit for the human consumption. High TDS causes change of taste of water and foods which makes it less desirable to consume. some health advocates say that High TDS water have a poorer cleansing outcome in the body than low TDS water, low TDS also has a greater capacity of absorption than water with high TDS.

2) Turbidity:

Turbidity of water means the amount dirt and suspended solids which are present in water which can be perceived by naked eyes. Which is used to specify quality of water and effectiveness of filtration process. Higher turbidity level means organisms are present which are frequently related with higher level of diseases, microorganisms such as bacteria, parasites & some viruses. These can cause cramps, nausea, associated headaches and diarrhea.

3) pH

Low/high pH - pH refers to Hydrogen Ion Concentration and is a measure of acidity or alkalinity on a 14-point scale (Zero through six is acidic, seven is neutral and eight through 14 are alkaline.) Source: BIS Standards: IS 10500: 2012

4) Temperature

It is harmful if we consume very high/low temperature water in our daily life thus it is required to be monitor.

C. Innovation in IoT

Around the globe approximately 1.5 billion computers are connected to internet and more than 1 billion mobile phones are internet-enabled. These both type of internet-enabled devices will be joined together and operate smart objects in the forthcoming years. By 2020, around fifty to hundred billion devices will be connected to the Internet, i.e. Mobile phones, ATM, computers and production equipment in plants and goods in transport containers.

IoT: It allows “people and things to be connected Any-time, anyplace, with anything and anyone, ideally using any path/network and any services.”

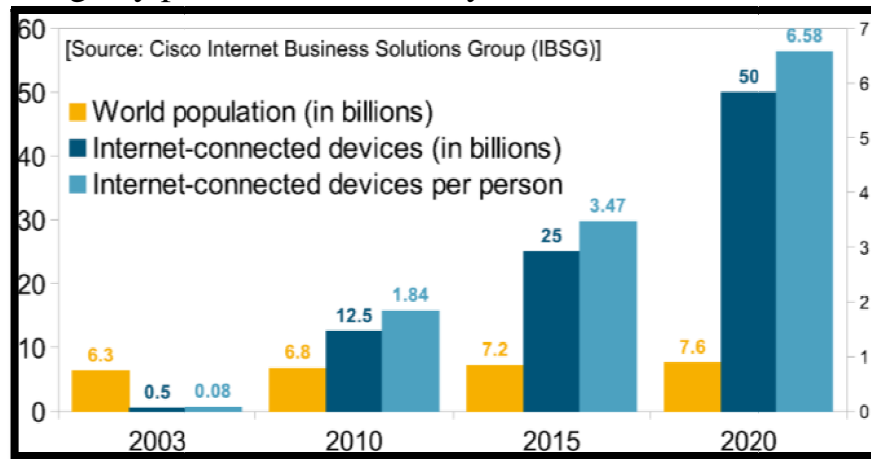


Fig. 3: Growth in Internet-Connected Devices/Objects by 2020

II. PROPOSED SYSTEM

A. Architecture

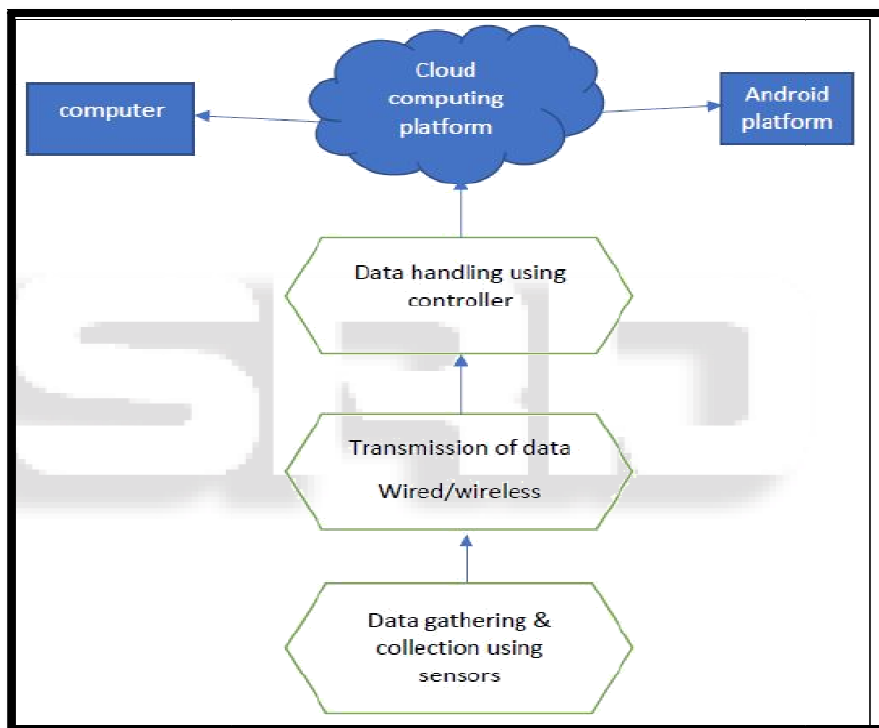


Fig. 4: Proposed Architecture of System

Figure depicts overall block diagram of a proposed system and shows the data flow of the system. It is made up of three subsystems

Data gathering and collection is a process in which multiple sensors collect the data from the water sample and send it over to the communication channel.

Transmission of data subsystem receives data from the various sensor and that data will be sent to the controller with the help of secured wired or wireless channel.

Data handling subsystem includes a software which monitors and access the data and sends it to cloud.

Cloud computing is kind of web server which access data and it also stores and analyze that data and send a notification to the user via email or message or alarm. User can observe and monitor data on a computer.

Block diagram of system

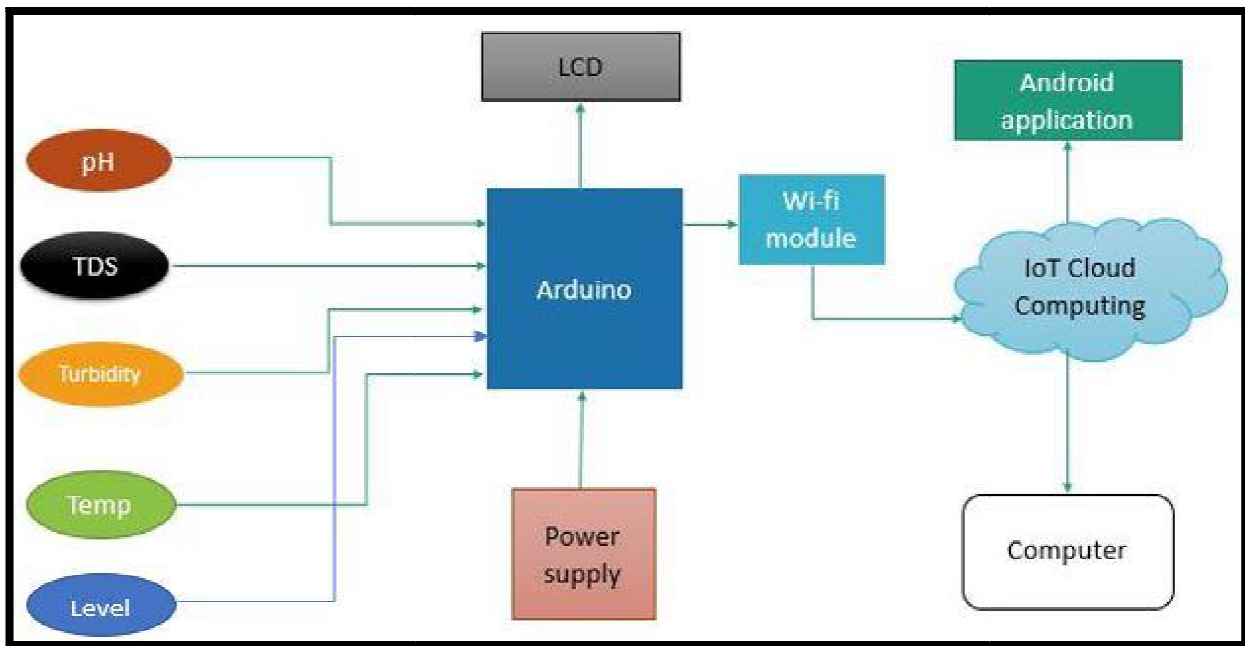


Fig. 5: Functional Block Diagram of System

1) Arduino Uno board:

Arduino Uno is a ATmega328P based microcontroller board. It has 14 i/o pins, out of which 6 analog inputs, six can be used as a PWM outputs, and 2 two serial pins. It has also USB connection, 16 MHz quartz crystal, an ICSP header, power jack, and a reset button. It includes everything which are required to supports the microcontroller. In Italian, the meaning of "Uno" is one and it was selected based on release of Arduino Software (IDE) 1.0.

2) Wi-Fi Module:

ESP8266 SoC is the serial Wi-Fi transmitter and receiver module. It consists of TCP/IP protocol set for communication and it is also highly integrated chip. It can host application or support WIFI networking facility form different processor and application, it also offers a self-contained Wi-Fi networking and complete solution for those whose project boards does not contain inbuilt Wi-Fi facility.

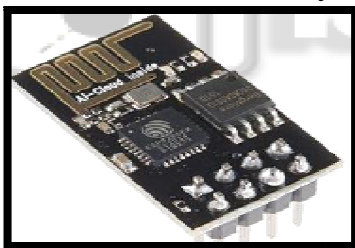


Fig. 6: ESP8266 Wi-Fi Module

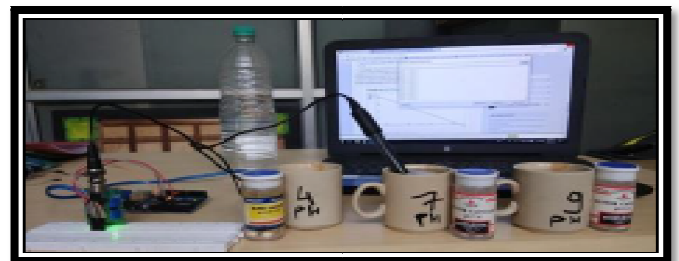


Fig. 7: calibration of pH sensor

3) pH Sensor

pH is used to measure of acidic or alkaline property of any solution; Its range lies between 0 to 14. Which indicates the H^+ ions concentration existing in liquid. It can precisely be measured by a sensor it is the potential difference between two electrodes: a glass electrode which is sensitive to $[H]^+$ ions and a reference electrode (silver chloride/silver). We also have to use a circuit for signal conditioning so that it can be used with controller boards, such as Arduino, nodeMCU, raspberry-pie etc.

4) *TDS sensor:*

This is an Arduino-compatible TDS sensor/Meter Kit for measuring TDS value of the water, to reflect the cleanliness of the water. It can be applied to domestic water, hydroponic and other fields of water quality testing. TDS (Total Dissolved Solids) indicates that how many milligrams of soluble solids dissolved in one liter of water. In general, the higher the TDS value, the more soluble solids dissolved in water, and the less clean the water is. Therefore, the TDS value can be used as one of the references for reflecting the cleanliness of water.

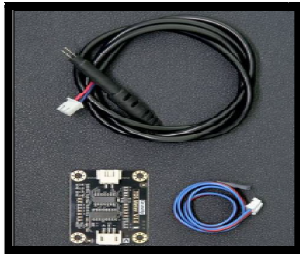


Fig. 8: TDS Sensor & signal transmitter

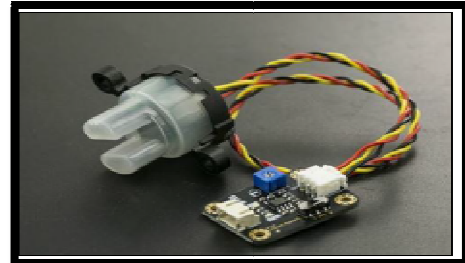


Fig. 9: Turbidity Sensor & signal transmitter

5) *Turbidity sensor:*

The turbidity sensor detects water quality by measuring level of turbidity. It is able to detect suspended particles in water by measuring the light transmittance and scattering rate which changes with the amount of total suspended solids (TSS) in water. As the TSS increases, the liquid turbidity level increases.

6) *Temperature sensor:*

This is a pre-wired and waterproofed version of the DS18B20 sensor. Handy for when you need to measure something far away, or in wet conditions. While the sensor is good up to 125°C the cable is jacketed in PVC so it need to be keep it under 100°C. Because it is digital, we don't get any signal degradation even over long distances! These 1-wire digital temperature sensors are fairly precise ($\pm 0.5^{\circ}\text{C}$ over much of the range) and can give up to 12 bits of precision from the onboard digital-to-analog converter. It works with any microcontroller using a single digital pin, and we can even connect multiple ones to the same pin, each one has a unique 64-bit ID burned in at the factory to differentiate them. Usable with 3.0-5.0V systems.



Fig. 10: Temperature Sensor

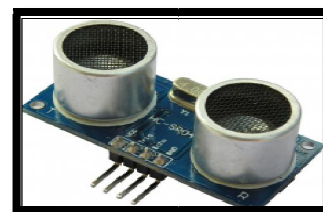


Fig. 11: Ultrasonic Sensor

7) *Ultrasonic Sensor:*

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object. This sensor is used in our project as a level detector that will measure the height of the water from the top and calculate the percentage of water in the tank.

8) IoT Cloud Computing (central hub/server unit):

Ubidots is most advance IoT platform provided free for the students which is used by us during development of this project, of course it is available for the commercial purpose but one has to pay a price for the same, Ubidots provides a unique token number to each account which is used in our program to send the data over cloud using internet. In this project we have used Arduino and ESP8266 to connect with internet, data which was collected by sensor are accumulated on cloud and converted in to useful information. Ubidots offers the real time data for monitoring purpose to each user, it will allow user to share this data publicly and also store these data so that one can process or analyze in detail for the further decisions. Ubidots cloud has the unique feature of sending notification to user via email or SMS when received data exceeds threshold limit set on cloud.

Ubidots has very good dashboard on which we can create, observed and monitor real time data from various sensor which was send by our devices, these data can be viewed in the form of charts, Metric, map, table, indicator etc. In Ubidots cloud platform user can add more than 50 devices which they want to monitor, it is also provide facility to enable LoRa. It is possible to create event in Events Telegram, Webhook, Create SMS, Trigger Events, Email etc. alerts based on your sensor data.

The system is connected to the Ubidots cloud using the following steps:

- 1) Create account in Ubidots
- 2) Ubidots will assign one unique Token number to your account.
- 3) Use this token number to communicate with your account.
- 4) Connect your Arduino or other microcontroller board with internet using wire or wireless protocol.
- 5) Link your device with Ubidots using unique token number.
- 6) Create device in your Ubidots account and give appropriate name according to your project.
- 7) Use token of your account and variable ID generated for different sensor in your controller program to update data on cloud.

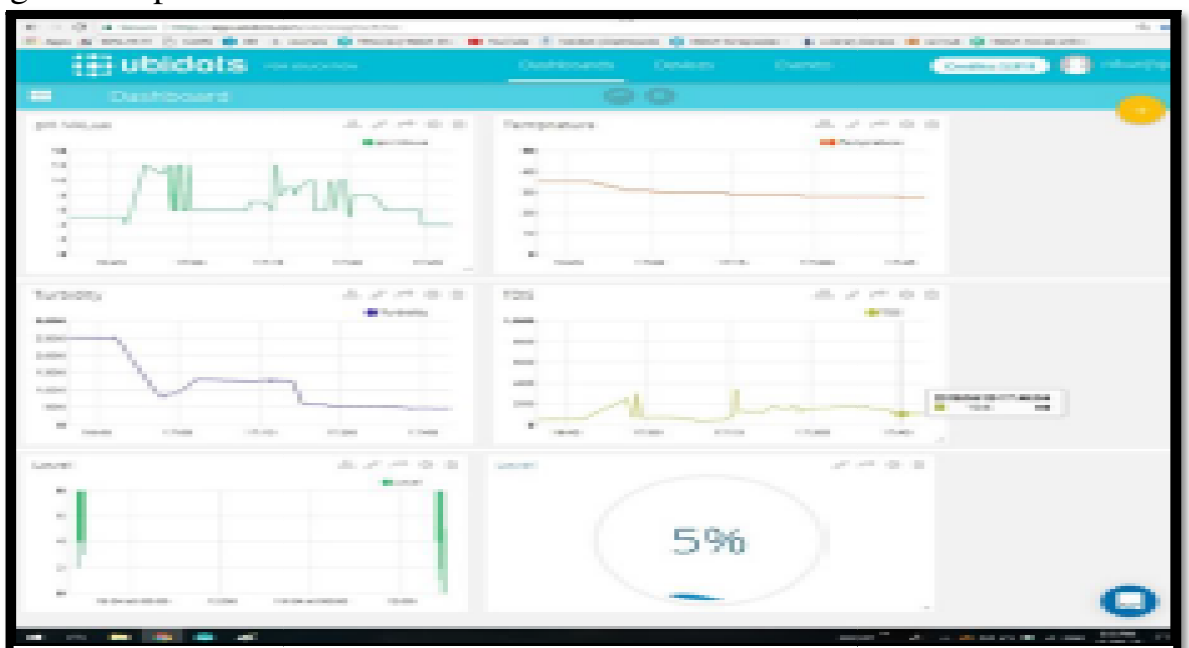


Fig. 12: Data Logging in Ubidots

Above Figure shows the real-time data monitored at IoT platform Ubidots, it is in the form of bar chart, there are multiple graphical methods which could be used by us to show the data, like, level is represented by two graphical view, one is with the help of bar chart and another one is showing tank level in percentage form. As we are monitoring parameters of water in real-time, we need some alarming system if anything goes wrong, Ubidots provides us an alert message in our mobile via SMS, telegram, E-Mail or at Webhook. We can also send commands over the internet to the controller board to do necessary changes if required

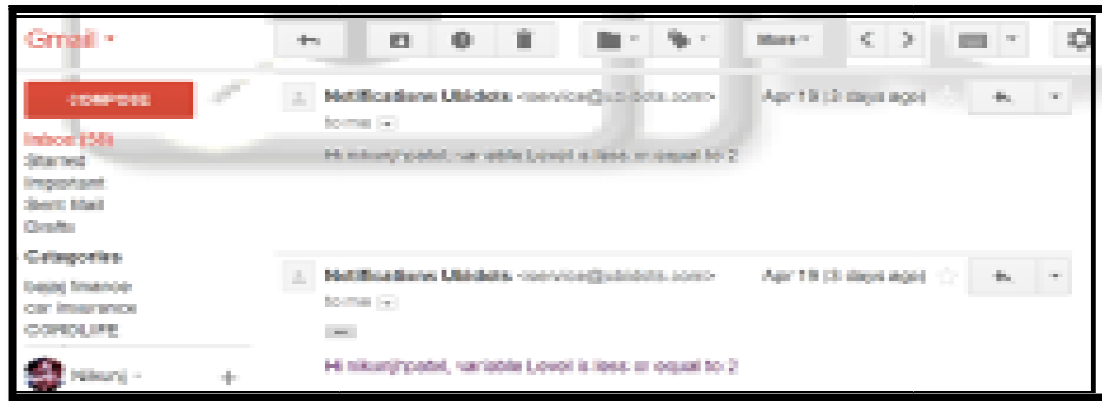


Fig. 13: notification by E-mail

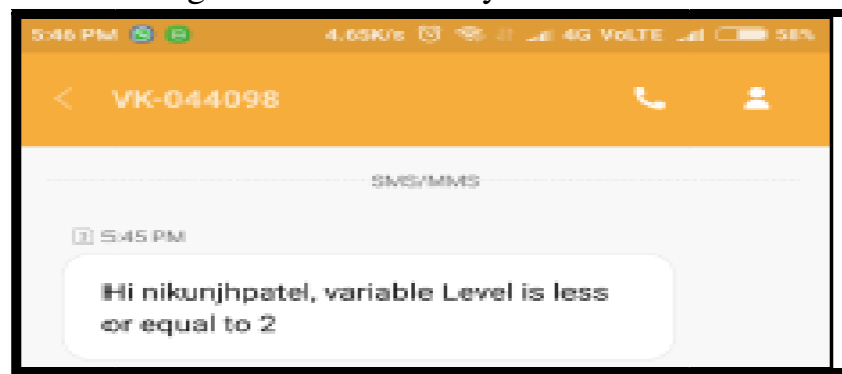


Fig. 14: notification by SMS

III. FUTURE WORKS POSSIBLE

Having ease of hardware and software implementation, execution, maintenance, troubleshooting, running and capital cast Arduino based system become more reliable and physical towards end users. Due to IOT platform users, service provides and third parties like government or research lab can analysis, monitor and control from different long or short distance point around globe.

- 1) Source of quality water can be identified (nearby)
- 2) Quantity of quality can also notify to the users, suppliers and third-party
- 3) Online metering can also be added to the system
- 4) Schedule of available water notified.
- 5) Recommendation after data analysis can be obtained.
- 6) Trouble-shooting for the poor quality of water can be added.
- 7) Do-It-Yourself platform can be added for the users.
- 8) Data analysis can be simulated with MATLAB for the simulation and possible new analysis.

IV. CONCLUSION

The Report presents a survey on the tools and techniques employed in existing smart water quality monitoring systems. Also, a low cost, less complex water quality monitoring system is proposed. The implementation enables sensor to provide online data to consumers.

The proposed system will help the consumers to know the water quality which will help them to take better decisions and preventive measures at the right time. This will lead to tremendous improvement in the health. This, intern, will save their time, labour, money and make effective use of resources.

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STUDENT CORNER

" BOOKS "

Books Books Books ,What are they ?

They are our best friends,

Which wre always in trends,

Just give a look to your book

A lot of knowledge u can took,

Books Books Books ,What are they ?

They are keys to success,

And they gives a lot of access,

Books Books Books ,What are they ?

A mysterious gates in which ,

A new adventure awaits,

Read the story of powerful knights

Open the suspense of dragons and dragon-fights !

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- By pandey anshu



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