

Water Quality Monitoring System

Ajith N¹, Dr. B. Rosiline Jeetha²

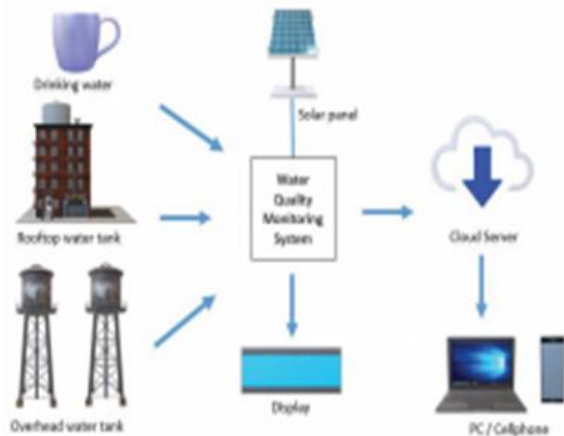
^{1,2}Department of Computer Science, Dr N.G.P Arts and Science College, Coimbatore-641407, TamilNadu, India

Abstract - This article presents the monitoring of water quality in means of wireless sensor technology that is powered by solar energy. The different constituents of water example pH level, turbidity, water level is measured by means of sensors that are been powered by solar energy. The information from the sensors has been gathered and will be sent to the cloud server by the means of Wi-Fi module. The collected data will be further analyzed has been shown in visual formats in LCD and graphical comprehension is demonstrated via Thing Speak. In the remote areas, the quality of water is displayed in LCD. If after analyzing the properties the water quality appears to be in negative, necessary steps will be taken.

Index Terms - water quality monitoring system, wireless monitoring, Thing Speak.

I. INTRODUCTION

With the feminized of lots of innovation, development globalization, communication, etc. it is said that the life has become easier now has it was before. It is the 21st century and its messy or polluted water is as now being utilized for drinking and the purposes with no sort of separating or filtering in many developing nations. The lack of user-friendly water quality monitoring system is creating these serious



This is a basic visualization of the research which is done for three different cases (Fig. 1). The cases are.

1. Normal drinking water
2. Rooftop water tank
3. Overhead tanks.

The LCD display is used to monitor normal drinking water, but for the monitoring of rooftop water tank and overhead tanks, the result is shown in “Thing Speak” (an IoT analytics platform service) through PC or cellphones. A Wi-Fi module (ESP8266 ESP-01) can be used to connect the nodes and cloud server. Solar cells can power-up the micro controller and different types of sensors those are used for collecting.

II. RELATED STUDY

In the course of the recent decades, water quality has been observing technology has quickly in advanced to the addressed the issue of their inhabitants. First, the work started with the survival, scans for a predator to look for source of the movements under the water or beside its water hole. The understanding of the health and science in regarding this issue has been ascended due to the need of clean water. This action was started in mainly Egypt through the Hippocratic sleeve system. It was basically a filtering system [3]. Water quality data collection been moved from written notes to a digital display through the sophisticated digital of electronics with the real time data. Examining limit has been progressed from the couple of hand to estimation for every day, one parameter of any given moment, to a steady of surges information as transmitted by multi parameter instrument sent for a couple of months on the end. This accuracy has been developed a lot in between the development of the technologies.

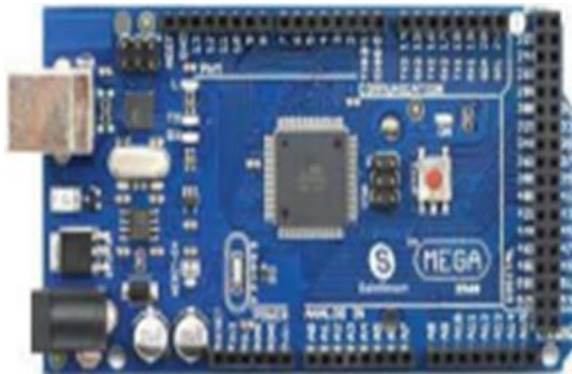
Relevant tools

Solar panel: Solar panel as intended to absorb the sun's heat and transforms it into a fund of energy to breed

the electricity or heating. Mainly transferring the light energy into electricity. This solar panel is a assembly of the solar cells in which cells are been distributed over its considerable sphere and are been able to design a lay back to afford its power of which it could be a useful. It uses the metal frame comprised of brackets and racking component, reflector and shapes. This efficiency of solar panel tin can be improved. The efficiency of solar panel can be increased with the help of MPP (maximum influence point) esteem in solar point. Solar panel is used as spacecraft in satellites.

Microcontroller:

Micro controller is used in the research was Arduino mega 2560. Basically, it is a kind of small computer on a single integrated circuit that consists of a memory, processor core and programmable input and output borderlines.[16] It consist of 54 digital i/o pins, 16 analog pins, 256 KB flash memory, 8KB SRAM, 4 KB EEPROM, a 16 MHz crystal oscillator. It has an USB connection along with a power jak and a reset button.



Ph Sensor: The pH sensor works in measuring of the hydrogen in ion activity of water-based solutions and, it indicates the acidity or basicity to that of the respective solution. This acidic solution carries far more positively charged ions of the hydrogen than in the alkaline or basic its one, therefore the potential is greater in an acidic solution than any alkaline or the basic solution to produce an electric current in a certain situation of any condition, and it's almost like a battery from which a greater amount of its voltage could be produced. Taking the advantage of the system, the pH meter works in similar as of the voltmeter. And it measures the voltage of its produced solution and the voltage of the known solution then it compares with each other, calculates the voltage and difference between the two solutions to find the

difference in pH. Same procedure is followed when it comes to the measure of its basic water.

pH Level of Water	Voltage at Arduino (mV)
0.00	414.12
1.00	354.96
2.00	295.80
3.00	236.64
4.00	177.48
5.00	118.32
6.00	59.16
7.00	0.00
8.00	-59.16
9.00	-118.32
10.00	-177.48
11.00	-236.64
12.00	-295.80
13.00	-354.96
14.00	-414.12

Turbidity sensor: The haziness or the cloudiness of a solution or fluid due to huge a considerable amount of the isolated or small particles which can be generally cannot be seen with the naked eye also similar to smoke in air is known as they turbidity. The SKU: SEN0189 is used as a turbidity sensor. By measuring the levels of the turbidity, the turbidity sensor detects they water quality. Light is used as to track out the floating or the hanged particles in the solution by measuring the light transmittance and the scattering rate, that too differs with the quantity of the total suspended of solids in the liquid solution (water). The liquid turbidity of the level increases with the increase of turbilty. This water quality in rivers, streams and ponds are measured by the turbidity sensors. It can also be used as a controlling instrumentation for the settling ponds, sediment transport, research and laboratory measurement.

Turbidity of water (NTU)	Voltage at Arduino (mV)
0	4.2
355.50	4.1
999.36	3.9
1554.434	3.7
2019.35	3.5
2394.634	3.3
2680.286	3.1
2876.306	2.9
2982.694	2.7
2999.45	2.5

Ultrasonic Sensor: The Ultrasonic sensor consists of 4 pin modules which are as VCC, Trigger, Echo in ground and respectively. It is a commonly used sensor that as applied in the different types of works regarding the measurements of they distance of its

different objects. In the front of the module has two types of articles which looks like eyes. Those are called as the Ultrasonic transmitter and the receiver. and sensor works with the simple formula that is,
 $Time \times Speed = Distance \text{ (1)}$

The ultrasonic transmitter sends a wave, and it travels in the air and when it gets blocked by any transparent materials it gets reflected back which the ultrasonic receiver observes.

Wi-Fi module (ESP8266ESP-01): The ESP8266 ESP01 is a Wi-Fi module that gives allowance to microcontrollers to get an access to a Wi-Fi network. The Wi-Fi module offers a self-contained and an entire Wi-Fi networking solution which allows it to offload all Wi-Fi networking functions from another application processor or to host the application.

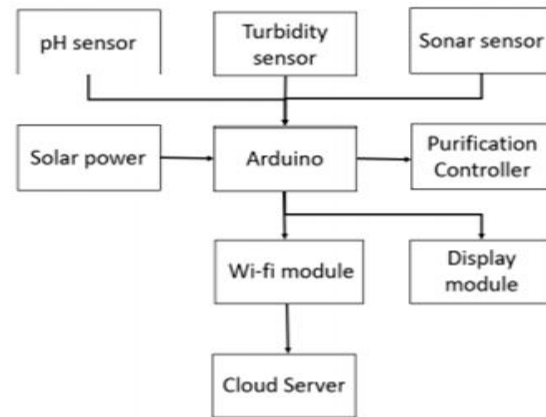
Cloud Server (Think Speak): Thing Speak is a thing used in Internet of things based on the analytics platform of service that will be allowed to assemble, analyze and visualize the current flow of the data in the cloud server. It gives an instant reorganization of the data posted by the connected device. In addition, with the implement of authority to perform the MATLAB encryption. In thing speak is to be likely to complete online analysis and breakdown of the data as it been followed and it as it comes in.

III .DESIGN AND IMPLEMENTATION

The information about the structuring of the circuit were accumulated by the form of a various sources i.e. books, papers, sites and so forth we have examined well to get up the ideas. Study on water monitoring system with the help of wireless network powered by solar energy were done. Photo voltaic panel was implemented to power up the micro controller the real time values of different factors of water were taken with the help of definite sensors. Those sensors are ph sensor, turbidity sensor and Ultrasonic sensor. At first, the topic and the title of the article are being selected. Different sources as for the example: papers, journals, books, websites etc. are used to be collected important the information of the articles. The idea of the about developing the water quality monitoring system is being prioritized by improvising the system with a multiple hardware for the implementations and developing new system for purification. Related to the

equipment are being collected to the circuit designed following and improvising the design from the previous journals. Micro controllers is used to receive the data from the sensor and ESP 8266 is used to transmit the data of the cloud to server. The circuit is being implemented on the bread board. The output value as been displayed in the multiples of LCD to display and the

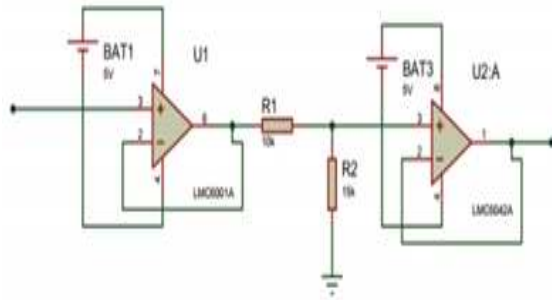
In addition, with playing a major role in MS Excel via ‘Thing Speak’ are been observed and monitored thoroughly. The result determines are.



In the beginning of the article the plan was made to mount the solar photovoltaic panel to power up the microcontroller. A pH meter is mainly used as a pH sensor to check whether the water is acidic or basic. Turbidity checks the haziness while the ultrasonic sensor detects the level of the water. The output of the system is demonstrated on the LCD and analyzed in the base station through wireless network. After that the sample water can be purified or further tested according to the output. Different tools were used for analyzing the data. Maximum efforts were given to exclude or eliminate the limitations. Steps required to complete the article are described in the following.

In the beginning of the article the plan was made to mount the solar photovoltaic panel to power up the microcontroller. A pH meter is mainly used as a pH sensor to check whether the water is acidic or basic. Turbidity checks the haziness while the ultrasonic sensor detects the level of the water. The output of the system is demonstrated on the LCD and analyzed in the base station through wireless network. After that the sample water can be purified or further tested according to the output. Different tools were used for analyzing the data. Maximum efforts were given to

exclude or eliminate the limitations. Steps required to complete the article are described in the following.



At first, the topic and the title of the article is being selected. Different sources as for example: papers, journals, books, websites etc. are used to collect important information of the article. The idea about developing the water quality monitoring system is being prioritized by improvising the system with multiple hardware implementations and developing new system about purification. Related equipment is collected and the circuit is designed following and improvising the design from the previous journals. Microcontroller is used to receive the data from the sensors and ESP 8266 is used to transmit the data to the cloud server. The circuit is implemented on the breadboard. The output values displayed in the multiple LCD displays and the MS Excel via ‘Thing Speak’ are being observed and monitored thoroughly. The result determines the further advancement in the purification of water.



IV. OUTPUT ANALYSIS

For the first case of the research, the reading for normal drinking water has been taken. For the case only the LCD display to have been used to demonstrate the condition of a water.



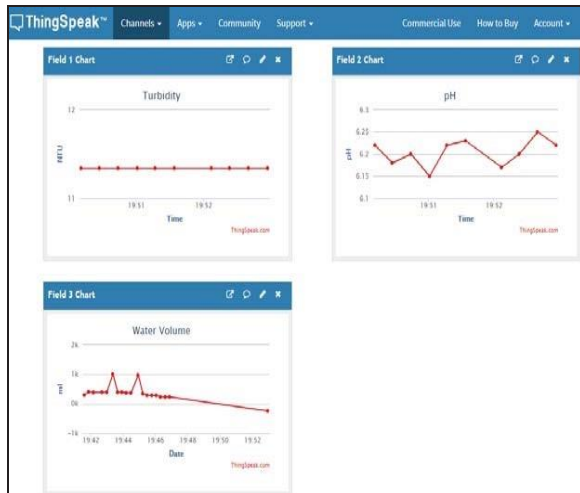
B. Case II (Water quality of rooftop water tank)
For rooftop tank, the factors of water have been shown through the cloud server (Thing Speak). According to the graphs in fig. 12, it is shown that the turbidity decreased to zero and pH level is varying with the change with time. The volume of water is also displayed.

C. Case III (Water quality of multiple overhead tanks)
For overhead tanks, the information was taken for two tanks. Sometimes it can be more than two. The information has been shown in “Thing Speak” in two different tabs and easily monitored.

V. CONCLUSION

In addition, with playing a major role in assisting in living a better living condition in the remote areas, this system can be implemented for multiple purposes as for example: agricultural purpose, in the private water tank that





REFERENCES

- [1] A. A. Joshi, "Water Quality Monitoring System Using Zig-Bee and Solar Power Supply", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol.4, no.10, 2015.
- [2] Jiang Peng, Huang Qingbo, Wang Jianzhong Research on Wireless Sensor Networks Routing Protocol for Water Environment Monitoring 07695-2616-0/06 2006 IEEE
- [3] "Water Quality Legislative History," [Online]. Available: www.des.nh.gov/organization/divisions/water/wmb/wqs/history.htm
- [4] R. Yue and T. Ying, "A water quality monitoring system based on wireless sensor network & solar power supply," in the proceedings of 2011 IEEE International Conference on Cyber Technology in Automation, Control, and Intelligent Systems, Kunming, China, 2011.
- [5] R. Kumar, M. Mohan, S. Vengateshapandian, M. Kumar and R. Eswaran, "Solar based advanced water quality monitoring system," International Journal of Science, Engineering and Technology Research (IJSETR), vol.3, no.3,2014.
- [6] F.Akyildiz, W. Su, Y. Sankarasubramaniam and E. Cayirci, "Wireless sensor networks: a survey," Computer Networks, Volume 38, Issue 4, pp 393-422, 2002.
- [7] F.Akyildiz lan, Su Weilian, Sankarasubramaniam Yogesh etc. A Survey on Sensor Networks 0163-6804/02 2002 IEEE.
- [8] SunPower - United States. (2019). Technology. [online] Available at: <https://us.sunpower.com/home-solar/solar-cell-technology-solutions/> [Accessed 8 Jan. 2019].
- [9] Amazon.com. (2019). [online] Available at: <https://www.amazon.com/ARDUINO-MEGA-2560-REV3A000067/dp/B0046AMGW0> [Accessed 8 Jan. 2019].
- [10] Microelectronicos.com. (2019). [online] Available at: <http://www.microelectronicos.com/datasheets/ArduinoMega2560.pdf> [Accessed 8 Jan. 2019].