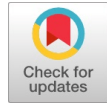


Aqua Check-Water Quality Monitoring System

Joshua Ranjith, Haritha Rajeev



Abstract: Water is essential in our life. Water has been proven to be essential for the smooth functioning of tissues, cells and organs in the human body. Water maintains body temperature, helps body to absorb nutrients, helps in moistening oxygen for breathing. Without water human body cannot function properly. Water is one of the most abundant resources on the planet, it's been estimated that over 71% of Earth is filled with water. Amongst the 71% only 1.2% is said to be drinkable or clean enough to consume. For human, we can survive without food, but without water it is not possible. Most of our metabolic activities depends on consumption of water. Drinking clean water is really important for us in order to maintain a healthy lifestyle. Apart from drinking, water can be used for carrying several domestic chores like washing, cooking, cleaning etc. Water contamination affects us in a much larger way than we anticipate. It's very important to check the quality of the water so that our health is not compromised. Water Quality can be measured by various parameters, including Temperature, Turbidity. So, we have proposed a way to test the water quality in the lively environment. The proposed system is a cost-efficient system and can be used anywhere. This helps in understanding the quality of the drinking water that we consume, and also to check if there is any contamination in the water.

Keywords: IOT, DS18820 Temperature Sensor, Turbidity Sensor, Water Quality Monitoring System.

I. INTRODUCTION

Basically, we have seen that a numerous water treatment plants were shut down due to the flow of contaminated water inside the facility. Such flow of contaminated water causes hinderance in the water treatment service. The ultimate objective of this project is to face this problem and find out an optimized and cost-efficient solution which could help us in monitoring real-time. There are many places throughout the world that require clean water. They prefer or use the water from the channels, river etc. People deserve clean water and needs to stay healthy. Due to polluted water that flows through different regions, cleanliness is a necessary requirement.

Some people throw chemicals and other wastes into the water and that water spreads to other regions. So, if it is filtered in the initial stages that won't even make a change in the environment. Several measures should be taken to preserve the water. So, it requires testing the quality of the water. Real-time monitoring allows us to check the source of contamination of the water and helps us to eradicate the cause and prevent or reduce this from happening again. Due to the increased effects of global warming, the quality of water is being affected along with all other natural resources like air and soil. Going forward with this project ensures us to develop a system that can not only monitor water, but also do that in a cost-efficient manner anywhere at any time.

II. LITERATURE REVIEW

[1] N.Kedia in his paper discusses possible cost efficient, economic and low-cost methods to monitor water quality in rural areas where technology has not been implemented at its full potential. Being in rural area, the resources available for them is far scarcer or limited as compared to urban localities. There access to technology is scarce and their knowledge regarding it is not much. The paper describes ways to integrate quality monitoring using embedded designs and sensors with involvement of government, network operators and villagers.

[2] M. Lom, O. Pribyl et al. The paper discusses an extensive smart city plan and development of an advanced industry, industry 4.0. It is a plan or an initiative to preserve and provide a quality life experience. The utilities used in such smart cities is based on technologies which offer optimized services based on intelligent systems. The key point of industry 4.0 is smart logistics with transportation. It can also be clubbed with IoT based devices to provide exceptional services. It can also include intelligent IOT based systems like air and water quality monitoring and intelligent and efficient treatment systems. Another concept is IOE, which is Internet of Energy, this describes ways to properly and efficiently use natural resources without contaminating or exhausting them.

[3] Z. Sun, C. H. Liu, C. Bisdikian et al. This paper elaborates a method to efficiently manage energy using an IOT based system. This allows us to find a satisfactory solution to management issues of energy. The energy can be conserved using lower protocols. Several instructions are fed to the sensors which are to be performed in a given time frame. To obtain longer statistics within the service limits, energy management is performed dynamically. Certain algorithms were tried and simulations were performed in this study to check which one provides the most accurate results.

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[4] Varsha Lakshmikantha, Anjitha Hiriyanagowda et al. This paper discusses about the pollution of water and that causes a main threat in the environment as the drinkable water gets mixed with pollutants. This causes diseases to the animals as well to the human beings. It even creates an impact on the life cycle of ecosystem. It can be prevented if it is detected early, there are several ways to measure the quality of water by doing that we could create or at-least know whether the water is clear or not.

To ensure that the water is clear or not it should be monitored real-time. In this evolving environment there are several ways for measuring the water, latest sensors are improving day by day in recent times. The innovation of new sensors, technology, Internet of Things(IoT) technology. The article ensures that implementing smart water pollution monitoring will be useful in testing them. It ensures cost reduced IoT based monitoring system to monitor water quality. If it follows all the guidelines then it can be done in any environment. Even the samples can be uploaded into the Cloud server and can be used efficiently.

[5] Sathish Pasika, Sai Teja Gandla et al. The article talks about how current developments in the area of sensor and network focuses on Internet of Things (IoT) to develop and extend its capability to environmental issues. Water is an important resource in our life. So, it is important to ensure the quality of water and there are several mechanisms to find it out. Nearly 40% of death caused from contaminated water, hence it is necessary to ensure the water quality as it is very important to sustain. In the village areas they are not getting proper water, the water they get are very polluted. So, it is very important to ensure or to implement water quality monitoring system. It can also be implemented in rural areas, cities, as well in villages. The system developed to ensure the water quality contains various sensors to measure parameters such as pH value, turbidity in the water, temperature and humidity in the atmosphere. The microcontroller used here will be Arduino UNO and further proceeding will be performed on the system. Then output is then sent to cloud to the monitor quality of the water.

[6] N. R. Moparathi, C. Mukesh et al. This article talks about the problem of water pollution and the drastic increase over the past years. The water from lakes, waterways and wellsprings have been polluted from last couple of years. The pollution and contamination in the water make people sick and causes damage to the animals and birds and also to the environment. The goal is to measure the quality of water by measuring the temperature, turbidity, dissolved oxygen as well as pH level. It can be clubbed with corporate water taps and tanks and can also be implemented to drinking water reservoir. For that the microcontroller used will be Arduino UNO for finding the values and GSM module for message techniques. There will be LCD display for observation of the water parameters. For the user to get message of the values of the water, we extend this by sending data to the cloud for global monitoring of water.

[7] Demian da Silveira Barcellos, Fábio Teodoro de Souza, et al. The article talks about challenges and problems for monitoring the water quality. There are many approaches to optimize water quality, few investigations are been tested with data mining. It introduces data-driven prototype for reducing several type for measurement information of the

monitoring area based on data mining. The main focus is to replicate several features from the database and are measured according to the automated probes calculated in the laboratory. This helps in replicating different samples measured using automatic probes, estimated in laboratory. This approach has been applied for over 35 monitoring stations around the world with 27 rivers in Southern America. The database from (1971-2021) shows the 6328 observations investigated over different environmental contexts. The results shows that the goal is innovative and can be decreased by the frequency calculated in the lab and can be used to widen the coverage around the world.

[8] Birui Jin, Zedong Li, Guoxu Zhao, Jingcheng Ji, Jie Chen, et al. In this article it explains about the significance of human health and water that is an important part to show how it affects us. Usually for checking the quality of water we might go to laboratory and that well-equipped lab will be prior to time, number of peoples and are very costly. In that the implementation is rapid, sensitive. So, we could implement a gadget for measuring and to ensure monitoring in every aspect. Moreover, the detection can be applied to health monitoring.

[9] Figene Ahmedi, Lule Ahmedi, et al. This article talks about the data that was collected from the WaterSense project with WSN that was installed in Serbia for remotely monitoring water and used as a case study. This can also be expanded to all water surfaces throughout the world as an extension for quality assurance. The data can be acquired for monitoring using advanced sensors as a part of cloud-based sensor that connects wirelessly throughout the country. It can also be broadcasted through GPRS wirelessly to server machines in the premises. The received data from the sensor will be in real-time and will be stored in MySQL server.

[10] John F. Orwin, Farley Klotz, Nadine Taube, et al. This one talks about the climatic induced changes in the ongoing scenarios for land and water facilities in the world. Some new methods to adapt to the existing system. The WQM network will be combined to the network and will connect the connection to the water quality data into the system. This approach helps us to assess other WQM for data records. This helps to overcome the difficulty in watching over the samples and the structured data assures the data is correctly monitored and are been noted or saved into the database.

III. NEED OF THE STUDY

Even though the estimation of coverage of water on Earth is 71%, only a small portion of this percentage can be consumable like if its is 1.2% drinkable then due to pollution we cannot consider that 1.2% also. Considering why we need this study, we know that quality of water is an important factor for its consumption for that we need to test it and presently there are many existing system for this but they are very complex as they are in a very large scale system, with complicated methodology, long waiting time for results that may take up weeks and also requires vey high power and high maintenance cost.

The proposed system in this study is suitable for a smaller system as smaller systems help to analyze things differently in a way that may not be possible with a larger system. This proposed system is portable and has easier methodology with faster results and easy maintenance with low power and low maintenance cost that helps in real time monitoring by checking the quality using physical, chemical and biological characteristics, for example effect of temperature on turbidity and vice versa like, high temperature can cause increased growth of bacteria's and algae which increases turbidity that will cause thermal gradients as an effect of varied or decreased thermal distribution and analyzing this will help to identify potential source of pollution and we can optimize water management strategies.

IV. SCOPE OF THE STUDY

The main scope of this study is to present a foundational basics for water quality monitoring and to provide an innovative cost effective solution with the potential to contribute to improved water quality measurement practices and basic ideas regarding it for further understanding for common people with scope to expand it with additional complicated sensors and parameters to use in the future, as the future of this study is going to be very vast and demanding because good quality water is one of the main basic needs for humans and it is not available to many. Good quality water is everyone's right and in future we will be having more advanced versions using advanced technologies.

V. OBJECTIVE OF THE STUDY

The main objective of the project is to make a simple IoT based water quality monitoring system using Arduino Uno along with sensors for turbidity and temperature measurement that can provide potential water management practices by identifying potential issues with the water and to help implement a low cost, efficient, and smaller system with easy methodologies and implementations without any complexities along with easy maintenance and very low power consumption making the system easy to handle and use with faster outcomes and enabling real time monitoring and collecting data for further analyzation and it is affordable to all.

VI. METHODOLOGY

For this project we have generic components and each of them needs to be assembled accordingly. The microcontroller used in this project is Arduino UNO. There are mainly 2 sensors DS18820 Temperature Sensor, Turbidity Sensor along with 16x2 LCD display. These 2 sensors are faced each other to the Arduino UNO, it helps in real time monitoring and management of water quality by continuously collecting data and analyzing it. It gives the Temperature level and Turbidity level. The Arduino collects the measurements of the data continuously, and the output will be displayed in the LCD Screen.

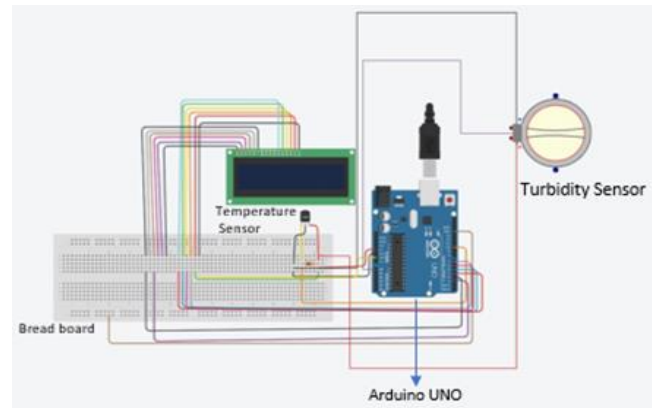


Fig. 1. Schematic Diagram of Aqua check

A. Temperature Sensor

The temperature parameter can affect the aquatic ecosystem. Health and survival of aquatic organisms, physical and chemical water properties can get impacted by water temperature. Temperature sensors can provide continuous readings that can be used to identify thermal stratification and optimize conditions for aquatic life or industrial processes and it can be also used to track changes over time. The purpose of Temperature Sensor can be of identifying or checking the temperature of the water. While it is dipped in water, the value will be shown or displayed in the LCD Screen. The value will be shown in Degree Celsius. There is also a Resistor connected in order to get the exact values.

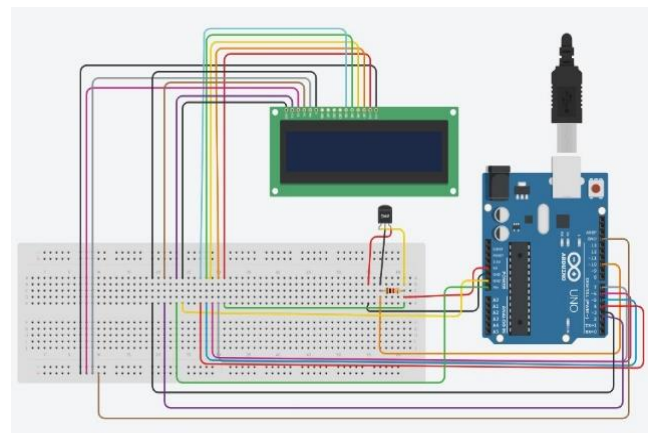


Fig. 2. Wiring Diagram of Temperature Sensor

B. Turbidity Sensor

Turbidity is used to find or to detect the level of Turbidity that are present in the water. Turbidity Sensor comes with modules and are of 3 parts. A waterproof lead, a driver circuit, connecting wire. It consists of transmitter and receiver with a probe that can be used for testing. It helps in detecting level of suspended particles as well turbidity in the water. The values while dipping the sensor into the water will be shown in the Arduino and the output will be shown in the LCD screen. Turbidity measures the suspended particles like sediments, algae or any other pollutants. It can detect the amount of light scattered or absorbed by these particles which can be correlated with the level of turbidity, it can also be combined with other parameters.

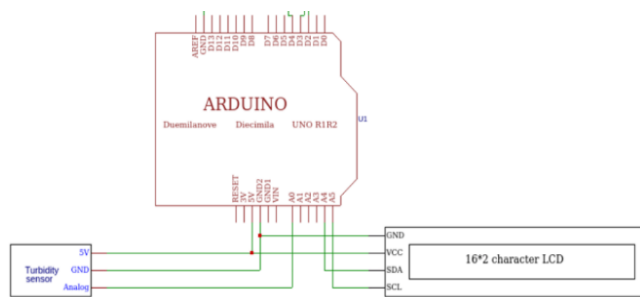


Fig. 3. Circuit Diagram of Turbidity Sensor

VII. WORKING

The hardware connection consists of Arduino UNO, Temperature Sensor, Turbidity Sensor and the output will be displayed in the LCD Screen. The sensors are connected in the Arduino UNO and the output will be displayed in real-time in the screen. Temperature sensor will show the temperature of the water, the Turbidity sensor will show the turbidity and levels of suspended particles in the water. Both sensors send the data to the Arduino board, which processes the information and displays the results on the display module. Turbidity is measured in Nephelometric turbidity units (NTU). Calibration process is used to ensure accurate readings by immersing sensors in distilled water and their values are used as references. The system can be used for monitoring water in various settings.

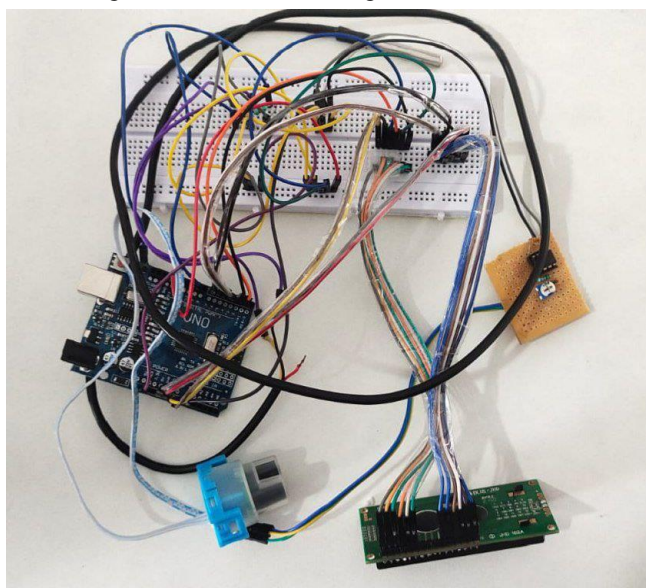


Fig.4. Prototype of Aqua Check

VIII. CONCLUSION

This is a simple project that contributes towards new possibilities of water quality monitoring even with some limitations using technologies like Internet of things and sensors. The main motive is to develop a system using Arduino Uno which ensures real time monitoring. It ensures the water quality by detecting amount of pollution that are seen in the water with the help of sensors in identifying the water quality and its purity. It assures the quality of the water in a cost-efficient way making this system a very simple and easy to manage, understand, operate with very low maintenance cost without any complex mechanisms.

DECLARATION

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Conflicts of Interest/ Competing Interests	No conflicts of interest to the best of our knowledge.
Ethical Approval and Consent to Participate	No, the article does not require ethical approval and consent to participate with evidence.
Availability of Data and Material/ Data Access Statement	Not relevant as there is no quantitative data used in this article.
Authors Contributions	Authors 01 is the main contributor and Author 02 is the project guide.

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AUTHORS PROFILE



outside the box, he loves to solve problems and has been keenly observing the latest technology.

Joshua Ranjith, currently pursuing Master of Science in Computer Science from the prestigious St. Albert's College (Autonomous), Ernakulam. Prior to this he had completed his Bachelor of Science degree in Computer Science from KMM College, Ernakulam. His area of interests includes prominent fields like IoT, Networking, Cyber Security. He is given attention to details as well as he is able to think



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