Water Disease Prediction Device

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Abstract **- This paper is basically based on the prediction of water diseases thus improving the liability of water and using the resource in a healthy manner. To do this we are using multiple sensors to measure the different parameters present in the water, the multiple sensors include pH sensor, turbidity sensor, and oxidation sensor. This will not only help us to improve the liability of the resource that we use daily but also prevent further chances of diseases. Here different sensors will work according to their respective functions. We are taking the analog input from the sensors and passing it to the system to examine the grade of water and detect the disease which we are going to find with the help of the dataset and prevent them at the initial stage. We are using Machine Learning techniques to develop and predict water quality. With the help of advanced technology, it is easy and fast to predict disease and inform the organization or user. As the amount of data keeps growing, an algorithm will become more accurate and predict faster. Different technologies like IoT and AI are used to build this project and predict the accurate output so it can be widely used.**

Index Terms **- Sensors, IoT, Drinking water chemistry indicators, Water Disease classification, Dataset, Machine learning.**

I.INTRODUCTION

In most parts of the world, availability of drinking water is a major problem in the world. Over 1 billion people do not have access to drinking water. Several factors like calcium can affect the water quality that exists in water sources like industrial waste, rocks, and sewage that leads to lower quality of water. The hard water is responsible for many of the diseases causing chronic and various other serious diseases. Water contaminators reached the groundwater sources. Ultimately, faster water quality testing techniques are needed to test and evaluate the water quality. This will help us in ensuring the water protection from water contamination and achieving quality water.

This is developed keeping in mind our most common resources i.e., water, we are developing this project for avoiding diseases that can easily affect mankind thus making it a very important subject to be remembered. The basic idea behind this project is to provide a healthy lifestyle by filtering out the contaminated particles present in it thus making it a healthy resource, by using the latest technology and fixing it at an early stage. This will also help us to understand the important statistics that can be more useful for further references. It must be predicted before it's been used for our daily routines, this project will help us knowing the diseases and preventing it from further problems that can occur through these diseases. Through this, we can deliver safe water to everyone, as we know water is the main natural resource for our society and it should be safe and healthy. Not only Industrial members but the domestic members can also use this device to identify the quality of water.

As water is a natural source that is used regularly, and it has to be tested at frequent time intervals. This project will not only check the water quality, but it will also be aware of the upcoming diseases which can be caused. This project will work on detecting harmful diseases at an early stage thus maintaining a healthy lifestyle. As we are using machine learning and advanced technology as a source thus it will be easy for users to find diseases thus saving time and increasing time efficiency. As the system will detect the diseases at an early stage thus there will be no need to have a special device required to check the parameters thus leading to the conclusion. It will be beneficial for most of the rural areas where there are boring water supplies or underground water which can lead to contamination of water leading to several fatal diseases.

II. LITERATURE SURVEY

Ming Yang et al [1] In this project water samples are collected from 21 sites. These samples are examined in the lab using various chemical methods thus concluding to the results. The results have revealed that rotavirus amplicons have a positive control and

thus environmental water samples can be noticed as a specific band in agarose gel thus after electrophoresis, which also suggested that virus particles are recovered from water samples using sodium chloride aluminum chloride precipitation method, and also using the RT nest PCR method it was effective to detect the rotavirus present in water samples.

Mohan Krishna Varma N et al [2] UWASN known as Underwater acoustic sensor network that can collect the ocean, river, lake data's such as salinity, temperature, pH, turbidity and also dissolved oxygen present in the water supplies. In this paper, they are adding pre-processing and rule-based engine functionalities to the underwater surface gateway thus to send the warning message to the local healthcare center. Government healthcare centers receive the data from the underwater surface gateway via the internet and the equivalent data can be observed using big data analysis for water-borne disease management.

S. Jayalakshmi et al [3] The main goal of this paper is to recognize the grade of water using the internet of things. Here executing a system for monitoring the water value through instruments – TDS meter, DC motor, LM35 temperature sensor, GSM. Microcontroller Avenue is the significance that is checked by using sensors. The retrieved data is gathered in the centralized database server. If the water value is below the TDS meter values, a warning message is sent to owners using GSM. The atmosphere can have adjustable good water. In this paper, the water worth is checked using the Total Dissolved Solids sensor and also the motor temperature using the LM35 sensor.

Asma Al Khaili et al [4] In this proposed work, a system is projected to remotely sense, record, and describe the worth of drinking water kept in residential tanks. Various different devices are used to calculate the pH, turbidity, dissolved oxygen, and temperature values present in the water. Three separate temperature sensors are used to check the temperature of the water, and also temperature inside and outside the tank were checked. The system sends warning messages to the landowner and the local establishments (if they set), when one of the values is lower than the normal values.

Ms. Ch. Sowmya et al [5] The main objective of this project is to examine the quality of the water in the overhead tanks simultaneously with help of using the three measuring devices like pH, conductivity, and temperature sensors. Application of Wireless Sensor Network technology is used for examination of instantaneous water quality. In this proposed work, system design and implementation of WSN is presented in detail. WSN for water quality checking the collected amount of sensor nodes with ability of networking, which is deployed at various overhead tanks and water bodies in a particular surrounding.

L. Nirmala Devi et al [6] In this paper, they used three sensors, microcontroller and GPRS module. Data collected by the device sent to a centralized system. Which monitors all received data from the servers. The used sensors are pH, turbidity and temperature.

Yafra Khan et al [7] In this paper, they used artificial neural network and time series analysis. They took data from the United States Geological Survey. Four indexes are used for ensuring the quality of water. It analyzes the Dissolved Oxygen, Chlorophyll, Specific Conductance and Turbidity.

Jun Li et al [8] In this paper, they used artificial neural networks to calculate the number of people affected by Kaschin-Beck disease in Sichuan district. The method used in this named "trial and error". This model uses the MATLAB library to calculate the affected number of people. It shows the relation between drinking water and Kaschin-Beck disease.

Hadi Mohammed et al [9] This paper consists of an Adaptive Neuro-Fuzzy Inference System which is initiated, for projection of the total number of Norovirus contents in untreated surface water in terms of water grade parameters such as water pH, turbidity, conductivity, temperature, and rain. This ANFIS model integrates in a transparent manner the semantic representations of fuzzy logic and the learning abilities of artificial neural networks. It also provides an automatic rule creation and parameter optimization procedure that clarifies the complicated process of model evolution and finally creates a transparent solution that is anticipated to offer meaningful insights into the physical processes intricated or the resultant modeling mechanisms. It is based on the research of untreated water samples from the Nedre Romerike water plant.

Sankhadeep Chatterjee et al [10] In this paper, an artificial neural network uses a multi-objective genetic algorithm to improve the performance. The data is collected from near the Hooghly river from different municipal areas. In this paper the accuracy of the algorithm is increased considering the previous

technologies used. As the water quality accuracy has been increased it has been predicted up to 97.22% accuracy.

III. PROBLEM DEFINITION

To predict water diseases using a hardware device that will measure the quality with the help of AI and thus eliminate them at an early stage, thus providing reliable quality of water.

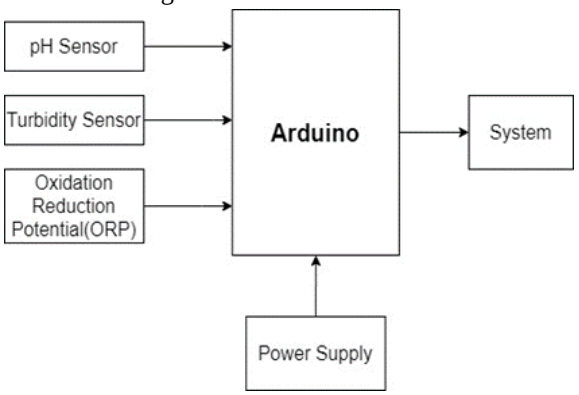
IV. PROPOSED WORK

Water Quality Classification Module:

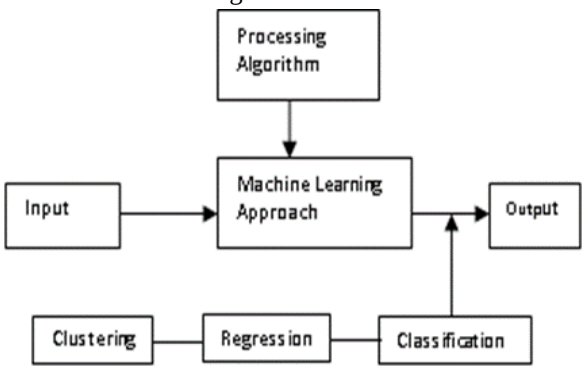
This project will help to predict water diseases thus avoiding contamination of water and using the resource in a healthy way. Thus, to implement these multiple sensors will be used to predict and avoid the nature of diseases that can occur, here we will use multiple sensors including pH sensor, turbidity sensor, oxidation sensor, conductivity sensor. Here different sensors will work accordingly, the pH sensor will provide us with acidic and non-acidic data to our machine, Turbidity sensors compute the total light that is scattered by the suspended objects in the water. As the sum of total suspended objects in water rises, the water's turbidity level increases, Oxidation-reduction potential measures the ability of water to clean itself or breaks into waste products. There is a lot of oxygen present when the ORP value is high in the water. Here we are taking the analog input from the sensors and passing it to the system to examine the grade of water and detect the disease which we are going to find with the help of the different water quality datasets and prevent them at the initial stage. In this advanced technology used while building the system such as AI, IoT will be used to predict water quality.

Flow Diagram:

1. The first step is to collect water-related data with the help of sensors like pH, Turbidity, and Oxidation-Reduction Potential (ORP), thus collected data will be processed to the system.
2. We will train and test the data, for that we need an accurate dataset, (Water quality-related dataset is easily available on any health-related website like WHO or government websites or find it on Kaggle).
3. After training and testing of data, we are using different machine learning algorithm techniques for analysis of data. (Vector machine, regression, gradient boosting classifier, and many more algorithms).
4. The system output data will be processed and driven to the user/organization.
5. Lastly, the device will be able to conclude the output implementing advanced algorithms thus using python as source programming language.
6. Block Diagram of Water Prediction Module.



7. Software working module.



Software Libraries:

1. Python - Python is a language, which can do complex machine learning tasks and thus it can help you to build prototypes thus allowing you to examine the product for machine learning purposes.
2. Arduino IDE - The Arduino Software makes things easy to understand and execute code and thus to upload it to the board itself.
3. Keras - Keras is a kind of neural network which is executed in Python. It can run on TensorFlow and many other Toolkits.
4. TensorFlow - TensorFlow is a free open-source software library for dataflow and also differentiable programming across a number of tasks.

5. Sklearn - Scikit learn is a software machine learning library for Python. It has various regression, clustering algorithms also including the help for vector machines, etc.
6. Matplotlib - Matplotlib is known as a plotting library for Python and it has its numerical mathematics extension known as NumPy.
7. Pandas - Pandas is a software which is executed on Python for data manipulation purposes.

Hardware:

1. Arduino and Arduino Shields - Arduino is a type of microcontroller board, which is open source based on the ATmega328P. The board also has a set of digital, analog input and output pins. An Arduino shield is a board that can be attached on top of the Arduino board panel. Shield pins are placed into the sockets of the Arduino board. Arduino is an Open-Source Hardware which is low cost.
2. pH Sensor - A pH sensor is a helpful tool which is useful for water measurements scenarios. The pH sensor is helpful to measure the amount of alkalinity and acidity present in water and also if any other solutions.
3. Turbidity Sensor - Turbidity sensors are used to measure the amount of light scattered by the suspended solids present in water. If the amount of total suspended solids in water increases, the amount water's turbidity level also increases.
4. ORP sensors - Oxidation-reduction potential measures the ability of water to clean itself or breaks into waste products. There is a lot of oxygen present when the ORP value is high in the water.

V. CONCLUSION

Water quality directly disturbs the health and economy of any region. It is very significant to ensure a safe drinking water supply to recollect good public health. Therefore, the exact calculation of water quality becomes a challenge. The prediction model accurateness is important so that no misleading outcomes ensue. Thus, it’s very possible to predict water diseases by avoiding any harmful chemicals coming in contact.

VI. FUTURE SCOPE

1. This project can have more positive outcomes in the future as well, currently the project is being developed using IoT devices, we can further build a system which can analyze using software as an inbuilt functionality in a system which will reduce the complexity for processing.
2. Further, as the project is using integrated sensors it can be modified using a single sensor thus reducing hardware complexity and thus reducing further immense cost.
3. This project will only identify diseases through the system thus which can be further modified to an android application for effortless accessibility.
4. As the water has 3 forms of liquid, gas and solid we are currently building on a liquid-based form which can be further upgraded to work on solid form as well.

VI. ACKNOWLEDGMENT

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