Water Quality Monitoring Using MQTT Algorithm with IoT

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Abstract- Degradation of water resources has become a common problem. The conventional methods of water quality monitoring involve the manual collection of water sample from different locations. These water samples were tested in the laboratory using rigorous skills. Such approaches are time consuming and no longer considered to be efficient. The older method of water quality detection was time consuming, low precision and costly. By focusing on the above issues, a low cost water quality monitoring system is developed and designed that can monitor water quality in real time using IOT. In the proposed system water quality parameters are measured by different sensors such as pH, temperature and dissolved oxygen for communicating data onto a platform via microcontroller system. So in order to meet all these requirements, other technologies can be used such as MQTT (Message Queuing Telemetry Transport) which allows publishing and subscribing of data between the sensor and end device. And with the help of MQTT algorithm there will be simultaneous flow of data between the sensors and the servers.
Keywords: MQTT, Raspberry Pi, Naive Bayes' theorem, Arduino, Internet of Things (IOT) etc.

1. INTRODUCTION

Since the time IOT has advanced a ton of issues have been fathomed in this world. By utilizing IOT in this water quality checking framework different issues, for example, correspondence, information gathering, information investigation, and early alerts have been taken a shot at. Be that as it may, so as to get this into picture, advances and conventions are consolidated to get the ideal yield. Here the utilization of MQTT makes the entire method quick and solid.

1.1. *Purpose*

The principle reason for utilizing IOT way to deal with screen water quality utilizing MQTT calculation is to build up a framework which gives the end client a helpful information utilized. Expectedly, the water tests are gathered from better places and tried thoroughly by researchers in the lab utilizing numerous systems to decide the water quality. In this manner more seasoned techniques were tedious procedure however at this point the IOT can possibly modernize the water generation, as increasingly more of its innovation is associated with the web. This IOT approach is obviously better than ordinary techniques since it is cost cordial, quicker and simple to utilize.

1.2 Background

he parameters for testing the water quality are checked with the assistance of GSM (Global Messaging Service) innovation yet there are different confinements to this innovation. Most importantly by

utilizing GSM over all improvement cost increments. Not just this, GSM faces security issues too since the client personality.

Privacy is disregarded by transmitting the personalities in unprotected structure. Amid the transmission of information, it is sent in a steady progression which makes a buzz and deferral in transmission. Anyway the information transmission ought to be concurrent, quick and secure. So as opposed to utilizing GSM arrange or some other innovation, MQTT calculation will be executed so as to make the framework possible, secluded, scalar and cost proficient. Not exclusively will this, with the assistance of MQTT calculation there will be synchronous stream of information between the sensors and server.

1.3 Method of investigation

So as to meet the prerequisites for building up the framework some work has been done preceding accomplish the ideal outcome. The framework made before use sensors to assemble data with respect to the water parameters. After that the data accumulated was sent to raspberry pi, through which it was shown to the PC or any gadgets. After investigation of the information acquired, the correspondence part was done with the utilization of GSM innovation. This framework was useful however had constraints also, for

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example, costly, no continuous information could be created and security issues.

1.4 Scope

To beat these restrictions, changes are done in this framework with the assistance of IOT, another water checking framework is created in which all the water parameters are examined utilizing sensors. After that the valuable information will be sent to the end client through MQTT calculation. MQTT makes the correspondence and transmission of information solid and fluff free. Aside from this it makes the framework cost inviting as the general expense of the framework diminishes. The principle favorable position of utilizing the MQTT is that there will be synchronous stream of information between the sensors and the server. In this manner settling on it a perfect decision as far as network.

2. CHALLENGES

There are basically three common challenges this system faces they are security, sensor network and the communication.

2.1. Security

Security is a fundamental factor for any framework. Security at both the gadget and system level is basic to the task of IOT.

a. Secure booting: When control is first acquainted with the gadget, the credibility and honesty of programming on the gadget is checked utilizing cryptographically produced computerized marks.

b. Access control: Next the diverse type of asset and access control are connected. Required or fold based access control incorporated with the working framework limit the benefits of gadget segments and applications so they get to just the assets they have to carry out their responsibilities. In the event that any segment is undermined, get to control guarantees that the gatecrasher has a negligible access to different pieces of the framework as could be allowed. c. Gadget verification: When the gadget is connected to the system, it ought to validate itself before getting or transmitting information. Profoundly inserted gadget regularly don't have clients sitting behind consoles, holding on to include the accreditations required to get to the system.

Sensor Network

A sensor arrange involves gatherings of modest, normally battery fueled gadgets and remote framework that screen and record conditions in any number of situations from the manufacturing plant floor to the server farm to a clinic lab and even out in nature. The sensor arrange interfaces with the web, a venture WAN or LAN, or a specific mechanical system so gathered information can be transmitted to back end frameworks for examination and utilized in applications.

Communication

Wireless communication system is the essential part of the IOT infrastructure, which acts as a bridge for dual directional communication for data collection and control message delivery. It can be applied to various IOT applications including mission critical industries, such as power grid, oil field and cases in our routine life like the smart city we summarize the common challenges and issues on wireless communication for IOT applications.

- Huge volume of sensors with varied types and distributed sites need to be connected, managed and maintained.
- High reliable communication will be required under the environment with lot of interfaces.
- Available spectrum resources will be very limited for new IOT wireless network.
- For harsh outdoor area, low power consumption and simple architecture will be required

3. METHODOLOGY

The first task is to determine which water parameter would provide a close indication of water pollution. Through extensive research the parameter are chosen to be composed of pH, dissolved oxygen and temperature.

- The second step is selection of locales that will provide useful data. The location were narrowed down to industrial areas, sewer waste openings and city lines where human interference has a considerable impact. Various sensors were installed at such locations for testing.
- The third step is to transmit the data from the sensor on to the Arduino kit for further processing.
- The transmission of data obtained is done the next step, from where MQTT comes in the picture. With the help of MQTT along with raspberry pi, the information obtained is passed onto the server and the end user.
- Finally data analysis is done on the acquired data set using Nave Bayes' algorithm with the help of which the desired information is obtained.

4. NAIVE BAYES' THEOREM

- In order to analyze the data obtained from the sensors to the MQTT, Naïve Bayes' theorem is used. Here with the help of this classifier, a particular or combined parameter of water quality is checked unrelated to the other attributes or it can be said that

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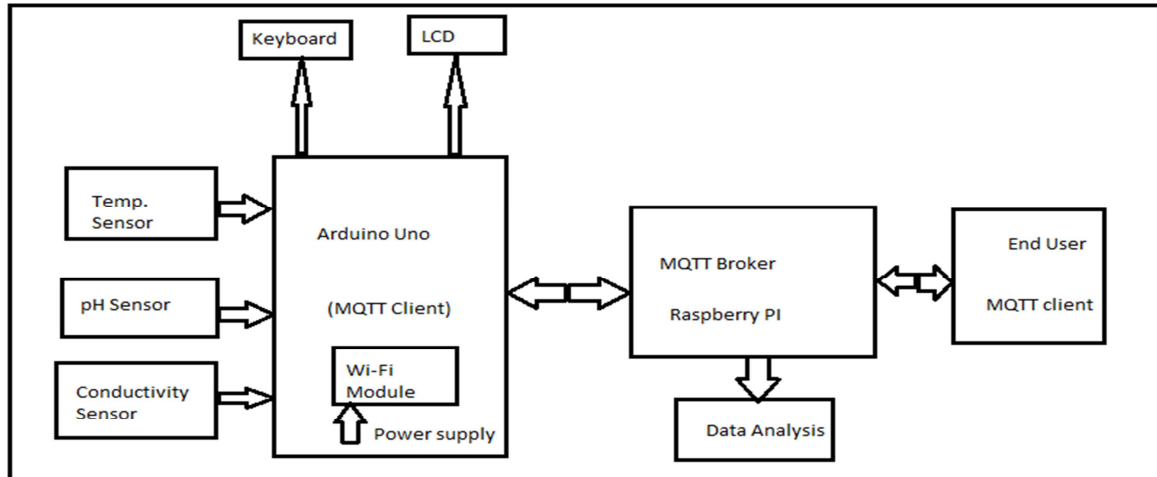
every feature being classified is independent of the

Fig. 1. Block Diagram

value of any other feature. In simpler word the Naïve Bayes' Theorem can be formulated as: P(a/b)= { P(b/a)P(a)} / P(b).

5. CONCLUSION

Figures are to be embedded in the content closest their first During the transmission of information, it is sent in a steady progression which makes a buzz and deferral in transmission. Anyway the information transmission ought be synchronous, quicker and secure. So as to meet every one of these prerequisites, different advances can be utilized, for example, MQTT (Message Queuing Telemetry Transport). Rather than utilizing GSM organize or some other innovation, MQTT calculation will be actualized to make the framework achievable, particular, scalar and cost proficient alongside this it makes correspondence of information among sensors and servers at the same time stream. A lot of information can be sent without confronting any obstacle. In future the framework can be executed on the bigger scale with the assistance of accessibility of different assets. Other water quality deciding sensors can be utilized for investigation of progressively exact and precise information.

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