

IoT based Industrial Water Quality Monitoring System

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Abstract - Nowadays in different area of research for monitoring, collecting and analysis data from remote locations, Internet of Things (IoT). Due to the major increase in global industrial output, change from rural to urban and the over-utilization of land and sea resources, the quality of water available to people has deteriorated greatly. The highly increased usage of chemicals in farm, mining and construction sector became major contributor for water quality degradation. The IoT based industrial water quality monitoring system will majorly focus on the following water parameters for analysis; Potential Hydrogen (pH), turbidity, temperature using IoT technology. While monitoring these parameters, it is perceived that one should receive a stable set of results. Therefore a continuous series of anomalous measurements would indicate the potential introduction of a water pollutant and the user will be notified of this activity with the aid of IoT technology. The locations were narrowed down to industrial areas, sewer waste openings and city lines where human interference had a considerable impact. Form of data logging would produce an acceptable format application. The final step was to decide on an acceptable, proficient and accurate form of analysis. The System is validated to enable these sensor nodes to make decisions and trigger alarms when anomalies are detected.

Key Words: IoT, Potential Hydrogen, turbidity, data logging, proficient, anomalies.

1. INTRODUCTION

In the 21st century, there were lots of inventions, but at the same time were pollutions, global warming and so on are being formed, because of this there is pollution at great extent in every aspects of natural resources. Majorly when we consider water pollution, the effect can be observed on the water resources as such river, lake, ocean, sea water. When we consider other forms such as air pollution, noise, soil pollution, they have their own different aspects. The basic idea lies for the pollution control actions is how to reduce the pollution of renewable resources. Although it is seen as we cannot take actions regarding total eradication of pollution as it's another effect of vast industrial and infrastructural development. The idea need to think over how to make efforts in order to minimize the impact of pollution on human lives and natural habitat.

1.1 Motivation

The Internet of Things (IoT) is a revolutionary new concept that has the potential to turn virtually anything "smart". The challenging task is to work with the controller and interfacing with sensor based hardware. To understand how this revolution took shape we have to travel back to the 1900's with a profound prediction from a well renowned inventor Nicolai Tesla in which he stated that the world will be wirelessly connected to a single brain. The utility and revolutionary technology motivated us to design our project idea. The need for water quality measurement is superior as per environmental aspects are considered. Hence for that purpose a cloud based embedded solution is developed to help in monitoring data in real time providing a fast and effective reaction in case of rising abnormalities.

2. OBJECTIVE

The basic idea for IOT based water quality monitoring system is the remote sensing technique. These implements the approach by using the pH sensor, Turbidity sensor so as to get the Analog values for water contaminates. Further we can add more sensor elements for the specific application. Motive is to design a web page designing along with the location of industry where the project module is being used. Thus it will help to locate which industry is drowning waste water with unreliable level of water parameters.

3. WATER PARAMETERS

The water parameters we are going to focus are pH, turbidity and temperature measurement-

pH measurement-PH is a measure of acidity or alkalinity of a solution, the pH scale ranges from 0 to 14. The pH indicates the concentration of hydrogen [H] + ions present in certain solutions. Voltage and pH relation. The pH of pure water is 7.

Turbidity measurement-Turbidity is a measure of the degree to which the water loses its transparency due to the presence of suspended particulates. The more total suspended solids in the water, the murkier it seems and the higher the turbidity.

4. METHODOLOGY

Block diagram shown above is a basic working block diagrams for the overall idea of the project design. Motive of the project is to implement it with the prototype for industrial waste water quality with real time monitoring.

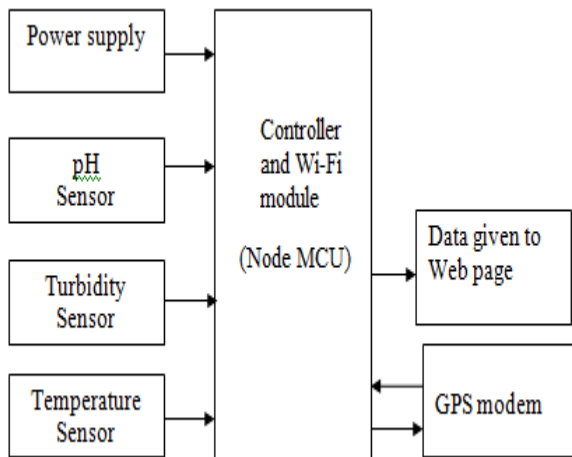


Fig -1: Block Diagram

5. SYSTEM OVERVIEW

The flow chart shown is exact steps for performance of the project we are going to design. The process for input parameter collection is done through the sensor modules namely the three as pH sensor, turbidity sensor and temperature sensor. After conversion of analog output values from sensors into digital ones they are given to Node MCU board. The information about these parameters is sent over internet from the project module to the web page or desired PC location with the help of GPS module. From where we can get the current and exact parameter values at any time, as the system is real time and operating with the help of IoT aid technology. Simultaneously we are checking the parameter levels such that if the values sent over the web page are not in required range then SMS will be sent to source industry.

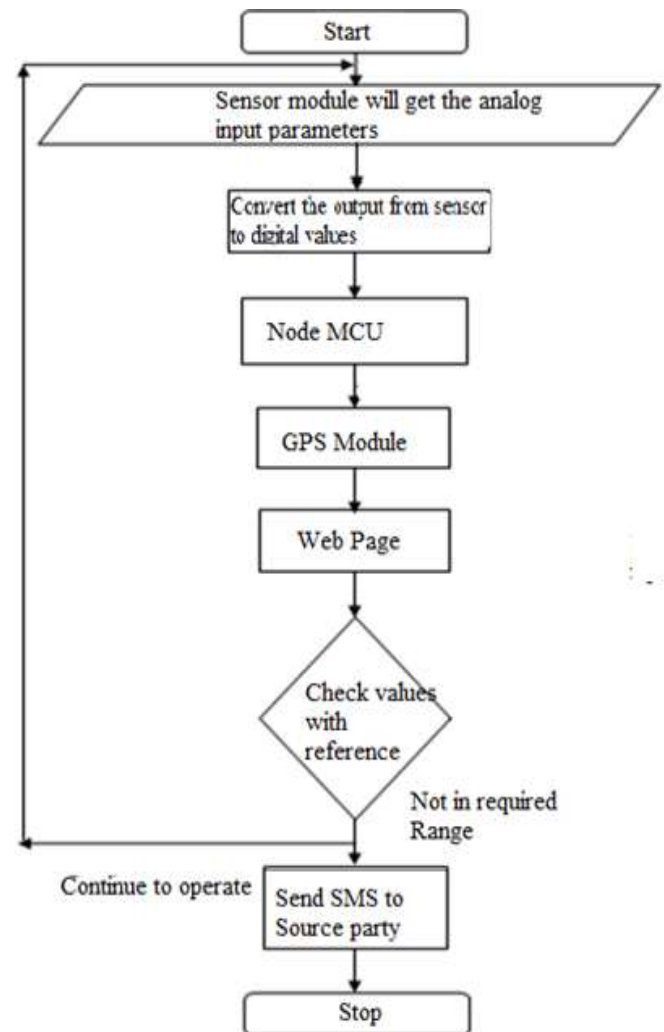


Fig -2: Flow chart

6. SYSTEM ARCHITECTURE

Taking about the proposed system, we have implemented the system with following important elements-

6.1 Sensors

- pH sensor



Fig -3: pH sensor

The principle of this sensor is to measure the concentration of Hydrogen ions in the water. The alkaline and basic water classification is possible with the help of this sensor. We

proposed system to measure acid, base and normal water samples.

- **Turbidity Sensor**



Fig -4: Turbidity sensor

Turbidity refers to the haziness of a fluid caused by the increased number of very tiny particles which, individually, is invisible to us. Moreover, turbidity measurement is based on the concept of Tyndall effect. TSD-10 module sensor we have used.

- **Temperature Sensor**



Fig -5: Temperature sensor

This is a pre-wired and waterproofed version of the DS18B20 sensor. Useful when you need to measure something far away, or in wet conditions.

6.2 Node MCU



Fig -5: Node MCU module

Node MCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SOC from Espressif Systems, and hardware which is based on the ESP-12 module. The term “Node MCU” by default refers to the firmware rather than the DevKit. The firmware uses C language. The advantage to select this component is we don't require separate controller to program the system.

6.3 SIM28 GPS



Fig -6: SIM28 GPS Module

The module provides complete signal processing from antenna input to host port. The module requires 2.8V~4.3V power supply. The host port is configurable to UART. Host data and I/O signal levels are 2.85V CMOS compatible.

7. HOW DOES THE SYSTEM WORK?

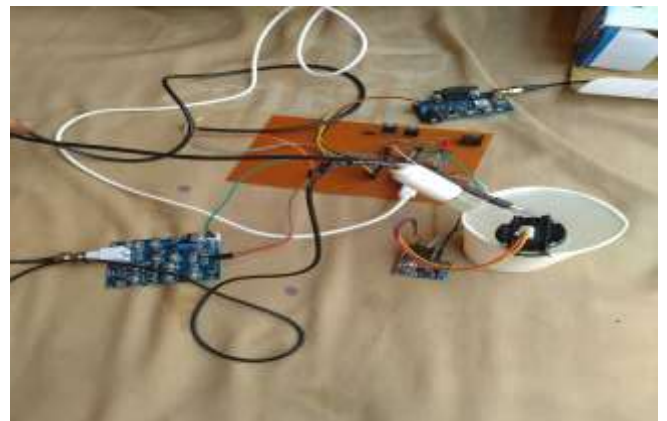


Fig -7: Project Prototype

The above shown prototype to measure water parameters with the help of interfaced sensors. The measured values are sent to Webpage over internet. One can review those values at any time by visiting the web address. The web page gets updated after every 2 second. Thus one can get exact and instantaneous values for pH, Turbidity and Temperature. The module location can be retrieved from the Location map shown in below.



Fig -8: Web Page Results

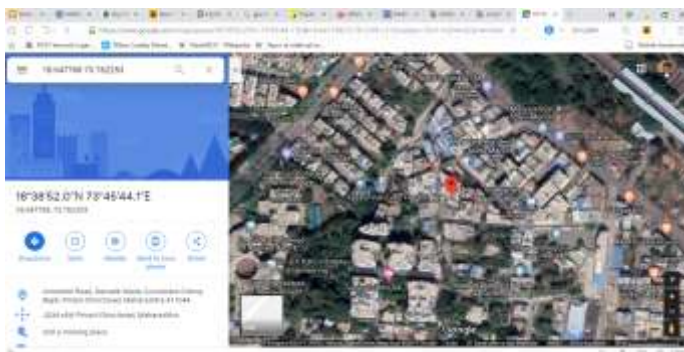


Fig -9: Location on Map

3. CONCLUSION

In this paper, a prototype water monitoring system using IoT is presented. For this some sensors are used. The collected data from the all the sensors are used for analysis purpose for better solution of water problems. The data is sends to the cloud server via Node MCU. So this application will be the best challenger in real time monitoring & control system. This system is beneficial for Pollution Control department in India such that they can monitor the different industrial water outlets to their nearby water resources which eventually reduced human efforts and implements remote sensing mechanism.

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