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CSE 4015

DIGITAL ASSIGNMENT - II

DEVELOPMENT OF WATER QUALITY MONITORING SYSTEM

BASED ON

WIRELESS SENSOR NETWORK

UNDER THE GUIDANCE OF

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Slot: C2+TC2

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1. ABSTRACT

This paper exhibits a framework system taking the upsides of the WSN for the constant checking on the water quality in aquaculture. We outline the structure of the remote sensor system to gather and consistently transmit information to the observing program. At that point we achieve the setup display in the product that improves the reuse and office of the observing undertaking. Additionally, the checking programming created to speak to the observing equipment and information perception, and investigate the information with master learning to actualize the auto control. The checking framework has been acknowledgment of the computerized, clever, and viably guarantees the quality of aquaculture water. Handy organization results are to demonstrate the framework unwavering quality and continuous attributes, and to show great impact on natural checking of water quality.

The monitoring of the water standard is a complex process as it has several laboratory testing methods and time consuming. To overcome this difficulty, a real time monitoring of water goodness by using IoT has been proposed. Internet of things together with the Sensor water meters for the effectiveness, govern the quality of water. Here we are executing, system for monitoring the water goodness through different sensors -turbidity, pH, temperature, conductivity. The controller accesses the information which is monitored by the use of sensors. The accessed data are controlled by the usage of Arduino controller. By using an IoT, the information is collected and the water pollution can be enquired, by a strict mechanism. To the addition, this system states an alert to the public and concerned subdivision or unit about the water. The atmosphere can have adaptable good water.

2. INTRODUCTION

2.1 BACKGROUND OF THE PROBLEM

Water is a fuel for all life and no lives can survey without water on this planet. Hazardous of various category are collapsed with the drinking water which arrives through industrialization, globalization, urbanization, agriculture etc. It is a need to check the water regularly using agile technologies. From our project we assure that water quality measuring is done automatically. The Central Pollution Control Board (CPCB) had established many continuous monitoring stations on water body across the country, which checks the quality of water either monthly or yearly. This is to make sure that the water standard is being maintained in desired level. Also It has significance that it is monitored on daily basis. The pollution controlling requirement and the measures for the effectiveness of pollution control in water is finished by using Water quality monitoring. CPCB have plans to develop the water standard monitoring network across Ganga river valley. All the stations are operating in real time and central site can acquire data from several of the above stations using GPRS/GSM or 3G cellular serviceability. And the price of the system differs in proportion to the components used. Our proposed model consists of various sensors which compute the standard of water in real-time for effective action, and is economical, accurate, and only less manpower required. In this paper, section 2 examine about the literature survey on surveillance of water quality while section 3 discusses on Internet of Things. Section 4 discusses implementation of water standard surveillance system, and results acquired by way of the system are discussed in section 5. Section 6 concludes the paper. Totally there are 50 lakh public water sources in our country. Including unreported, totally there are 60 lakh water sources Which is tested twice/year for bacterial analysis. And once/year for chemical analysis. According to NRDWP 120 lakh water samples to be tested/year. And water testing method was started in the year 1988,

from 1988 to 1991 Substrate technique was used to identify the target bacteria. And in 1996 Epidemiological method was used to recognize the water quality but in this method many water borne diseases were missed. And from 1995 to 2007 the number of observed specimen with B

2.2 MOTIVATION OF THE PROPOSED WORK

At present, most household water quality checking are as yet utilizing manual strategies. The identification procedure engaged with examining, test transportation and safeguarding, research centre information estimated and so on, is a complex yet related framework. Any blunder of the means will influence the aftereffects of the last information. The customary counterfeit technique as normal or sporadic inspecting and checking is exercise in futility, wasteful, and hard to dispassionately reflect variety guidelines and actualities. It has been not able meet the current water quality observing needs.

2.3 FOCUS OF THE PROPOSED WORK

The proposed framework or prototype of the model is mainly focused on Wireless Sensor Networks using the process of internet of things and cloud computing. Alongside the rapid advancement in communication technology and sensor technology, it quickens the remote checking and programmed water quality observing procedure.

2.4 PROPOSED WORK CONTRIBUTION

This ongoing water quality observing framework in light of wireless sensor network because of its comfort, constant, precise characters, has been getting researchers an ever increasing number of considerations.

In this system it makes use of four sensors (Turbidity, temperature, pH, conductivity) and the Arduino controller connected with internet of things. The Processing module microcontroller, and the transmission module GSM. The four sensors capture the data in the analogy signals. The ADC converter which converts the four signals information's into the digital format. The digital signals are passed to the Arduino controller which is together with the transmission module. The microcontroller in Arduino will examine itself and course the digital information, and here the available GPRS/GSM module is for next communication in the channel, the GSM model will send the water quality factors to the smartphone/PC by the SMS, which can be viewed on the LCD. Fig. 1 display the water quality monitoring system. Microcontroller in the Arduino accepts the information and processes the information which are collected from the sensors to the Web page via GSM module. With the help of coding the transmission is performed. The Embedded-C language is used for writing the code and Keil u vision software is used to simulate the program. For C programming we have used evaluation version of MDK-ARM v4. A software tool called Flash Magic is used for burning the. Hex files to NXP Controllers.

The water quality monitoring system employs sensors such as pH, temperature, Electric Conductivity (EC) and turbidity to get the data parameters. These sensors are positioned in the water will analyse the quality of the water resources. The verified content is used to prophesy the quality of water.

The analysed data is processed through the microcontroller in the Arduino module and transferred through the GSM/Wi-Fi module using the data communication module to the central server. By giving a user id and password to the user they can view the data which is collected, processed, transmitted and analysed.

The collected data is displayed in real time. The microcontroller in the Arduino is based on supporting the embedded trace & emulation through real time. It also supports the high speed flash memory in the embedded system. Hence the size is considered as the main requirement for the point of scaling applications and for controlling the access provided to the consumers it is good to use and it also consumes less power. It also suitable for providing the low resolution image with high processing power and by providing the protocol modifiers for communication in soft modems & in communications and providing paths with large buffer size [11]. The Wi-Fi or GSM module used is merely low cost with chips in it. The TCP/IP protocol stack and the microcontrollers are manufactured by M/s Espruino [12]. The wireless local area network provides service for offloading the other processor applications with Wi-Fi network functions or it also can host the various applications. The applications in this boots up from the external flash directly during hosting. Due to its integrated cache, the memory requirement is minimized and the system performance has been improved.

Based on the type of interfaces like the UART interface or the CPU AHB bridge design, the microcontrollers can be accessed with the wireless internet access, it can be done when the Wi-Fi adapter works similar to the WiFi module. To send and receive data in Ethernet buffers, the Wi-Fi module uses the transceiver(Tx/Rx) which is in serial format. In the Wi-Fi module to change and query the configurations of Wi-Fi, serial commands are used. For the communications between a Wi-Fi module and the microcontroller it requires only two wires for the transmission and reception. Making the code very light weighted it allows the microcontroller to perform offload Wi-Fi related tasks on the module. To build an Internet of Things applications very easy, SPI and UART interfaces are addressable over the Wi-Fi module. To connect the TCP connections which is open

and the Wi-Fi network we use the AT commands. The open TCP connections do not need any protocols like TCP/IP stack running in the microcontroller. The factors can be pushed to the internet (server) by the regular connections to the microcontroller.

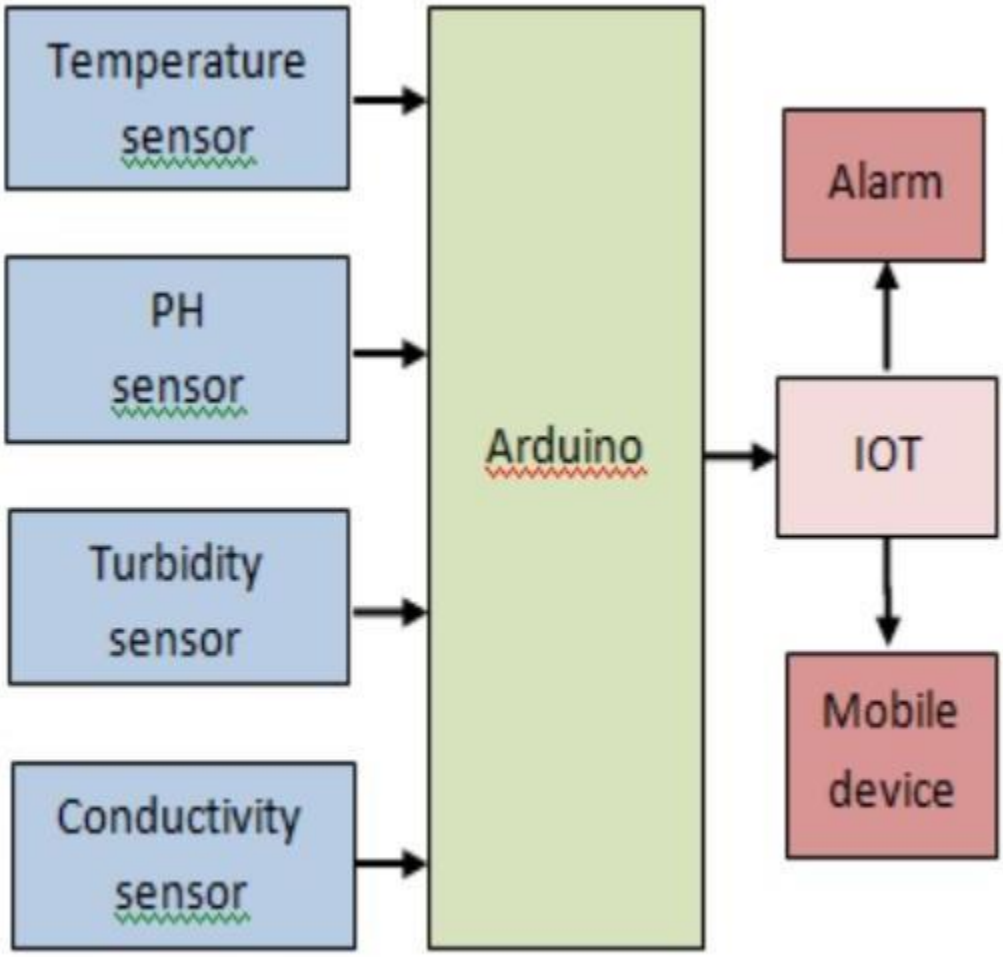


Figure 2. Water quality monitoring system

3. Related Literatures

3.1 Existing work with regards to proposed work

Some of the works done in this regard are:

(A)

Plan and Development of Water Quality Monitoring System in light of Wireless Sensor Network in Aquaculture

Introduction

The procedure to screen water quality condition incorporates information procurement, information transmission, information conservation and basic leadership, which is included with programming and equipment far reaching coordination, so the fantastic design turns into the best need to the water quality checking framework as a composite framework. WSN (Wireless sensor organize) is made out of information obtaining hub, remote transmission system and data preparing focus. Information securing hubs coordinate sensors, information handling module and correspondence module. Through the correspondence convention, the hubs frame a conveyed arrange. At that point the system transmits the streamlining information to data preparing focus.

The framework embraces Zigbee in light of IEEE 802.15.4 correspondence convention. Zigbee is a remote intercommunication system that has low transmitting rate and minimal effort preferences. It tends to be insert in gadgets, is

especially appropriate for modern control, aquaculture water quality observing, remote sensor systems and savvy gadgets, for example, the generally circulated applications[1-4] . Remote system checking framework incorporates the major technologies

:(1)

Wireless correspondence innovation—2.4GHz short range correspondence and GPRS correspondence, remote signs cover 3km territory;

(2)

Embed control innovation—insightful data procurement and control;

(3)

Wireless system innovation—organize steering layer, correspondence storing, 3 self-finding and upkeep innovation;

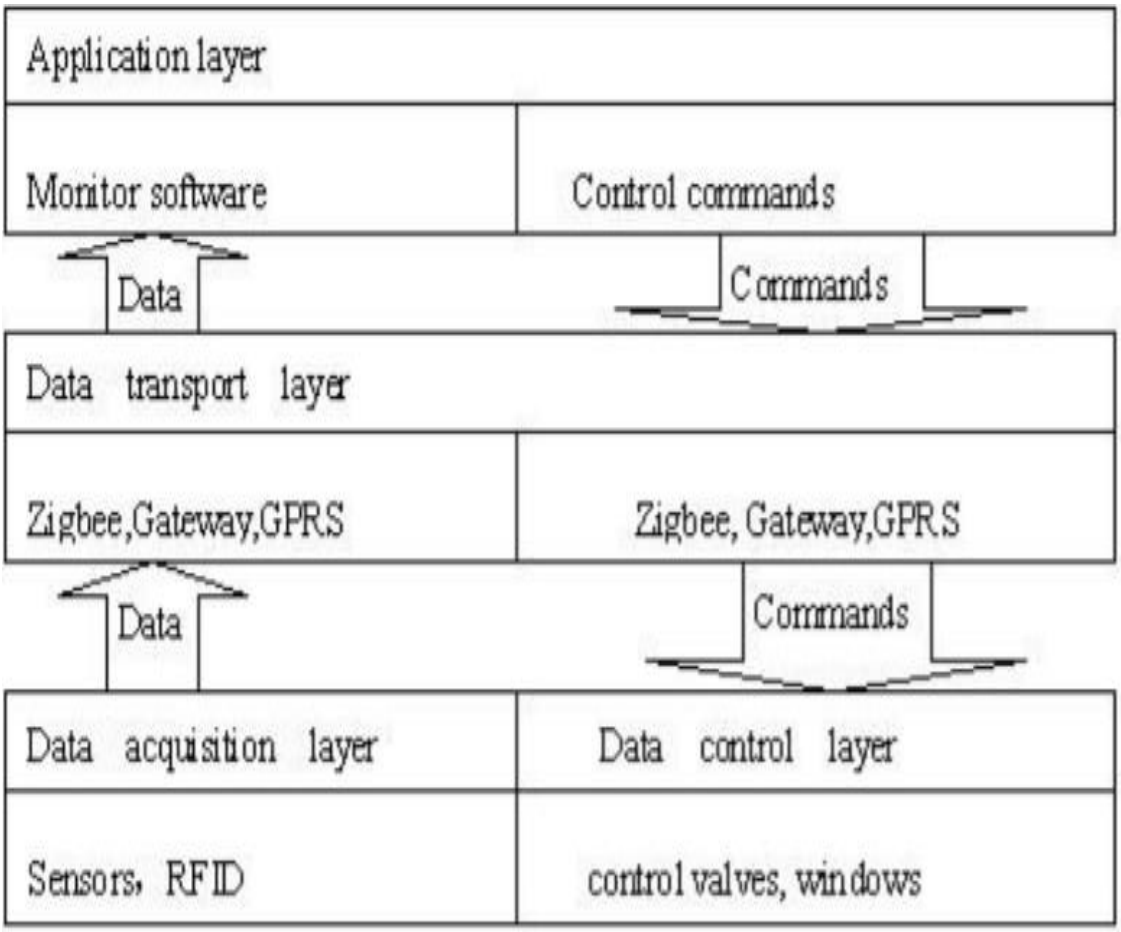
(4)

Energy oversee innovation—low power utilization and vitality administration. Remote sensor systems are broadly utilized all through savvy transportation, ecological security, open wellbeing, peace at home, keen fire caution, mechanical observing, elderly care, individual wellbeing, gardening, sustenance traceability, adversary identification and knowledge gathering, and different fields [5] . Especially in the territories of agribusiness and rustic data, WSN can be all the more generally accessible, for example, exactness horticulture the exact use of sensor innovation, keen master administration framework, remote checking and remote detecting frameworks, bioinformatics and analytic frameworks, sustenance security traceability framework.

(B)

Water quality monitoring system architecture applied WSN

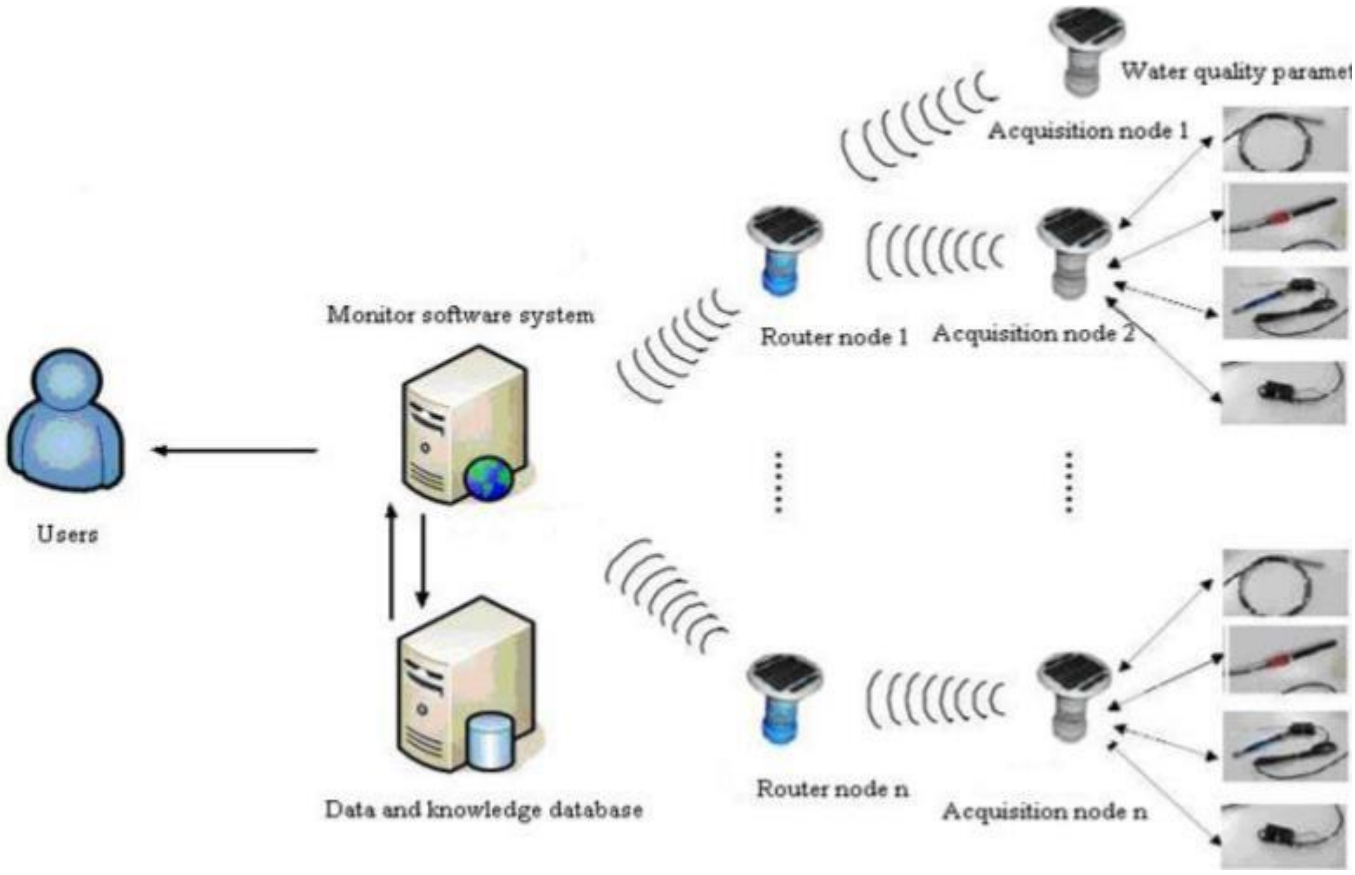
In view of WSN, the water quality checking framework utilizes three-layer structure: information securing layer, information transport layer and application layer to build up its design. The design as figure appears:



In the data anchoring layer, the water quality watching structure uses WSN which is molded by endless sensor center points through remote self-dealing with way. The sensors get data in the framework join PH, water level, water temperature, DO (separated oxygen) sensor. WSN fuses sensor, MEMS and remote correspondence

progresses, can continuous acumen and handle question's data information in organize reach out, by then send to the customers. It has various great characters, for instance, sweeping spread broaden, remote screen, high watching exactness, expedient sending and straightforwardness. Through using WSN development, the system can effectively screen transport data and certification the steady data to be transported to the water quality watching programming for dismembering and giving later control decisions. In the data transport layer, there are two sorts of transmission methodologies: long-division and short-expel data transmission. The structure uses the GPRS to transport long-isolate data, and uses the Zigbee to obtain the sensors' watching data, and after that utilizations application programming to manage the data and to settle on decisions 4 to control devices. The steady data through the sensors by Zigbee set away in the database to ensure customers can address at whatever point any sensor watching data information to separate. In the application layer, the water quality watching writing computer programs is the crucial part. Through the fragile item, customers can screen the idea of the water all the time from the nonstop data to ensure the water idea of the aquaculture. Water quality checking programming utilizes the ace data set away in the data and learning database together with the pretreatment data transported from sensors to settle on the decisions. By then the structure picks whether to open or close the valve on association device to addition or decay the oxygen, water with the decisions. On area customers can get early forewarning information from sharp handheld contraption and depend upon the decisions to work. To energize customer organization, and data on water quality issues can happen in order to respond, the item in like manner uses SMS early advised limit. Off-site customers can get early alerted information from PDA and other propelled cell phones, and can send summons by SMS to control the valve on device. The customers can not simply get the back and forth movement water quality characteristic data, yet furthermore analyze the data in period to get the water condition examples to all things considered manage water quality. The system assembles temperature, PH, deteriorated oxygen sensor movements by sensor module, by methods for remote transport module transmit data, and joins with structure programming to achieve steady checking and control. The system in perspective of customers ask for, can screen the water quality data at whatever point. It gives consistent affirmations to modified checking of water quality information, customized control and sharp

organization.



Real Time Water Quality Monitoring System

Water Pollution is a noteworthy worldwide issue which requires progressing valuation and adjustment of water asset controlling guideline at the levels of global down to singular wells. It has been studied that water contamination is the main source of passings and maladies around the world. The records demonstrate that in excess of 14,000 individuals bite the dust day by day around the world. In India unsurprising 580 individuals pass on of water contamination related disease consistently. In many creating nations, messy or debased water is being utilized for drinking with no appropriate previous treatment. One reason for this occurrence is the ignorance of open and organization and the absence of water quality observing

framework which makes genuine medical problems. Additionally normal marvels, for example, volcanoes, green growth tints, rainstorms, and tremors likewise change the quality and environmental status of water. As water is the most critical factor for every single living being it is imperative to ensure it. Also, water quality checking is one of the initial steps required in the normal advancement and administration of water assets. In this manner in this paper we portray the plan of Wireless Sensor Network (WSN) [1] [2] that screens the nature of water with the assistance of data detected by the sensors inundated in water, in order to keep the water asset inside a standard depicted for household utilization and to have the capacity to take important activities to reestablish the strength of the debased water body. Utilizing diverse sensors, this framework can gather different parameters from water, for example, temperature, pH, oxygen thickness, turbidity et cetera. The quick improvement of remote sensor organize (WSN) innovation gives a novel way to deal with constant information procurement, transmission and handling. The customers can get progressing water quality data from faraway. In an arrangement of this kind, there are a few hubs, a base station and a remote observing station. Every hub contains a gathering of sensors and the hubs are coursed in unmistakable water bodies. Information gathered by sensor hubs is sent to the base station by means of WSN channel then to the remote checking station. The remote observing station is generally a PC with Graphic User Interface (GUI) for clients to assess water quality information. The recorded information can be assessed utilizing different reproduction instruments for future correspondence and activities.

3.2 LIMITATIONS:

Central Water Commission (CWC) screens water quality by social affair tests from specialist regions inside the planning and appointment structure. These cases are analyzed at the readied labs. At these exploration focuses tests from unrefined water, channel water and treated water are taken for examination. The estimation of water parameters like turbidity, pH, broke down oxygen, et cetera is done with the help of meters.

So the weights of this ebb and flow system are that; there is no relentless and remote checking, human resource is required, less strong, no seeing at the wellspring of waters i.e. no on field watching and the repeat of testing is low. On account of these weaknesses of the ebb and flow system it is required to develop a structure that will allow steady and predictable seeing of water quality. In this way unique pattern setting advancements for checking water quality have been proposed in the progressing years. In the structure of the remote sensor sorting out in which different sensor centers are arranged in a lake is proposed. An extensively more unassuming number of UAVs in like manner watch the lake and they are controlled by the central watching station (CMS). The sensor centers and UAVs are both portable while the CMS is settled. The CMS accumulates the information from the sensors and process them. In [9] a framework for watching water quality by joining bacterial sullying of water for immense water bodies using WSN (containing sensors for recognizing parameters of interest), UV Light to test the contamination of water and Fluorescence as a checking contraption is proposed. It shows an online remote sensor compose , for checking water pollution by strategies for Zigbee and WiMax progressions. This structure would have an adjacent Zigbee orchestrate that will be prepared for evaluating distinctive water quality parameters, a WiMax framework and electronic seeing with the help of a controlling PC. The structure is proposed to accumulate and process information, in this way settling on decisions consistently by methods for a remote web server. The data is facilitated through the Zigbee gateway from sensor centers to the web server by techniques for a WiMax sort out, in this way enabling customers to remotely screen the water quality from their place instead of get-together data from the scene. Test outcomes pleases that the structure is prepared for checking water defilement constantly.

3.3 Research gaps from existing work

Different cutting edge innovations for checking water quality have been proposed in the ongoing years. The structure of the remote sensor organizing in which various sensor hubs are situated in a lake is proposed. A significantly more modest number of UAVs additionally watch the lake and they are controlled by the focal observing station (CMS). The sensor hubs and UAVs are both versatile though the CMS is settled. The CMS gathers the data from the sensors and process them. A system for checking water quality by consolidating bacterial pollution of water for vast water bodies utilizing WSN (comprising of sensors for detecting parameters of intrigue), UV Light to test the tainting of water and Fluorescence as an observing instrument is proposed. Likewise one research introduces an electronic remote sensor arrange, for observing water contamination by methods for Zigbee and WiMax advancements. This framework would have a nearby Zigbee organize that will be equipped for estimating different water quality parameters, a WiMax system and online checking with the assistance of a controlling PC. The framework is planned to gather and process data, along these lines settling on choices continuously by means of a remote web server. The information is coordinated through the Zigbee passage from sensor hubs to the web server by methods for a WiMax arrange, in this manner allowing clients to indirectly screen the water quality from their place as opposed to social affair information from the scene. Exploratory outcomes delights that the framework is fit for observing water contamination continuously

3.4 Proposed System

We depict the outline of Wireless Sensor Network (WSN) that screens the nature of water with the assistance of data detected by the sensors submerged in water, in order to keep the water asset inside a standard portrayed for residential use and to have the capacity to take fundamental activities to reestablish the soundness of the corrupted water body. Utilizing diverse sensors, this framework can gather

different parameters from water, for example, temperature, pH, oxygen thickness, turbidity et cetera. The quick advancement of remote sensor organize (WSN) innovation gives a novel way to deal with continuous information obtaining, transmission and preparing. The customers can get progressing water quality data from faraway. In an arrangement of this kind, there are a few hubs, a base station and a remote checking station. Every hub contains a gathering of sensors and the hubs are flowed in unmistakable water bodies. Information gathered by sensor hubs is sent to the base station by means of WSN channel then to the remote checking station. The remote checking station is normally a PC with Graphic User Interface (GUI) for clients to assess water quality information. The recorded information can be assessed utilizing different reenactment instruments for future correspondence and activities

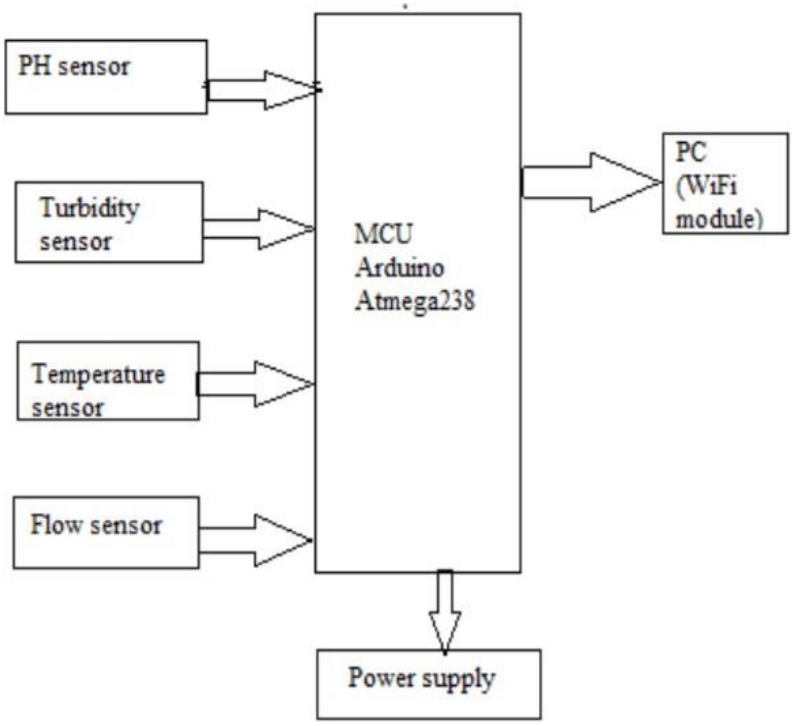


Fig: Block diagram of our project

The fundamental point here is to build up a framework for nonstop observing of water quality at remote spots utilizing remote sensor systems with low power

utilization, minimal effort and high discovery precision. pH, conductivity, turbidity level, and so forth are the parameters that are investigated to enhance the water quality. Following are the targets of thought usage [12]: • To gauge water parameters, for example, pH, broke down oxygen, turbidity, conductivity, and so on utilizing accessible sensors at remote place. To gather information from different sensor hubs and send it to base station by remote channel. To reenact and break down quality parameters for quality control. (Graphical and numerical record utilizing MATLAB) To send SMS to an approved individual naturally when water quality identified does not coordinate the preset principles, so that, fundamental moves can be made. The definite square outline of water quality checking framework is appeared in Figure

4. Proposed Methodology (Framework)

4.1 Method and approaches

The main aim here is to develop a system for continuous monitoring of water quality at remote places using wireless sensor networks with low power consumption, low cost and high detection accuracy. pH, conductivity, turbidity level, etc are the parameters that are analysed to improve the water quality. Following are the objectives of idea implementation [12]: • To measure water parameters such as pH, dissolved oxygen, turbidity, conductivity, etc using available sensors at remote place. To collect data from various sensor nodes and send it to base station by wireless channel. To simulate and analyze quality parameters for quality control. (Graphical and numerical record using MATLAB) To send SMS to an authorized person automatically when water quality detected does not match the preset standards, so that, necessary actions can be taken. The detailed block diagram of water quality monitoring system is shown in Figure 1.

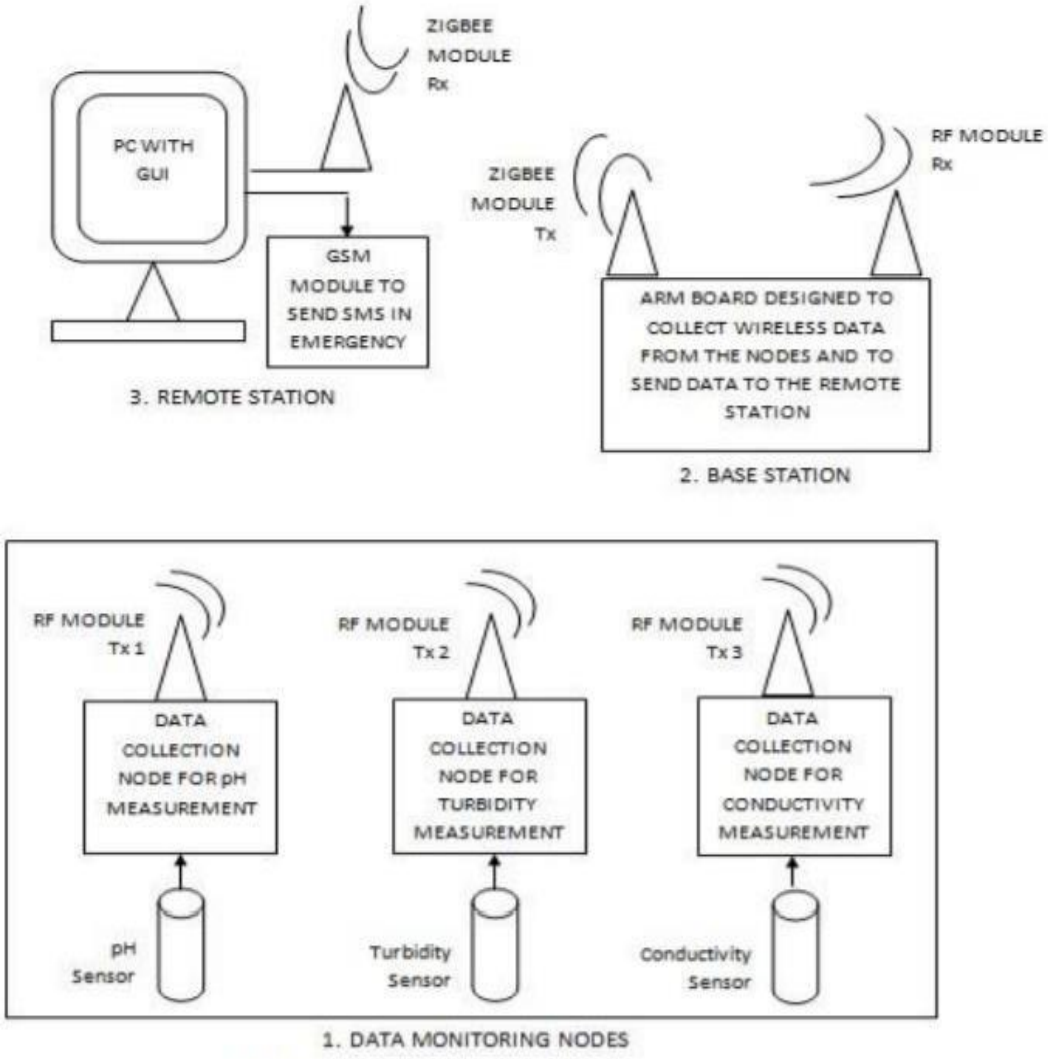


Fig 1: Block diagram of proposed Wireless Sensor Network

The proposed water quality monitoring system based on WSN can be divided into three parts:

• Data monitoring nodes

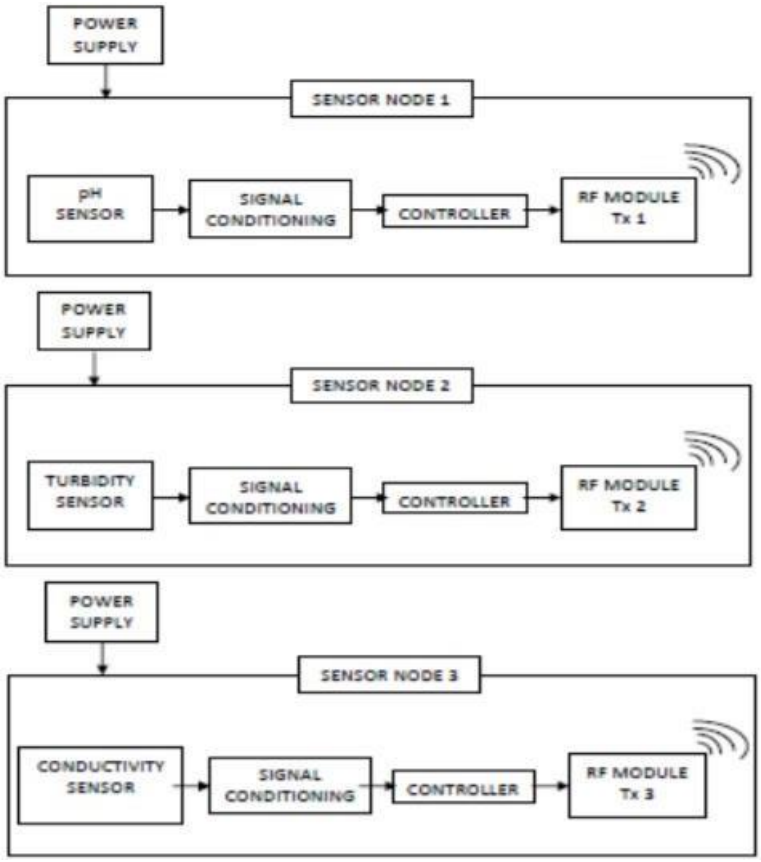
• Data base station

• Remote monitoring centre

(a) Data Monitoring Nodes Figure 2 illustrates the data monitoring nodes which consist of sensors (pH, turbidity and conductivity), signal conditioning circuit, a controller and RF module. The data sensed by the sensor will be passed through a signal conditioning circuit in order to manipulate the analog signal in such a way that it meets the requirements of the next stage for further processing. Then the manipulated data will be given to the controller (PIC16F877A). The inbuilt ADC will convert the analog signal to digital signal for further processing. With the help of the RF module the manipulated sensed data will be sending to the data base station as shown in figure 1.

(b) Data Base Station The data from all the nodes is collected at the data base station consisting of ARM processor (LPC2148) as shown in figure 3. The data from each node is collected one after another i.e. using time multiplexing. This obtained data is displayed on a LCD display. Also, this data is forwarded to the remote monitoring station via zigbee module.

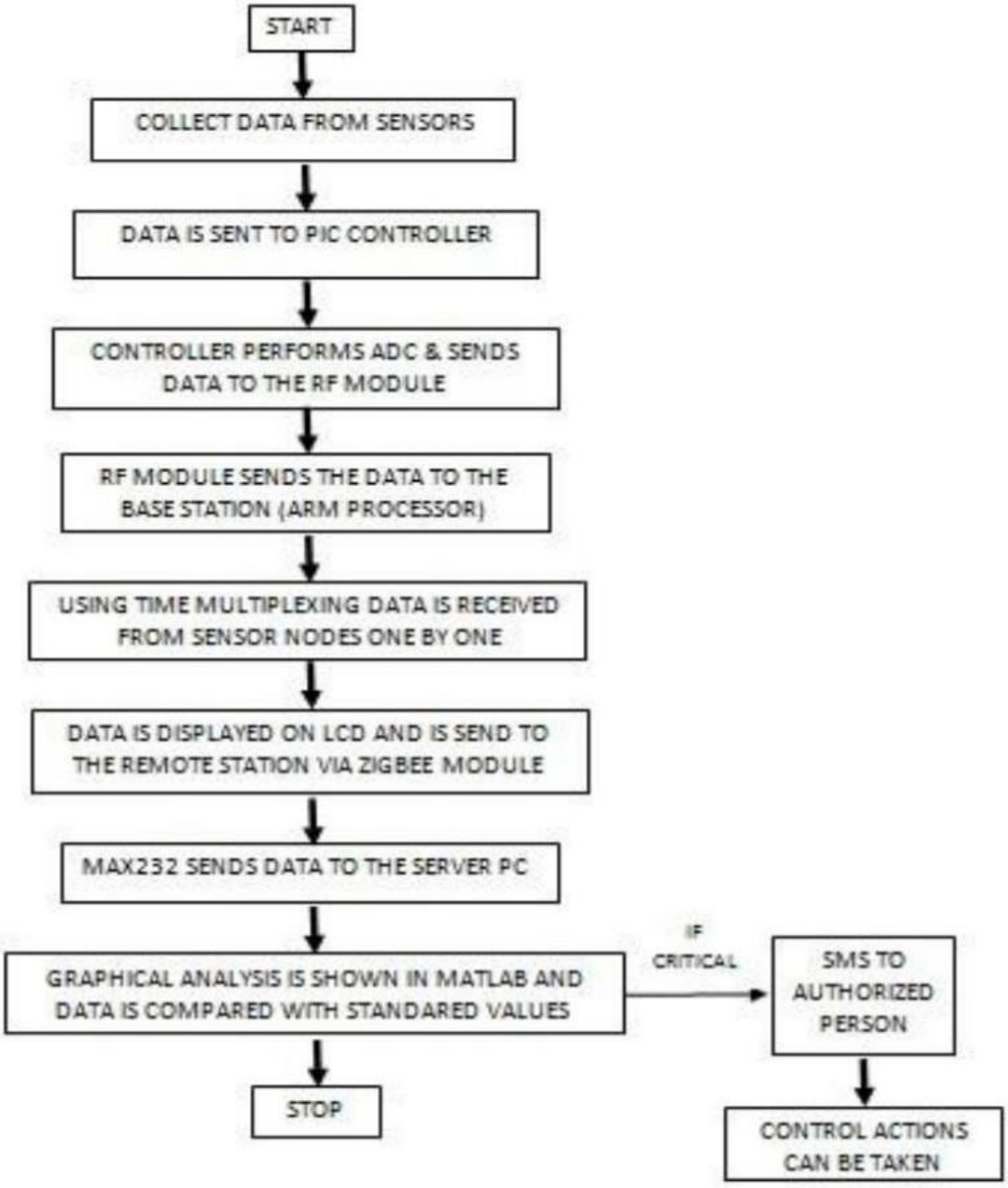
(c) Remote Monitoring Station The remote monitoring station consists of a zigbee module which will receive the data sent by the data base station. This data will be fed to a server PC consisting of Graphic User Interface (GUI) via serial communication as shown in figure 4. The obtained data will be represented graphically with the help of MATLAB and will be saved for further reference. Also the obtained data is compared with the standard values of the water parameters. If the obtained water parameters do not match the preset values then SMS will be sending to an authorized person in order to take preventive measures.



B. Software Design:

Software design approach for water quality monitoring system is based on three parts, first is PIC programming, ARM programming and GUI design in MATLAB. PIC programming is done in MPLAB IDE version 8.92 and ARM programming is done in Keil uVision4 IDE software. Embedded C is used as the programming language. The GUI platform is successfully developed using the MATLAB software which is able to interact with the hardware at the remote monitoring station.

Detailed flowchart for the working of whole system as well as software design is shown in figure



4.2 Metrics and measurements

The graphical user interface using MATLAB, displaying results is shown. Water parameters are collected from the nodes. Then this data is displayed on LCD.

Collected data is forwarded to the server PC with GUI shown in figure 4. From prior testing, a threshold value (range of values) is defined for the monitoring of pH, turbidity and conductivity of water. Depending on whether the average of the values obtained is less than or greater than the defined threshold, we get to know whether the water is acidic or basic, conductivity is high or low, is the water pure or impure and hence if it is suitable or not for the specific purpose.

SENSORS USED:

A sensor gives a corresponding electrical data by discovering the events or modifications in its environment. A sensor is a transducer device. The Performance of the sensor is increased by the sensor calibration. Speed, accuracy, resolution and linearity are the most important quality of the sensor. The activities can be enhanced & removing of errors due to frame are deleted in the sensor results which makes it enhance. The difference between the wanted output and the obtained output of the sensor makes way to identify the mistakes due to structure. During the real time measures in the sensor, the repeatable mistakes are compensated during the measured standards.

1) Temperature Sensor

To analyze the coldness or hotness of a product, the Temperature sensor is designed. The output of an IC temperature sensor is with proper value to the temperature (°C). The precision of the temperature is more accurate than the thermistor. This sensor does not possess more than 0.1 °C temperature rise in the air which is still. It has the low self-heating. The range for operating temperature is from -55°C to 150°C.

2) PH Sensor

It measures the acidic & basic alkaline in the water. It can be defined by using the hydrogen ion concentration with the negative logarithmic. The pH scale range is from 0 to 14, it is logarithmic. The concentration of hydrogen ion values is translated using Ph. The hydrogen ion concentration is small for acidic and if it shows high it is for alkaline solutions. The PH around 7 is the natural source water. The water becomes less acidic as the concentration of hydrogen ion decreases for ten-fold for the increases in the number of PH. A reference electrode & a measuring electrode are enclosed in the pH sensor. The measuring electrode is

connected to the positive end of the battery where the reference electrode is connected to the negative terminal. When the pH sensor is immersed in the solution, the reference electrode has its fixed potential. The change in the hydrogen ion concentration does not change the reference electrode. A potential is developed when hydrogen ion concentration is related to the hydrogen ions which is sensitive to the measuring electrodes. The temperature sensor is necessary to correct any variations in the voltage, as the electrodes differential voltage changes with the temperature.

3) Electric Conductivity Sensor

The salts in water breaks into positive and negative ions when it is dissolved. The transmitters in the water are the dissolved in it and the electrical current is conducted by the conductivity. The calcium, sodium, potassium and magnesium are the major positively charged ions, and bicarbonate, sulfate, chloride, carbonate, are the major negatively charged ions. The minor charged ions are phosphates and nitrates for the conductivity. With the help of a probe and a meter, the electrical conductivity is standardized. The pair of metal electrodes, in the probe which is spaced 1 80cm apart (unit: milli or micro-Siemens per cm). The electrodes have the constant volts. The electrical conductivity is measured by the concentration of dissolved ions which is proportional to the current flow. The dissolved salts concentration is directly proportional to electrical conductivity. The amount of minerals and salts that resides within the water is resulted by the total dissolved solid (TDS). By multiplying the conductivity by a factor of 0.67. B the TDS of water can be determined.

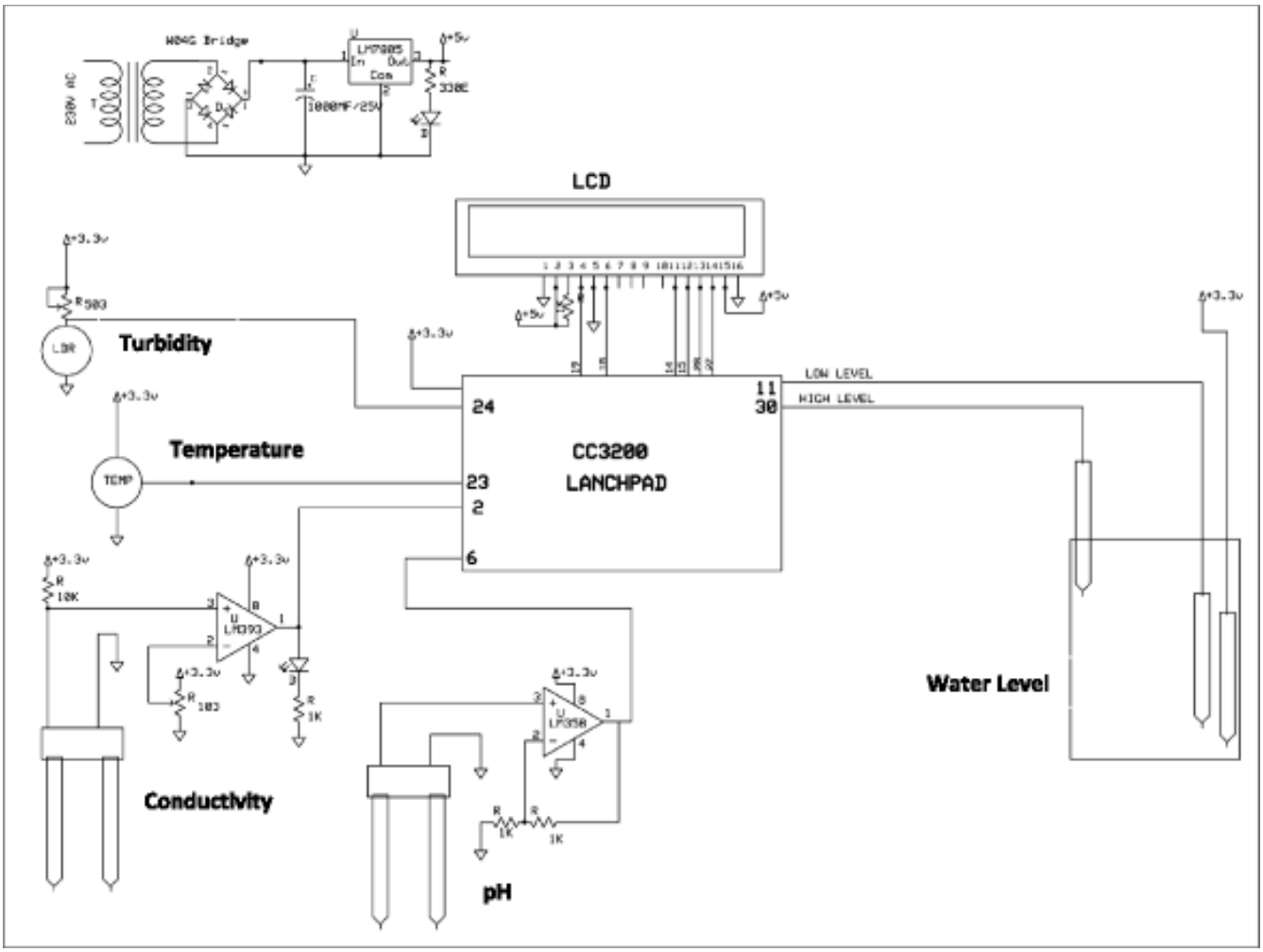
4) Turbidity sensor

Turbidity is the cloudiness or haziness of a fluid which is produced by a large number of independent particles that are generally invisible to the visible eye, like smoke in air. Turbidity is the main method to measure the quality of water. The light that is scattered due to the suspended solids in water is measured by the help of turbidity sensor. When the amount of total suspended solids (TSS) in water increases simultaneously the water's turbidity level (and cloudiness or haziness) also increases. To monitor the turbidity level of water, turbidity sensor is preferred.

The gravity Arduino turbidity sensor is preferred to identify the water standard by measuring the states of turbidity. The sensor uses light to detect suspended particles in water by calibrating the light transmittance and scattering rate and it changes with the quality of total suspended solids (TSS) in water. When the TTS increases by the way the liquid turbidity level also increases.

Turbidity sensor is used in measuring the standard of water in rivers and streams, wastewater and the efficient measurements, managing instrumentation for settling ponds, sediment transportation research are also in the laboratory measurements. The analog and digitized signal result modes are given by the liquid sensor . The threshold signal is adjustable when it is in digital signal mode.

4.3 Overview organization of the proposed work (Context Diagram):



Our work addresses about developing an efficient wireless sensor network (WSN) based water quality monitoring system, which examines “water quality”, an important factor as far as, irrigation; domestic purposes; industries; etc are concerned. Water pollution can be easily detected by this system, which will help in controlling it. Overall the proposed execution of high power Zigbee based WSN for water quality monitoring system offering low power utilization and low cost is presented. Another important fact of this system is the easy installation of the system that is the base station can be placed at the local residence close to the target area and the monitoring task can be done by any person with very less training at the beginning of the system installation. Performance modelling is one important aspect in different environment to be studied in the future as different

kind of monitoring application requires different arrangement during system installation.

4.4 Data Analysis methods

Internet of Things (IoT) is determined natural articles or things which incorporates vehicles, structures which are inserted with sensor, miniaturized scale controller, and system associativity these things to get together and int different condition. The IoT is a wide arena which are submerged distinctive worked in remote broadcast communications utilizing the current web system connected with any infra structure and looked. Every one of the gadgets have its interesting it catches the continuous information consequently IoT have sensors, processors and entryway principle fundamental building group. By 2020 it says that billion 'things' will together Wireless advances, for example, Wireless Personal Area Network RFID, 6LoWPAN (IPv6 Low power) Wi Bluetooth and ZigBee allow the gadgets to with each other and to the system by the servers. The realities related by the sensors are spare and examined by the cloud administrations. Individuals are permitted to take a legitimate choice for the gathered information At the present day, Smart telephones have turned into the podium for correspondence and Mobile telephones develop to be a less expensive it tends to be utilized for transmitting different composes o data. Due to the disseminate different portable information organization applications are being extended. The report of the water standard observing can be exceptionally effective exactness for dissecting the information innovation is joined alongside the portable information online pressure driven displaying, it guarantees the persistent conveyance of a basic asset in the Fig 1, says in regards to the different levels of immaculateness in Analysis of Purity f Things of Things (IoT) is resolved as the system of which incorporates gadgets, inserted with sensor, roller, and system associativity. It empowers and exchange information to the different condition. The IoT is a wide and enormous web of and planned with in remote broadcast communications. By system, the IoT can be and can be checked have its remarkable idiosyncrasy; time information naturally. The

sensors, processors and entry which are the . By 2020 it says that 50 to the Internet [9]. , Wireless Personal Area Network RFID, 6LoWPAN (IPv6 Low power) Wi-Fi, the gadgets to related work by the method for ted by the sensors are spared and examined by the cloud administrations. Individuals are permitted n for the gathered information. telephones have turned into the correspondence and assessing field. As solace to utilize, and transmitting different sorts of data. Due to the disseminate of cell phones, us portable information organization applications are report of the water standard and also with great the information when the sensor innovation is consolidated alongside the versatile information application. Cell phones, PC and tablets have the show and keypad unit sensors which are inserted in it. By utilizing an IP address in the web, the Phones might be combined effectively with the Internet (IoT gadgets fulfills each necessity). In IoT cell phones go about as center/cell organize. savvy things are a piece of the Internet in Ubiquitous Network Architecture; thus approved clients have approach for data. The information are gathered from every question by utilizing servers which goes about as sink.

This framework will be fabricated utilizing Arduino Uno and Node MCU. Arduino Uno is associated with Water level sensor(HCSRO4), Turbidity Sensor, pH sensor, Wi-Fi module (ESP8266) that procedure and exchange detected information to cloud. . What's more, opposite side ultrasonic sensor associated with Node MCU. This put away information is gotten to by clients. This empowers the client to check the level of water and in the event that it goes full then programmed stop. Different parameters identified with water like water quality can likewise observed

for avert wastage of water

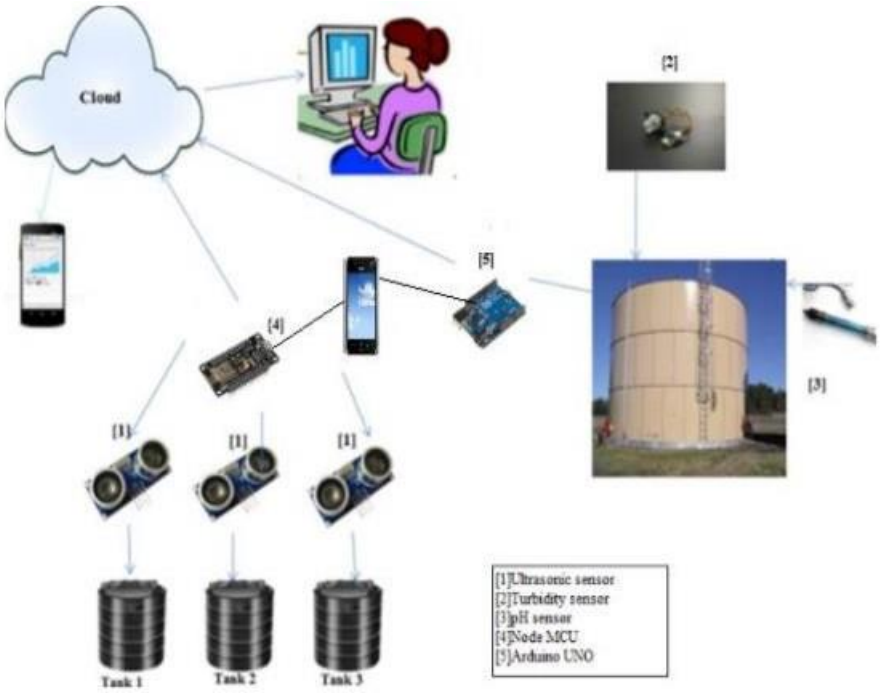


Fig: 4 Model Diagram

- This system is using WI-Fi module (Esp8266) to send the sensor data to the cloud.

- All the sensors are connected with Wi-Fi module. Wi-Fi module needs the internet.

- So here Mobile data or Wi-Fi is the access point for the internet. And after all this data sends to the cloud (Thingspeak).

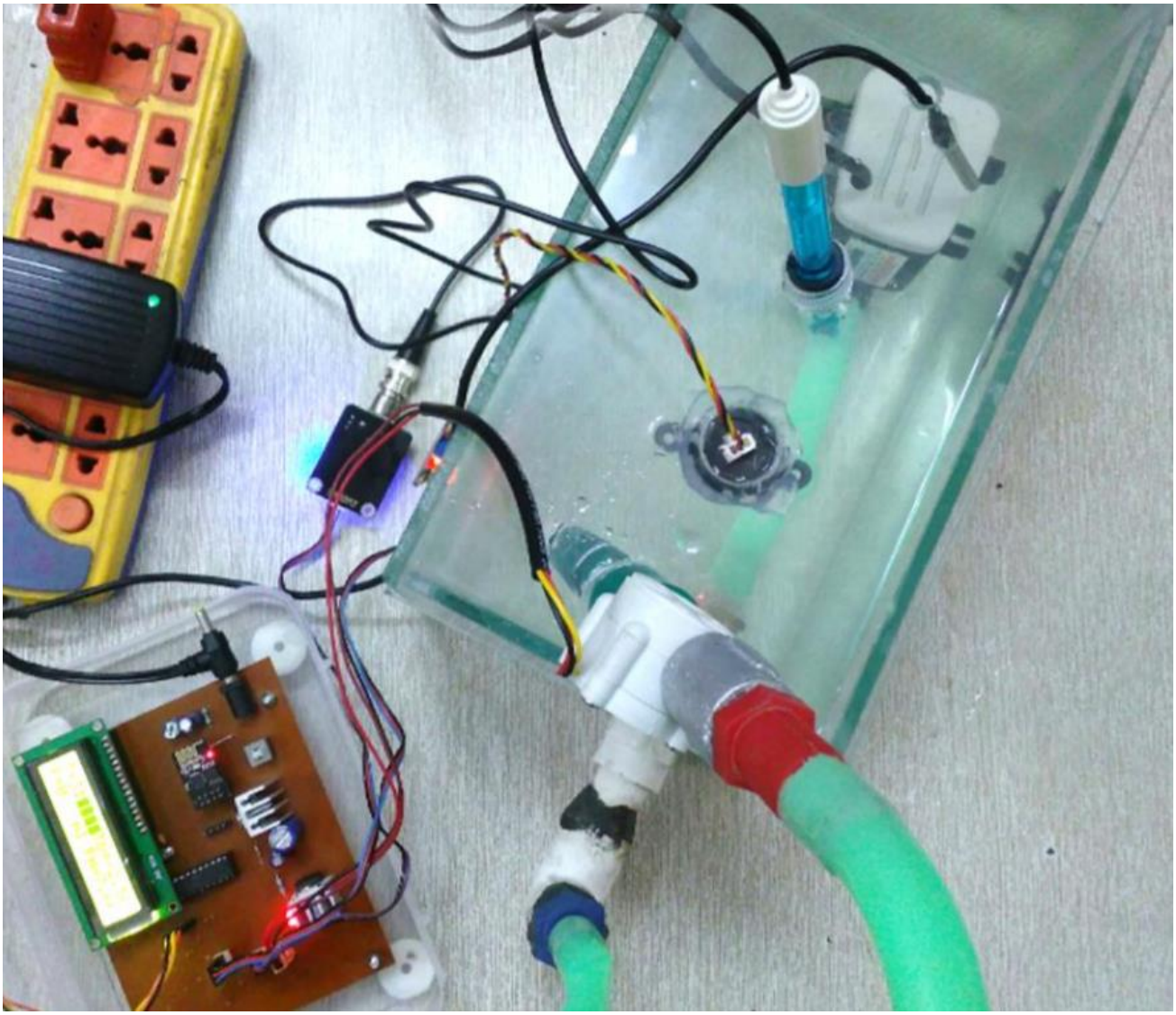
Here, All the sensors like pH, Turbidity & Ultrasonic sensor are connected with different microcontrollers like Arduino Uno & Node MCU.

And three sensors pH, turbidity, Ultrasonic sensor are connected with Arduino Uno & ESP 8266 to sending data to the cloud. One ultrasonic sensor is connected with the Node MCU.

In 2nd figure Node MCU is connected with an ultrasonic sensor. The water level is shown in inches (in)and centimeters(cm).The graph is plotted by using sensor data.

This sensor data are sent to the cloud(Thingspeak) using Node MCU& Wi-Fi module.

IMPLEMENTATION AND PROPOSED SYSTEM RESULTS



Mathematical Foundation

The software program includes the C codes jogging over the embedded Nios II processor in the FPGA processor and VHDL codes. The Quartus II software is used to create VHDL codes of the interfaces, then the compilation is carried out and the gadget is downloaded into the FPGA tool. The Nios II is a smooth processor and it's far implemented in the FPGA tool by means of using the Quartus II CAD gadget. The Nios II incorporated improvement surroundings (IDE) is software program development environment of Nios II processor and it's miles based totally at the GNU C compiler and Eclipse IDE. The Nios II software build tools (SBT) is used for Eclipse™ and all software development duties are executed within the Nios II processor gadget. The Nios II machine is generated the usage of Qsys to feature the desired components, and to configure how the components join together. The C software application code is created with the Nios II SBT for Eclipse by the usage of facts from the .sopcinfo report which is wanted to configure the FPGA before strolling and debugging the mission on the right track hardware. The software applications for sensor nodes and wireless network are written in C and it's miles run in NIOS II IDE with the NIOS II processor. subsequently, the Nios II machine is incorporated into the Quartus II task. Later, the very last FPGA hardware design is created by using the use of the Quartus II software

First resistance to frequency conversion approach Bandyopadhyay et al. consists of a 555 timer-based astable multi-vibrator to convert sensor resistance information to frequency variation.

$$f = \frac{1.44}{(R_y + 2R_x)\,C}$$

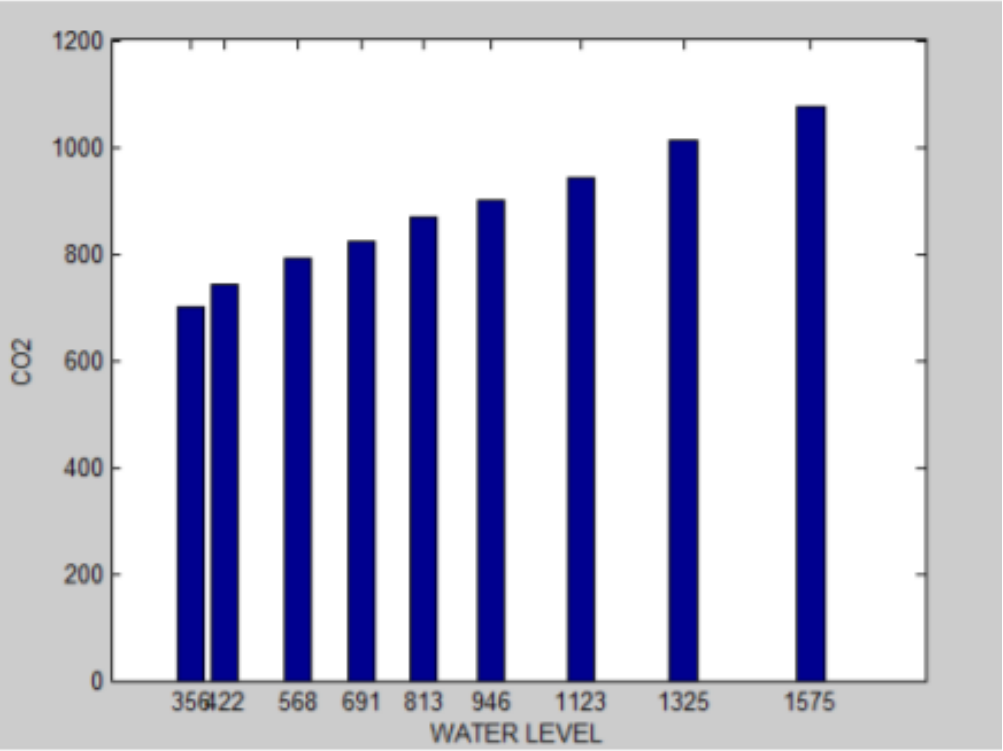
$$R_x = \frac{0.72}{fC} - R_y$$

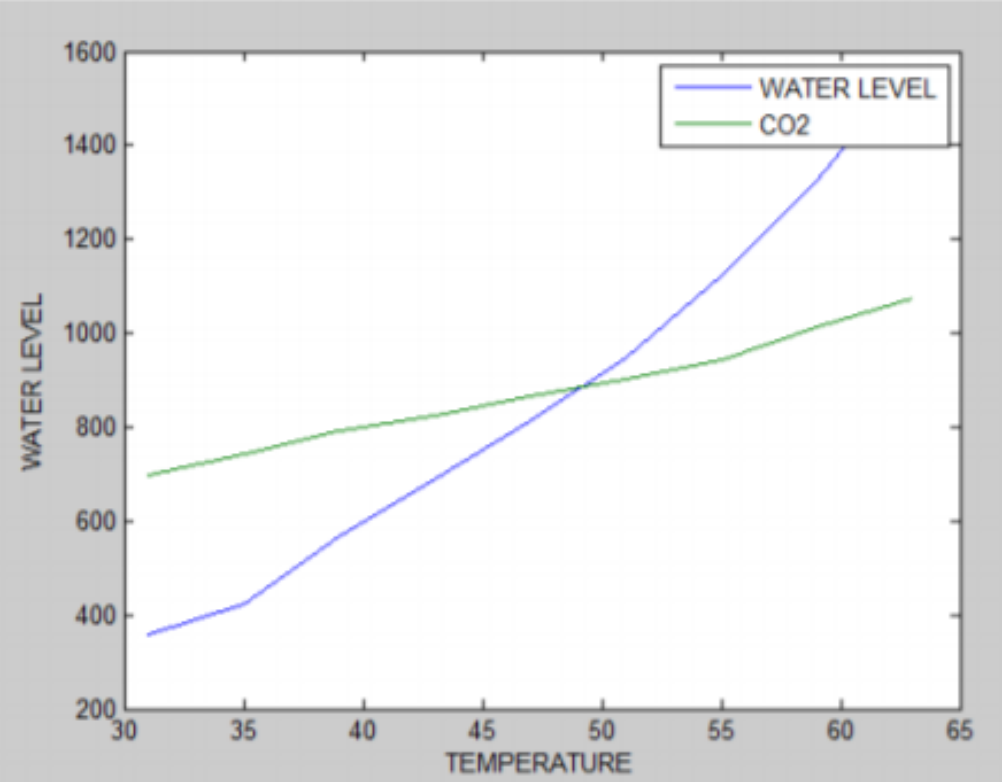
$$\mathrm{TDS\,(ppm)} = -2208.1R_x + 2825.1$$

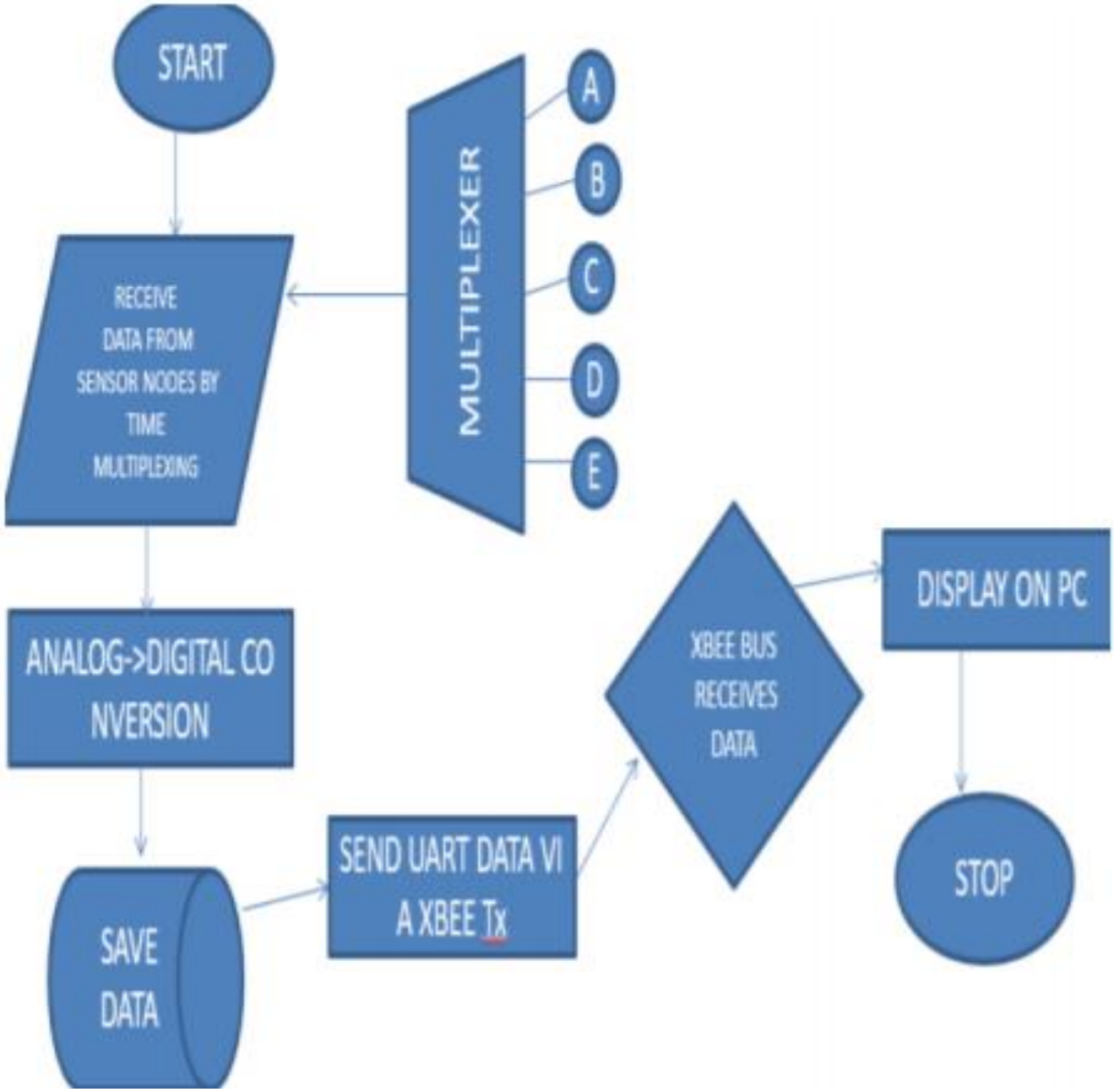
$$R_x = \frac{(2825.1 - \mathrm{TDS\,(ppm)})}{2208.1}$$

$$f = \frac{1.44}{(R_y + (2825.1 - \mathrm{TDS})/1104.05)\,C}$$

where R_x is the resistance of TDS sensor, and R_y and C are the values of the corresponding circuit elements. R_y has been used for calibration.


1200
1000
800
600
400
200
0
CO2
356
422
568
691
813
946
1123
1325
1575
WATER LEVEL


1600
1400
1200
1000
800
600
400
200
WATER LEVEL
30
35
40
45
50
55
60
65
TEMPERATURE
WATER LEVEL
CO2


START
MULTIPLEXER
A
B
C
D
E
RECEIVE DATA FROM SENSOR NODES BY TIME MULTIPLEXING
ANALOG->DIGITAL CONVERSION
SAVE DATA
SEND UART DATA VIA XBEE Tx
XBEE BUS RECEIVES DATA
DISPLAY ON PC
STOP

TOOLS USED/GRAPHICAL ILLUSTRATION OF RESULTS

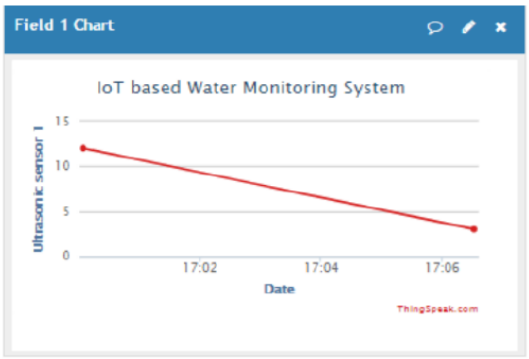


Fig:5 Result of Ultrasonic Sensor on Thingspeak Cloud (Wi-Fi Module)

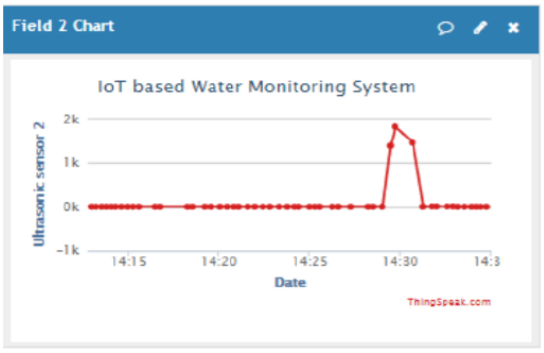


Fig:6 Result of Ultrasonic Sensor on Thingspeak (Node MCU)Cloud

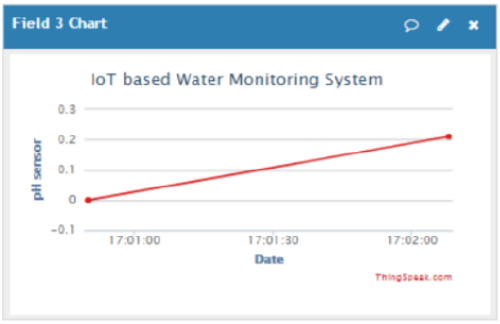


Fig:7 Result of pH Sensor on Thingspeak Cloud

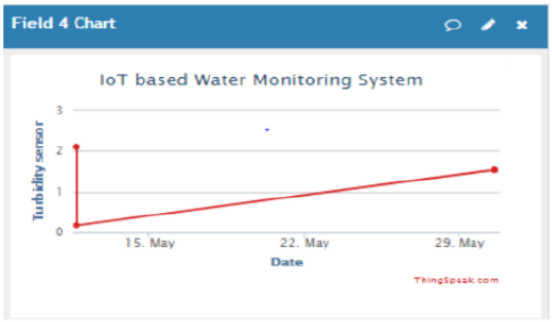


Fig:8 Result of Turbidity Sensor on Thingspeak Cloud

Here, All the sensors like pH, Turbidity & Ultrasonic sensor are connected with different microcontrollers like Arduino Uno & Node MCU.

And three sensors pH, turbidity, Ultrasonic sensor are connected with Arduino Uno & ESP 8266 to sending data to the cloud. One ultrasonic sensor is connected with the Node MCU.

In 2nd figure Node MCU is connected with an ultrasonic sensor. The water level is shown in inches (in)and centimeters(cm).The graph is plotted by using sensor data.

Results and Discussion:

We have identified a suitable implementation model that consists of different sensor devices and other modules, their functionalities are shown in figure. In this implementation model we used ATMEGA 328 with Wi-Fi module. Inbuilt ADC and Wi-Fi module connects the embedded device to internet. Sensors are connected to Arduino UNO board for monitoring, ADC will convert the corresponding sensor reading to its digital value and from that value the corresponding environmental parameter will be evaluated. After sensing the data from different sensor devices, which are placed in particular area of interest. The sensed data will be automatically sent to the web server, when a proper connection is established with sever device.

Conclusions:

Based on a study of existing water quality monitoring system and scenario of water we can say that proposed system is more suitable to monitor water quality parameters in real time. The proposed system introduces wireless sensor networking using several sensors to measure water quality, microcontroller and Zigbee module which make sensor network simple, low cost and more efficiently. Furthermore, to monitor data from all over the word IOT environment is provided using raspberry pi for creating gateway and also, cloud computing technology is used to monitor data on the internet. Moreover, to make system user-friendly web browser application is there. Therefore, the system will be low cost, faster, more efficient, real time and user friendly. Thus, we can fulfill aim and objective of the proposed system.

Future Scope and Limitations:

Monitoring of Turbidity, PH & Temperature of Water makes use of water detection sensor with unique advantage and existing GSM network. The

system can monitor water quality automatically, and it is low in cost and does not require people on duty. So the water quality testing is likely to be more economical, convenient and fast. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters. The operation is simple. The system can be expanded to monitor hydrologic, air pollution, industrial and agricultural production and so on. It has widespread application and extension value. By keeping the embedded devices in the environment for monitoring enables self protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network. Then the collected data and analysis results will be available to the end user through the WiFi.

Future Scope:

- Detecting the more parameters for most secure purpose
- Increase the parameters by addition of multiple sensors
- By interfacing relay we controls the supply of water