ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 5, May 2018

Real time Water Quality Surveillance System

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***Abstract*: -- Nowadays Internet of Things (IoT) is used in the different region of research for scanning, collecting and examining the data from remote locations. Due to the rapid increase in worldwide industrial output, carrying water from rural to urban and the over-exploitation of water resources, the caliber of water available to people has collapsed greatly. In order to secure the safe supply of the drinking water, the calibre needs to be scan in real time. In this paper, we present an architecture and evolution of a low-cost system for real-time scanning of the water calibre in IOT (internet of things). The system consist of several sensors helped to measure the parameters of the water. The parameters such as water level, temperature, PH, turbidity, conductivity can be measured. The measured values from the sensors can be refined by the microcontroller. Finally, the sensor data can be noticed on the internet using cloud computing. The high usage of fertilizers in farms and other chemicals mining and construction zone have subsidized enormously to the long-term reduction of water calibre globally. The availability of good calibre of water is outstanding in avoiding outbreaks of water-borne diseases as well as developing the calibre of life. The development of a surface water monitoring network is a critical element in the assessment and protection of water quality. We advanced a model of easy to install technology by which the different surface of water (e.g. rivers, lakes) calibre signals can be measured. This paper presents a smart water calibre system.**

Keywords— Internet of things, water calibre scanning system, pH, Turbidity, Temperature, Wireless sensor network.

I. INTRODUCTION

Water is used in various enterprises, such as consumption, agriculture and travel, which may affect water quality. The calibre issues of surface water bodies are paramount provoked by organic and nutrient ingredients loads. Therefore, the water calibre scanning is necessary which holds several chemical and physical parameters. Some of these are: Temperature, PH, turbidity and conductivity of the water can be measured. The measured values from the sensors can be refined by the microcontroller. There is obligation to boost existing system for scanning water bodies given that laboratory methods are too slow to develop a viable response and does not provide a public health protection in real time. The WSN system allows users to scan and restrict the connected device from the base stations through various wireless communication standards such as Wi-Fi, gprs, Bluetooth, zig bee and cellular modules. Internet of things was organized in parallel to Wireless sensor networks (WSN) and is a physical network which associates all things in order to swap the data and report through the data sensing devices such as sensors and computers in line with relevant obligations. Large amount of information can help to take right decisions and also to gadget in time accordingly cost of the system depends on number of parameters to be measured. Water quality surveillance systems need to instantly diagnose any changes in the calibre of water and report the same to the officials for instant action. The system is architected for continuous onsite sensing and real time reporting of water calibre information where the officials can approach the information on the smart phone/pc through internet. Our scheduled system exploits use of multiple sensors to calculate the parameters, measures the calibre of water in real-time for adequate action, and is economical, accurate, and required less manpower. In this paper section 2 discusses about literature survey on water calibre monitoring while section 3 discusses proposed system of our project ,section 4 discusses about implementation of water calibre scanning system, and results obtained through the system, Results and conclusion are discussed in section 5, section 6 gives the references we referred to proceed with this project.

II. LITERATURE SURVEY

The available water is getting reduced and water quality is deteriorated due to the instant increase in population and need to meet the requirements of human beings for agriculture, industry and personal use. The calibre of water is also overwhelmed by pesticides, insecticides. In order to dismiss issues correlated with manual quality scanning,

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CPCB has planned to go hi-tech and prepare to organize "real time water quality monitoring network". Quio tie-zhn, 2010[1] established online water quality monitoring system based on GPRS/GSM, Steven silva, Hoang N Ghia. Nguyen, Valentina Tiporlini, Kamal Alameh, 2011[2] developed web based Water quality monitoring with wireless sensor network using Zigbee Technology. The developed system measures different water quality parameters and the data collected send to web server. Donge He, Li Xin Zhang, 2012[3] He proposed Water quality monitoring system using wireless sensor networks. J. A. Stankovic, 2014[4] In parallel to wireless sensor network, an IoT is developed which combines all the parameters in order to exchange data and details through data sensing devices(sensors). Purohit. A and Gokhale U, 2014[5] developed a WQM system in real time using Intel Microcontroller, GSM ADC, LCD. Due to the difficult architecture of the microcontroller, the developed system is very high cost and time consuming. Beri N N[6], developed an independent real time device to calculate the water parameter (physical and chemical) such as PH, Turbidity, Temperature, Conductivity using microcontroller. Vijaykumar N and Ramya[7], 2015, they developed a water quality monitoring in real time using Iot Environment, as a core controller the system uses raspberry PI.

III. PROPOSED SYSTEM

In this paper, we scheduled a bang theory of real time water monitoring on calibre of water using IoT. The general block diagram and each block of the proposed system is explained in detail. As shown in the figure, the block diagram consists of different sensors (temperature, pH, turbidity, Conductivity) which is connected to core controller. Arduino UNO is used as core controller and the data collected through various sensors can be viewed on our android phones through Wi-Fi.

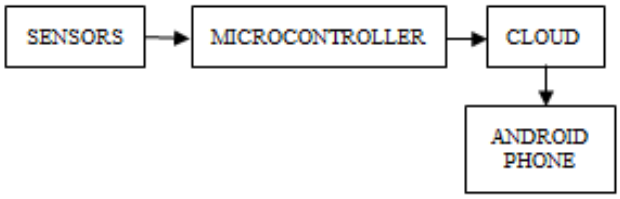

Fig: General block diagram

A. HARDWARE COMPONENTS

- pH sensors
- Turbidity sensors
- Conductivity sensors
- Temperature sensors
- Water level sensors
- Arduino UNO
- PC
- Android phone

pH SENSORS: A pH Sensor is a scientific instrument that calculate the hydrogen-ion concentration in water-based quick fix, implying its acidity or alkalinity convey as pH. The pH meter calculate the difference in electrical potential between a pH electrode and a reference electrode, and so the pH meter is sometimes referred to as a "potentiometric pH meter". The difference in electrical potential relates to the acidity or pH of the quick fix. The pH sensor is used in many applications ranging from laboratory experimentation to quality control.

TURBIDITY: Turbidity is the significant calculation of suspended particles in a fluid. It can be soil in water or chocolate flakes in your favourite milk shake. While chocolate is something we want in our drinks, soil particles are totally unwelcome. Keeping aside the potable purposes, there are many quick fixes that make use of water in other way for an urgent need, a car uses water to clean the windshield, a power plant needs it to cool the reactors, washing machines and dish washers depend on water like fish. Now the question arises here: how do these devices get to know about the turbidity? We are blessed with nature's gift of sensing to find out soil in the water, but what about your washing machines? No eyes to see, no tongue to taste, no skin to feel but just a plastic body with some buttons and motor inside. How does it so smart to work as per soil suspension?? The answer to this is a 4.7 cm gadget: Turbidity Sensor, which along with a micro controller unit, takes care of turbidity calculations. Crafted with plastic and some metal-alloy traces, turbidity sensor consists of light to convey instruction about turbidity in water.

CONDUCTIVITY SENSORS: These sensors are defined as accommodated sensors which are used to calculate the electrical conductivity of water. Conductivity is a criterion for estimation of many fundamental physical possessions of water. For water, the capacity to conduct electrical current is mostly controlled on temperature and the amount of inorganic diffused solids. Salinity is briefed as the concentration of diffused solids. This means that, unitedly with temperature and depth data, a good extent of the salinity may be analyzed. By using the inductive principle, stable calculation can be obtained with¬out using electrodes

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that are simply infected and may deteriorate in the field.
TEMPERATURE SENSORS: An analog temperature sensor is fully simple to explain, it is a chip that tells you what the surrounding temperature is. These sensors use a solid state model to determine the temperature. Nowadays they don't use mercury (like old thermometers), bimetallic strips (like some stoves will be available in old homes), nor do they use thermistors (temperature sensitive resistors).By absolutely magnifying the voltage change, it is clear to implement an analog signal that is directly proportional to temperature. There have been some growth on the model but, fundamentally that is how temperature is calculated. Because these sensors have no operational parts, they are absolute, never deteriorate, don't need adaptation, work under many environmental situations, and are stable between sensors and readings. Also they are very economically and fully simple to use.
WATER LEVEL SENSOR: Water level sensor little vary from remaining sensors. A water level sensing device is designed to compute the level of water. A water level sensor is also described as the device used in the detection of the water level for various approaches. Water level sensors are of several types that contain ultrasonic sensors, pressure transducers, bubblers, and float sensors. Sometimes water level sensors are used to gather real time water level flowed.
ARDUINO UNO: Arduino is an open source electronics platform to use hardware and software. The boards are designed with sets of digital and analog input/output pins that may be merged to various addition boards or Breadboards (shields). You can suggest your board what to do by sending a set of commands to the microcontroller. To do so, you use the Arduino programming language, and the Arduino Software (IDE), based on Processing.

B. BLYNK APPLICATION

Blynk is an IoT platform with a drag and drop mobile application builder that grants to anticipate sensor data and control electronics in any place by using remote sensors. This app is readily available on the Android play store/OS app store. Blynk was developed for the Internet of Things.
There are three major components in this IoT platform:

1. Blynk App - It allows to you create an amazing consolidate for your project using various apparatus we provide.
2. Blynk Server- It is responsible for all the interactions between the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server. As it is defined as open-source, could easily handle many devices and can even be used on a Raspberry Pi.
3. Blynk Libraries- It is responsible for all the popular hardware platforms enable interaction with the server and process all the incoming and out coming commands.

C. SOFTWARE SPECIFICATION

1. Arduino IDE: The Arduino IDE is an open source application, which is simple to code and transfer it to the board. It runs on windows, Mac OS x, and Linux. A program for Arduino may be composed in any programming language for a compiler that constructs binary machine code for the target processor.
2. Blynk App: Blynk is an IoT platform with a drag-n-drop mobile application builder that allows to grant sensor data and control electronics in any place remotely. This app is readily available on the Android play store.
3. Embedded C: To Program a microcontroller we are using Embedded C which is similar to C programming language. To program an Arduino we are using Arduino IDE.

IV. IMPLEMENTATION

1. WORKING WITH SYSTEM PARTS

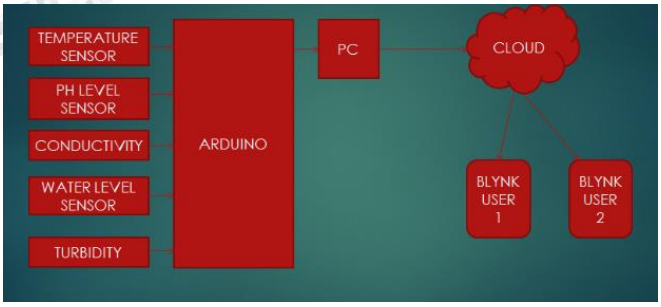

Fig: System architecture

A system design is the conceptual technique that defines the structure, behaviour and more views of a system. An architecture explanation is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviours of the system. A system design can compose system hardware components, the externally visible properties of those components, the relationships (e.g. the behaviour) between them. It can provide a plan from which products can be procured, and system developed, that will work together to implement the overall system.

The water calibre monitoring using IOT consists of three levels:

ISSN (Online) 2394-2320

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1. Level 1 consists of the sensor part
2. Level 2 consists of the cloud part
3. Level 3 consists of the user part

1. Sensor part

It consists of the sensors which is connected to the microcontroller .Temperature sensor measures the water temperature, pH measures the water ph(acidity or alkality) and etc.

2. Cloud part

Cloud computing is a type of Internet-based computing that supply with shared computer processing resources and data to computers and other devices on request. It is a model for enabling far apart, on-demand entry to a shared pool of configurable computing supply (e.g., computer networks, servers, storage, applications and services), which can be rapidly provisioned and free up with minimal management attempt. Cloud computing and storage solutions provide users and enterprises with various abilities to store and process their data in either privately owned, or third-party data centres that may be located a long way from the user–ranging in distance from across a city to across the world. Cloud computing relies on sharing of resources to achieve coherence and economy of scale, comparable to a utility (like the electricity grid) over an electricity network.

3. User part

It is an android phone which in which a Blynk app should be downloaded from the play store. Blynk is a Platform with ios and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. Following table represents the readings of water parameters based on purpose of using it:

Parameters/Water quality	Purpose of Drinking	Purpose of Irrigation
pH	6.5-8.5	6.5-8.7
Temperature	25-30 degree Celsius	50-100 degree Celsius
Conductivity	250-750uS/cm	400-900uS/cm
Turbidity	3.5-5	4-5
Water level	Preferably High	Medium

Table 1: Readings of water parameter with ranges

2. WORKING WITH BLYNK APPLICATION

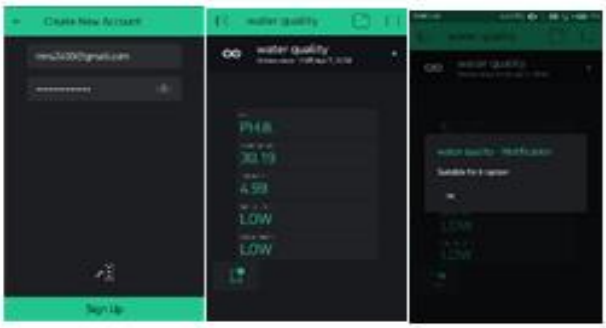

Fig 1: As per first point in Getting started.

Fig 2: shows the values of water parameter.

Fig 3: Shows the quality of water whether it suits for drinking or irrigation purpose.

Getting started

•Create a Blynk Account: After you download the Blynk App, you need to create a New Blynk account.

•Create a New Project: After you have successfully logged into your account, start by creating your new project.

•Choose Your Hardware: Select the hardware model which you will use to interface with blynk.

•Authentication Token: This is a unique identifier which is necessary to connect your hardware to your smartphone. Every new project that you create will have its own Authentication Token. You will get Authentication Token automatically on your email after project get created. If you want you can also keep that data manually.

•Add a Widget: Let's add a widget (button) to control our LED, because your project canvas is empty,

•Drag-and-Drop: Tap and hold the Widget to drag it to the new position.

•Widget Settings: Each Widget has its own settings. Tap on the widget to get in to them in order to change any settings.

•The most important parameter to set is PIN: The list of pins reflects physical pins defined by your hardware model. If LED is connected to Digital Pin 8, then select D8.

•Run the Project: When you are done with the Settings, press the PLAY button. This will moves you from EDIT mode to PLAY mode where you can interact with the hardware modules. While in PLAY mode, you won't be able to drag, press STOP and get back to EDIT mode.

Sending data to Blynk application

•You can send any data from Widgets in the app to your hardware: All Controller Widgets can send data to Virtual Pins on your hardware.

For example, code below shows how to get values from the Button Widget in the App
•When you press a Button: Blynk App sends 1and on the second click, it sends 0.
•Sending array from Widget: Some Widgets (Joystick) have more than one output.
•Getting data from hardware in two different ways like pushing data from your hardware to the Widgets in the app over Virtual Pins.
•Widget requests to perform
•Pushing data from hardware: If you need to PUSH sensor from your hardware to Widget, you can write any logic you want.
•We suggest sending data in intervals and keep away from Flood Error. You can use timers like Blynk Timer.

V. RESULTS AND CONCLUSION

As the system is well defined for low cost, efficient, time consuming, real time water quality monitoring has been tested and implemented. In the water quality monitoring system, when the sensors is switched on, they are activated to detect the individual water parameters (chemical and physical).The system can be expedient detection of water temperature, pH, conductivity, turbidity and water level. Then the collected data is transmitted to PC through wireless sensors. We proposed a prototype of easy to install technology by which the different surface of water (river, lake, etc.) quality can be evaluated. Through this system, the government officials can keep track of the levels of pollution occurring at some particular place where river is flowing and able to provide healthy environment for safe drinking water and irrigation purpose. This system can also help in preventing water borne diseases caused due to pollution which contains metals.

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