IoT Based Water Quality Monitoring System Using Raspberry Pi

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Abstract- This Project Proposes a system, that system performs water quality monitoring and Regulated water supply operation. We have some more sensor like pH,Turbidity,CO2. By using this sensor value, we calculate the continually and taking the data, analyze after any problem in the sensor value we will calculate to the water purity and sent the alert message to the authorized person by using the IOT Technologies. We have the purity sensor and pH sensor by using this we got the sensor values.

Water plays an important role in human daily life such as drinks of human, farming, livestock breeding and also manufacturing. However, urbanization modernization and industrialization had cause pollution to the clean water source for the usage agriculture. Therefore, it is vital to have a water quality monitoring tool which provides real-time water quality data and cover large area. Although the research of water quality monitoring system is widely done and applied, the current system is still expensive, small coverage and not user friendly. Moreover, most of the WQMS developed is not suitable for agriculture purpose due to the usage of unsuitable sensors. Thus, an affordable, large coverage and user friendly wireless water quality monitoring system with suitable sensors is proposed to assist the authority effectively in maintaining the health of the natural water source around the area. Here, a low-cost, large coverage and user friendly water quality monitoring system with multi sensor which is based on Wi-Fi Technology is presented. The process of designing the system involves three main parts which are hardware development, software development and also wireless network process. For hardware development part, different types of sensor will be employed and the sensors will be integrated with microcontroller. As for the software development, a few programming software is integrated for data acquisition, processing and displaying. Finally, for the wireless network process, wireless network module is used to for data transmitting and receiving while website is used to display the obtained data.

Keywords- ph,IOT,co2

I. INTRODUCTION

This In recent years, the pollution especially water pollution has become one of the major issues that are faced by countries around the world. The increase of amount of factory and vehicle had caused the emission of plague water and chemical to the river, sea and pond. Besides, the plagued air that is released to the atmosphere also causes acid rain to occur when the chemical is mixed with the water in the atmosphere. The acid rain will damage the building and reduce the lifespan of the building. Moreover, the use of excessive fertilizer in agriculture will lead to excessive nutrient such as nitrogen and phosphorus. The excess nutrient will cause the harmful algae blooms which will reduce the dissolved oxygen in the water and threaten the aquatic life.

Hence, it is important to monitor the water quality constantly so that immediate action can be taken to counter water pollution. Water quality is described as the general composition of water with reference to its chemical, physical and biological properties. Water is a limited natural resources and it is very essential for human beings. This is because nowadays, human uses water for daily chores such as hydration, washing, cooking and other. Aside from that, water is also a vital substance for most of the human activity such as agriculture, industrial manufacturing, animal rearing, etc. Therefore, it is necessary to maintain the water at high quality so that the water is save for the consumption of human and human activity. Nowadays, WQM are performed by integrating advance technologies to achieve a larger amount, more precise and accurate data for better data analysis. The technology such as microcontroller system and electrical and electronic sensors are implemented for a better result. Further improvement of WQM systems is done by applying the concept of wireless sensor network (WSN) and Internet of Thing (IoT) to achieve effective result in supporting the capture, analysis and transmission of water quality data . Besides the capability of the system to acquire and process data at various distributed spot in a short manner of time is also reducing the manpower require to perform the WQM . Realizing the advantages of integration between microcontroller system and WSN for WQM, this project is motivated to develop a low-cost WQM system with large coverage and user friendly based on Wi-Fi technology.

II. PROPOSED SYSTEM

Can check the quality of water through Web from where ever we want and if sensors recognized that water is drinkable the we can switch on the water motor from where ever we want. If the sensors detects that the water is not drinkable then we can switch off the motor from where ever we want.

III. BLOCK DIAGRAM

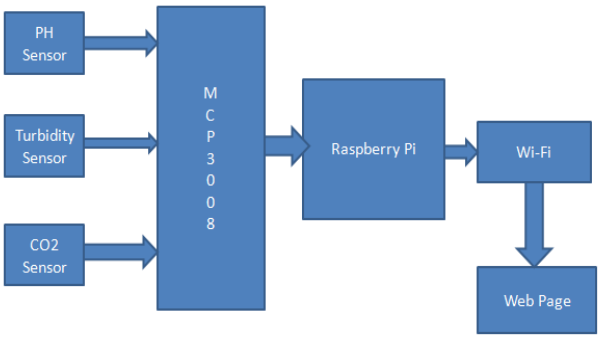

Fig.1: Block Diagram of IOT based water quality monitoring system using raspberry pi

BLOCK DIAGRAM EXPLANATION:

- Sensors Reads the Analog Information and sends the Data to MCP3008 IC(ADC)
- The Analog Values are Converted into Digital and Sent into the Raspberry pi Using SPI Protocol.
- Remote Monitoring of the Water Quality Using Webpage.

IV. HARDWARE TOOLS

A. Raspberry-pi

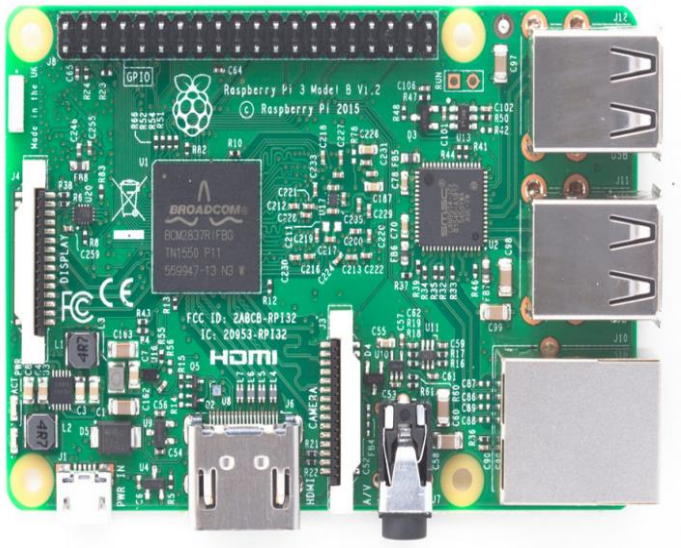

Fig.2: Raspberry-Pi

The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processer, 10x faster than the first generation Raspberry Pi. Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.

B. DC MOTOR

Fig.2: DC Motor

DC engines are arranged in numerous sorts and sizes, including brush less, servo, and apparatus engine composes. An engine comprises of a rotor and a changeless attractive field stator. The attractive field is kept up utilizing either changeless magnets or electromagnetic windings. DC engines are most regularly utilized in factor speed and torque. Movement and controls cover an extensive variety of parts that somehow are utilized to produce as well as control movement. Regions inside this class incorporate direction and bushings, grips and brakes, controls and drives, drive parts, encoders and resolves, Integrated movement control, restrict switches, straight actuators, straight and rotating movement segments, straight position detecting, motors(both AC and DC engines), introduction position detecting, pneumatics and pneumatic segments, situating stages, slides and aides, control transmission(mechanical),seals, slip rings, solenoids, springs.

C. PH Sensor:

The pH of a solution is the measure of the acidity or alkalinity of that solution. The pH scale is a logarithmic scale whose range is from 0-14 with a neutral point being 7. Values above 7 indicate a basic or alkaline solution and values below 7 would indicate an acidic solution. It operates on 5V power supply and it is easy to interface with arduino.The normal range of pH is 6 to 8.5.

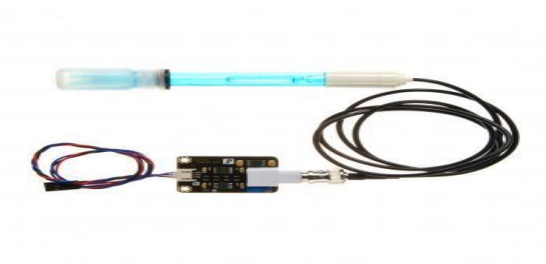

Fig.3: pH sensor

D. Turbidity sensor:

Turbidity is a measure of the cloudiness of water. Turbidity has indicated the degree at which the water loses its transparency. It is considered as a good measure of the quality of water. Turbidity blocks out the light needed by submerged aquatic vegetation. It also can raise surface water temperatures above normal because suspended particles near the surface facilitate the absorption of heat from sunlight.

Fig.4: Turbidity sensor

E. CO2 sensor:

Carbon dioxide (CO2) sensors for monitoring the Indoor Air Quality (IAQ) are required in modern building with ventilations to insure the wellbeing of the occupants by adapting the ventilation rates to their needs. As the continuous ventilation of thermally isolated buildings contributes to the energy consumption CO2 sensors will be used to optimize ventilation rates to lower the energy dissipation

Fig.5: CO2 Sensor

V. SOFTWARE TOOLS

5.1.Linux

Linux is a free open source working framework and it has a place with the Unix working frameworks. In reality Linux implies the piece itself which is the core of the working framework and handles the correspondence between the client and equipment. Regularly Linux is utilized to allude to the entire Linux dispersion.

Linux appropriation is a gathering of programming in view of the Linux Kernel. It comprises of the GNU-task's parts and applications. Since Linux is an open source venture, anybody can alter and circulate it.

5.2 Raspbian Wheezy

Raspbian Wheezy is a free working framework in view of Debian appropriation. It is made by a little group of designers who are enthusiasts of Raspberry Pi. Raspbian is improved for the Raspberry Pi's equipment and it accompanies more than 35 000 packag-es and pre-incorporated programming. Raspbian is still under dynamic advancement and it intends to enhance the solidness and execution of the Debian bundles

5.3.Python

Python is a multi-worldview programming dialect: protest arranged programming and organized writing computer programs are completely upheld, and there are various dialect highlights which bolster practical programming and viewpoint situated programming (counting by meta programming and by enchantment strategies). Numerous different standards are bolstered utilizing expansions, including configuration by contract and rationale programming.

5.4.Open-cv

OpenCV-Python is the Python API of OpenCV. It joins the best characteristics of OpenCV C++ API and Python dialect. OpenCV Python is a universally useful programming dialect begun by Guido van Rossum, which turned out to be extremely mainstream in brief time fundamentally due to its effortlessness and code lucidness. It empowers the software engineer to express his thoughts in less lines of code without decreasing any clarity. Contrasted with different dialects like C/C++, Python is slower. In any case, another vital component of Python is that it tends to be effectively reached out with C/C++. This component causes us to compose computationally concentrated codes in C/C++ and make a Python wrapper for it so we can utilize these wrappers as Python modules. This gives us two favourable circumstances: first, our code is as quick as unique C/C++ code (since it is the real C++ code working in foundation) and second, it is anything but difficult to code in Python. This is the manner by which OpenCV-Python works, it is a Python wrapper around unique C++ execution. Furthermore, the help of Numpy makes the errand more less demanding. Numpy is an exceedingly upgraded library for numerical tasks.

VI. RESULT

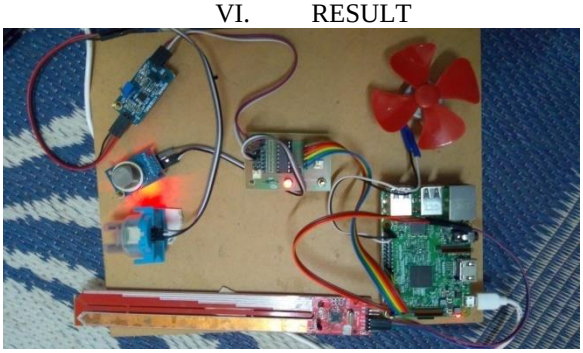

Fig.6: Hardware Design

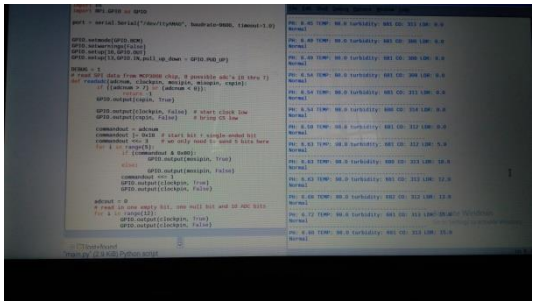

Fig.7: Resultant sensor values of pH, turbidity and co2

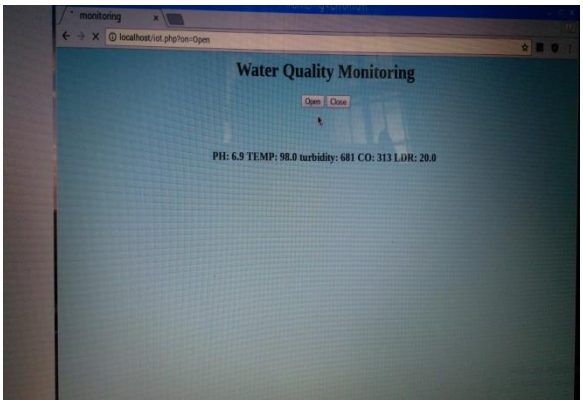

Fig.8: Webpage for to monitor the water flow

VII. CONCLUSION

Our project "IOT Based Water Quality Monitoring System Using Raspberry Pi" focused on analyzing the water quality with high performance, real time and accurate. In our proposed system we have measured pH, Turbidity, and co2 values of water with the help of Raspberry Pi and various Sensors. Water quality monitoring information is used to protect human health, to preserve and restore healthy ecological conditions, and to sustain a viable economy.

VIII. REFERENCE

[1]. Nikhil Kedia, Water Quality Monitoring for Rural Areas- A Sensor Cloud Based Economical Project, in 1st International Conference on Next Generation Computing Technologies (NGCT-2015) Dehradun, India, 4-5 September 2015. 978-1-4673-6809-4/15/$31.00 ©2015 IEEE

[2]. Jayti Bhatt, JigneshPatoliya, Iot Based Water Quality Monitoring System, IRFIC, 21feb,2016.

[3]. Michal lom, ondrejpriby&miroslavsvitek, Internet 4.0 as a part of smart cities, 978-1-5090-1116-2/16/$31.00 ©2016 IEEE

[4]. Zhanwei Sun, Chi Harold Liu, ChatschikBisdikia_, Joel W. Branch and Bo Yang, 2012 9th Annual IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks

[5]. (SECON), 978-1-4673-1905-8/12/$31.00 ©2012 IEEE

[6]. SokratisKartakis, Weiren Yu, Reza Akhavan, and Julie A. McCann, 2016 IEEE First International Conference on Internet-of-Things Design and Implementation, 978-1-4673-9948-7/16 © 2016IEEE

[7]. MithailaBarabde, shrutiDanve, Real Time Water Quality Monitoring System, IJIRCCE, vol 3, June 2015.

[8]. AkankshaPurohit, UlhaskumarGokhale, Real Time Water Quality Measurement System based on GSM , IOSR (IOSR-JECE) Volume 9, Issue 3, Ver. V (May - Jun. 2014)

[9]. Eoin O'Connell, Michael Healy, Sinead O'Keeffe, Thomas Newe, and Elfed Lewis, IEEE sensors journal, vol. 13, no. 7, July 2013, 1530-437x/$31.00 © 2013 IEEE

[10]. Nidal Nasser, Asmaa Ali, Lutful Karim, Samir Belhaouari, 978-1-4799-0792-2/13/$31.00 ©2013 IEEE

[11]. Niel Andre cloete, Reza Malekian and Lakshmi Nair, Design of Smart Sensors for Real-Time Water Quality monitoring, ©2016 IEEE conference.

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