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Real Time Water Contamination Monitoring System using IoT to avoid Water borne diseases in Textile Cluster Areas

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ABSTRACT

The Internet of things is that the network of vehicles, physical devices, embedded with sensors, which enables these objects to connect and exchange data. In today's world automatic systems are more preferred than manual system. This paper propounds a design for monitoring the water contamination in water sources based on IOT. Currently, many water monitoring system are used to monitor the purity parameters of water like Ph, turbidity, temperature using Arduino. This has a disadvantage in that the small amount of water is monitored and there is no system to monitor the water sources like river. In our system we use NodeMCU used to control and monitor the sensor and send a notification using WiFi. Turbidity level of water is displayed in the LCD. If the turbidity level of water gets increased then the notification message is send to the media people using IFTTT service. By implementing this system, we can bring the awareness among people about the water pollution in the Textile Cluster Areas. Thus we can prevent the water sources from the pollution.

Keywords – IOT, NodeMCU, Turbidity sensor, Water Contamination Monitoring, WiFi Module

I.INTRODUCTION

India is one of the largest textile exporters in the world. Presentation of New financial arrangement and evacuation of standard framework has additionally energized the development of fares throughout the years. Tirupur, Tamil Nadu is one of the biggest supporters of India's material yield, and has 4,000 units in this business. It in this way, contributes a critical piece of India's outside trade. Coloring and dyeing units, for the most part primitive, are directing out expansive amounts of effluents. The ceaseless stream of untreated gushing water has made serious contamination of air, water and land. The wellbeing economy and tranquility of individuals are methodically influenced by the surges of toxic substance discharged by the tanneries consistently, in-cognizant of their natural, ecological, monetary and organic impact reporting in real time, water arrives, plants, individuals and the cattle. The turbidity of lakes is profoundly powerful. Worldly varieties of the water turbidity are among the most vital components that impact watched examples of species abundance, composition and organic instruments. The water turbidity dynamic has been credited to factors including phytoplankton, the focus and character of suspended silt, debris and supplement facts.

The ground water, soil and water bodies, thus have debased up to a vast expand. 700 coloring units release 100 million liters of untreated emanating each day. Therefore, slop has collected generally in Noyyal. Additionally, 20,000 sections of land of land downstream have been rendered unfit for development. The frequency of natural exposures on the general status of wellbeing has been progressively recognized for various sicknesses. The innovative risky waste may indicate impacts as far as death and horribleness. This may show as respiratory ailments, skin responses, sensitivities, decrease of vision, corneal mistiness, fetus removal, abnormality of pregnancy, hindered development, neurological scatters, mental despondency, mental changes, adjusted safe reaction chromosomal distortions and tumor.

This paper includes the outline and usage of a sensor pack that is mounted close to the lake shore. The LCD display used in unit to advertise turbidity, temperature levels. Turbidity alludes to the lucidity of the water or the measure of particles in it. It is generally the case that water nature of open lakes is infrequently observed in a straightforward way for people in general to see.

II. LITERATURE SURVEY

The authors [1] Vaishnavi ,V. Daigavane and Dr. M.A Gaikwad propound a design for say Water Quality Monitoring System Based on IOT. The hardware part has sensors which help to measure the real time values, another one is arduino atmega328 converts the analog values to digital one, & LCD shows thse displays output from the sensors. In software they developed a program based on embedded c language. BLYNK app is installed in the android handset to see the output. When the system gets started dc current given to the kit and arduino and WIFI gets on. The parameters of water are tested and their result is given to the LCD display. The app went provided with hotspot gives the exact value as on LCD display shows on kit.

The authors [2] Rohit Kamble, Sagar Kakade, Abhijeet Mahajan And Akshay Bhosale propound "Automatic Water Quality Monitoring System Using Arduino" .This paper ensures the automatic water quality monitoring system which gives the data about quality of water on a webpage. By using this data we will know that how much quality have the water. When some access the webpage, data will display on it. The different water parameter sensor is connected to Arduino. The system uses GPRS module for wireless data transfer. This GPRS module is connected to Arduino and it will send data to webpage through GPRS. They create webpage and it also provides security. GPRS module sends data via internet it will upload on created Web GUI.

The authors [3] Dr.K.Karuppasamy M.E., Ph.D, B Abinaya, R Sudha, J P ArunPrasath entitled "Water quality monitoring and control using wireless sensor networks". This paper ensures the lake monitoring by measure water pH, conductivity, dissolved oxygen (DO) and temperature t hat provides some important service such as water for drinking, domestic purpose, sites for recreational activity, and important fisheries and also agricultural purpose. In this system the WSN system gateway is one of the most essential and unique block. From multiple sensor nodes the gateway node collect all received information. The developed gateway is equipped with microcontroller unit, Global System for Mobile Communication (GSM) module, Zigbee transceiver and power supply. Through the Zigbee transceiver PIC16F877A microcontroller is used to acquire and process received

sensor data from WSN sensor nodes. The GSM module residing on top of the gateway node is used to communicate with the cellular network to forward the Short Message Services (SMS) data to specified stockholders. This is quad-band low power consumption Global System for Mobile Communications (GSM)/GPRS module. In these it needs a user SIM to transmit the resulting values.

The authors Pradeepkumar M ,Monisha J , Pravenisha R , Praiselin V, Suganya Devi K [4] entitled "The Real Time Monitoring of Water Quality in IoT Environment". This paper describe Routinely monitoring parameters of water quality are temperature, pH, turbidity, conductivity, dissolved oxygen (DO), chemical oxygen demand (COD), biochemical oxygen demand (BOD), ammonia nitrogen, nitrate, nitrite, phosphate, various metal ions and so on. By the advantages of sensors, Monitoring of Turbidity, PH & Temperature of Water is designed and developed. The measured values from the sensors can be processed by the core controller. By the use of cloud computing we can see the sensor data on internet.

The authors [5] Cho Zin Myint*, Lenin Gopal*, and Yan Lin Aung say "WSN-based Reconfigurable Water Quality Monitoring System in IoT Environment". The system consists of a set of water quality sensors to monitor conductivity, pH, and turbidity, a compact reconfigurable I/O (RIO) real-time embedded controller and an FPGA. In the system, the implementation of processing algorithms is difficult due to FPGA data representation format. Since the WSN platforms are used in IoT environmental monitoring applications for more cost effective and time.

"An IoT Based System for Water Quality Monitoring" [6] monitors the necessary water parameter which include several chemical parameters. Some of these are: pH, redox potential, conductivity, dissolved oxygen, ammonium and chloride ion amount. There is need to improve existing system for monitoring water bodies, given that laboratory methods are too slow to develop an operational response and does not provide a level of public health protection in real time. Due to the vast increase in global industrial output, rural to urban drift and the over-utilization of land and sea resources, the quality of water available to people has deteriorated greatly. The high use of fertilizers in farms and other chemicals in sectors such as mining and construction have contributed immensely to the overall reduction of water quality globally.

The authors [7]Mr. Swapnil Katole , Prof. Yogesh Bhute say "The Real Time Water Quality Monitoring System based on IoT". This system consist of several sensors (temperature, pH, turbidity, conductivity) is connected to core controller. The core controller are accessing the sensor values and processing them to transfer the data through internet. Ardunio is used as a core controller. The sensor data can be viewed on the internet using cloud computing with a separate IP address.

The authors [8]Pragati Damor1, Kirtikumar J Sharma2 presents "IoT based Water Monitoring System". In design various controller like Arduino Uno, Raspberry PI b+ are used as a core controller. The invented system is used some IoT modules for accessing sensor data from the core controller to the cloud. The data which is obtained from the sensors can be shown on the internet and provides facilities for screening the data on mobile phones or web application.

III. WATER CONTAMINATION MONITORING

3.1 SYSTEM REQUIREMENTS

The system is implemented with the three main components namely NodeMCU, turbidity sensor, LCD

3.2 HARDWARE REQUIREMENTS

3.2.1 NodeMCU

NodeMCU is a is a open source IoT platform. It is a 32bit microcontroller that is built baesd on ESP2866. ESP8266 is a low cost microchip that contains Wi-Fi with TCP/IP stack and microcontroller. This allows microcontroller to connect to the Wi-Fi network.

Various microprocessors and microcontrollers are used to design a NodeMCU board. These boards are embedding with set of analog and digital input/output pins that may be interfaced to various circuits. These boards provide features of serial communications interfaces.

It also includes Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. It is programmed using Ardunio IDE (Integration Development Kit).

Figure 1: Arduino UNO

3.2.2 Turbidity sensor

Turbidity sensor is the device that measures the amount of light that is scattered by the suspended solids in the water. If the amount of Total Suspended Solids (TSS) increases, the water turbidity level(haziness or cloudiness) will also increase. Turbidity sensors are mainly used in river and stream gagging, control instrumentation for setting ponds, waste water and effluent measurements, laboratory measurements and sediment transport research.

Figure 2: Turbidity sensor

3.2.3 LCD

LCD is Liquid Crystal Display. LCD uses a flat panel display technology. It is commonly used in TV screen and computer monitors. It is also used in screens for mobile such that laptops, smart phones and tablets.

LCD uses a backlight that provides lights to a individual pixels arranged in rectangular grid. Each pixel in a grid has a red, green, blue the RGB sub pixel that can be turned off or turned on. When the pixel's sub pixels that is all sub pixels turned off, it appears black. If all sub pixels are turned on, it will appear in white color. By adjusting the colors of sub pixels, it will form a million of colors.

Early LCD uses the passive matrix screens, which controlled by sending charge to their row and column. Since low number of electrical charges will be sent at each second. Latest LCD uses a active matrix display that contain Thin Film Transistor (TFT). These transistors comprise capacitors that allow individual pixels to "actively" retain their charge. Hence the active matrix LCD's are more efficient and appear more responsive than passive matrix displays.

Figure 3: LCD

3.3 SOFTWARE REQUIREMENTS

3.3.1 Arduino IDE

The Arduino IDE is an Integrated Development Environment cross-platform Java application that serves as a code editor and compiler and is also capable of transferring firmware serially to the board. The development environment is based on processing, an IDE designed to introduce programming to artists unfamiliar with software development. The programming language is derived from Wiring, a C-like language that provides similar functionality for a more tightly restricted board design , whose IDE is also based on Processing. The open-source Arduino software (IDE) makes it easy to write code and upload it to the board. It runs on the windows, Mac OS X , and Linux. The environment is written in Java. This software can be used with any Arduino board and NodeMCU board.

3.3.2 SYSTEM DESIGN

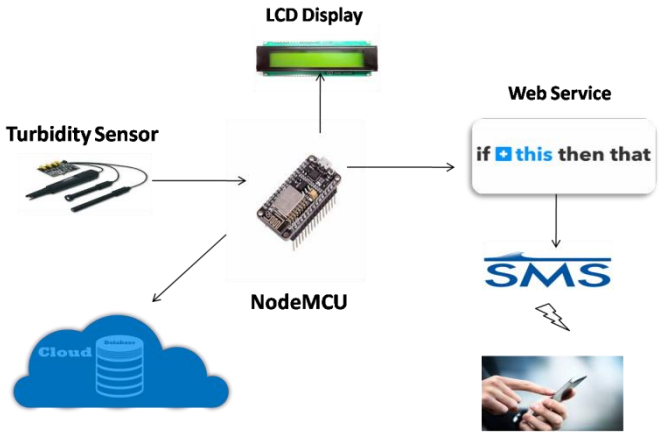

Figure 5.1 : System design

The proposed system functions with the **NodeMCU** for automatic monitoring of water contamination. Turbidity level of water is measured by Turbidity sensors. The data retrieved from the sensor is sent as input to the NodeMCU. LCD is connected to the NodeMCU, this will show the turbidity level on the screen. Also NodeMCU checks the turbidity level. IFTTT (IF THEN THIS THAT) is a web service used for sending messages. If turbidity level reaches the critical level then the IFTTT service gets invoked through the Wi-Fi module that presents in the NodeMCU. IFTTT will automatically send messages to the media people that we specified as recipients. Thinkspeak is a cloud platform to store data. This also invoked using Wi-Fi module in the NodeMCU. Whenever NodeMCU gets a data from the sensor the data will be automatically sent to the thinkspeak platform.

3.3.3 FLOW DIAGRAM

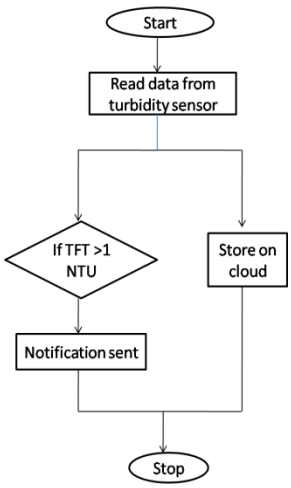

Figure 6: Flow Diagram

The above flow diagram represents the step by step process of turbidity sensor, LCD and NodeMCU.

IV. SYSTEM OPERATION

Turbidity Sensor is set with the polluted water. Turbidity Sensor measures the turbidity level. LCD display is included to display the turbidity level. NodeMCU acts as a controller of the system to communicate with the Sensor. Sensor data is retrieved and store it to the cloud using Wi-Fi module in the NodeMCU. IFTTT used for sending messages to the media. If turbidity increases the IFTTT get invoked using Wi-Fi module in NodeMCU.

V. CONCLUSION

This work is focused on the critical evaluation on the role and reliability of the lake monitoring system in Textile Cluster Areas. Primary and secondary resources were used in the project execution. For the primary data, a survey has been conducted in the areas of Namakkal, Tirupur and Erode districts. Secondary resources derived from various publications including books and journals were integrated to support the findings. Based on the results of the various test cases, system functionalities were validated. The test results agree that this solution is capable of monitoring the Turbidity level and water temperature. It provides notifications by enabling various triggering actions under varied conditions. The integration of NodeMCU technology in administering this project also made this system a cost-effective product.

VI. FUTURE WORK

The proposed system could be implemented with mobile notification that is notification is sent to the android mobile phones. It could be implemented to send notification to the ios phones. So this project will convenient for all type of mobile users.

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