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Smart Water Monitoring System

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Abstract - Water is important to human life and the health of the environment. To provide the good quality of water required by the people we developed IoT based water quality monitoring automation system. To design a system we measured water flow, quality of water i.e purity, etc. water parameters using various sensors. In this paper, we proposed a smart sensor interface device that integrates water flow monitoring, water purity monitoring, and water wastage monitoring. We used a turbidity sensor to check the water purity, a flow sensor to detect water flow in pipelines, GSM (Global System for Mobile communication) module to send the message to the user, and an Arduino mega board to control all flow of the system. By placing this system in smart places, we will be able to collect and analyze the water usage patterns of the residents and save a lot of water from wastage.

Keywords:- Sensors, Ardunio, Flow Sensor, GSM (Global System for Mobile communication), Automation, etc.

1 INTRODUCTION

Wwater is an essential need for human survival but due to the rapid pace of industrialization and greater emphasis on agricultural growth combined with latest advancements, agricultural fertilizers and nonenforcement of laws have led to water pollution to a large extent. The availability of good quality water is paramount in preventing outbreaks of water-borne diseases as well as improving the quality of life. In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. The internet of Things (IoT) is a revolutionary concept that has the potential to turn virtually anything to smart. IoT provide interface to monitor and operate remotely from anywhere and anytime.

Water quality refers to the chemical, physical, biological, and radiological characteristics of water. In this work Water quality is calculated by turbidity sensor. Water pollution monitoring system can help to detect the water pollution that means the quantity of pH and the temperature of the water. The flow of water is also the important thing to avoid the wastage of water. So, to ensure safe supply of drinking water and to avoid wastage of water we are proposing a Smart Water monitoring automation System using the techniques of different sensors (Internet of Things) and Analytics. The existing liquid level control systems are widely used for monitoring of liquid levels, reservoirs, silos, and dams etc. The proposed system is used for home / office.

2 Literature Survey

To Designed a good quality model we studied out different existing system developed by researchers. Different authors have proposed distinguished models to check water quality, water leakage by analyzing the parameters such as temperature, pH and electrical conductivity, pressure and so on. By considering all these points we designed a smart water monitoring system which can perform all these monitoring functions.

Bhad Vidya et al. [1] has proposed a system which monitors the water level periodically. They designed a zigbee network which has lower energy and real time behavior. It helps to wireless sensor network to send the notification message to the mobile application user and digital notification board. A microcontroller, water level sensor and a pair of Raspberry pi and DAS have been used to design the system. The Sensor used to detect the water level, then the data will go to transmit and receive through the Raspberry pi and the whole procedure is then control by this unit.

Mithila Barabde et al. [2] 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. The system architecture consists of data monitoring nodes, a base station and a remote station. All these stations are connected using wireless communication link. For developing this system they have considered the parameters such as pH, conductivity, turbidity level, etc that are analyzed to improve the water quality. These parameter readings were sent to the remote monitoring station to display in visual format on a server PC with the help of MATLAB and is also compared with standard values. If the obtained value is above the threshold value automated warning SMS alert will be sent to the agent.

Jayti bhatt et al. [3] were proposed IOT based water quality monitoring system to ensure the safe supply of drinking water in real time. Water parameter such as pH, turbidity, conductivity, dissolved oxygen, temperature is considered to check the water quality. The measured values from the sensors are processed by microcontroller and these processed values are transmitted remotely to the core controller that is raspberry pi using Zigbee protocol. Zigbee module is connected to controller which manages data coming from different devices. To transmit the data to IoT, a gateway is created on the raspberry pi using FTP. A separate IP address is provided which make possible to monitor data from anywhere in the world using the internet.

3. Components of System

In the proposed smart water quality monitoring automation system, water quality monitoring, and water flow management is designed. The hardware smart water quality monitoring automation system comprises the following components:

3.1 Arduino Mega Board

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board -- you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

Arduino Mega Board

3.2 Water Flow Sensor

Sensors play a very crucial role in today's automatic systems. Being a small, low cost and reliable device, sensors are easy to embed with larger electronics. Today we can find various types of sensors in the market. With the advance in technology, sensors are also evolved in their functioning and size. From the early size of cm units, size of sensors has shrunk to the scale of nm. Sensors have also solved many challenges of electronic and electrical engineering such as finding the intensity of ambient light, determining the temperature in the furnace, calculating humidity of surrounding, etc…. Water flow sensor gives an amazing solution for measuring the flow rate of liquids.

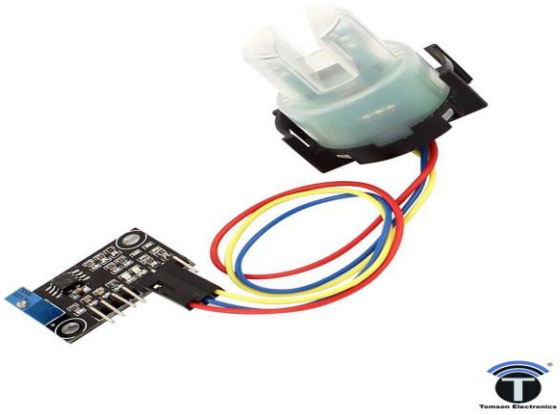
Water flow sensors are installed at the water source or pipes to measure the rate of flow of water and calculate the amount of water flowed through the pipe. Rate of flow of water is measured as liters per hour or cubic meters.

A flow sensor is used for flow measurements to find the leakage in a pipe. Accurate flow measurement is an essential step both in the terms of qualitative and economic points of view. This sensor sits in line with the water line and contains a pinwheel sensor to measure how much water has moved through it. There is an integrated magnetic Hall-Effect sensor that outputs an electrical pulse with every revolution.

Water Flow Sensor

3.3 Turbidity Sensor

Turbidity, the measure of suspended solids in liquids, is utilized as a measure of water quality and can be leveraged as a way for processors to slash waste, improve sustainability, and control consumables. Turbidity Meters are engineered to detect the instant a liquid media reaches a pre-defined specification With the use of LED light sources, turbidity meters determine the level of particulate matter in water or other fluids. Anderson-Negele, our turbidity partner, defines turbidity as "the phenomenon whereby a specific portion of a light beam passing through a liquid medium is reflected by undissolved particles. The sensor measures the light that is reflected by these particles to determine their concentration in the liquid." For example, purified water would have nearly zero undissolved particles, while ice cream mix has a high concentration.



Turbidity Sensor

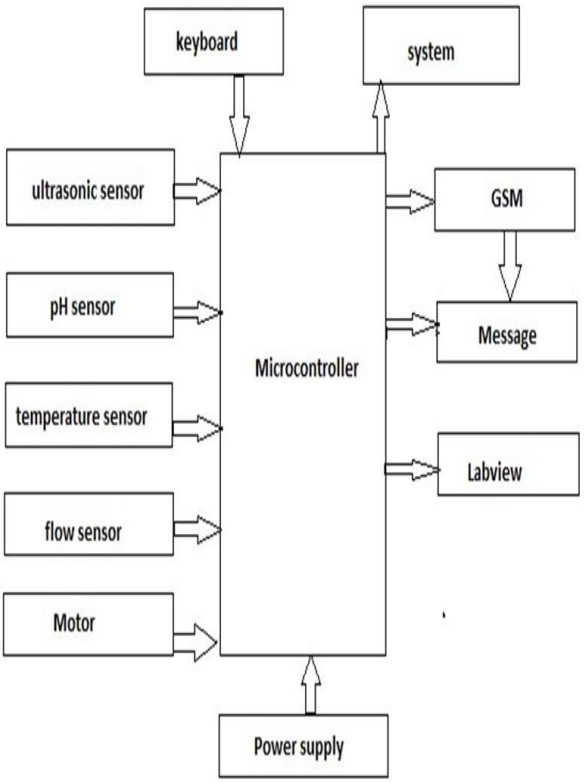
3.4 GSM (Global System for Mobile communication)

GSM is a mobile communication modem; it stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is a widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operating at the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands.

GSM Module

GSM technology was developed as a digital system using the time division multiple access (TDMA) technique for communication purposes. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has the ability to carry 64 kbps to 120 Mbps of data rates.

4 Architecture Diagram



5 Methodology

5.1 Water quality monitoring

Water quality monitoring system is very important for measure the quality of the water. To measure the quality of water we use the pH and the temperature sensor. The pH stands for "Potential of Hydrogen," referring to the amount of hydrogen found in water. pH is measured on a scale that runs from 0 to 14. 7 is neutral, meaning there is a balance between acid and alkalinity. A measurement below 7 means acid is present and a measurement above 7 is basic (or alkaline).

The second parameter is a temperature. Temperature will also affect the equilibrium and the pH. In pure water, a decrease in pH of about 0.45 occurs as the temperature is raised by 25 °C. We kept the pH probes and temperature sensor in the water for two minute and recorded the pH value and temperature value that was displayed on the meter screen on Labview.

In this water quality monitoring system if the value of pH sensor is greater than 7 then it will be send the message to the

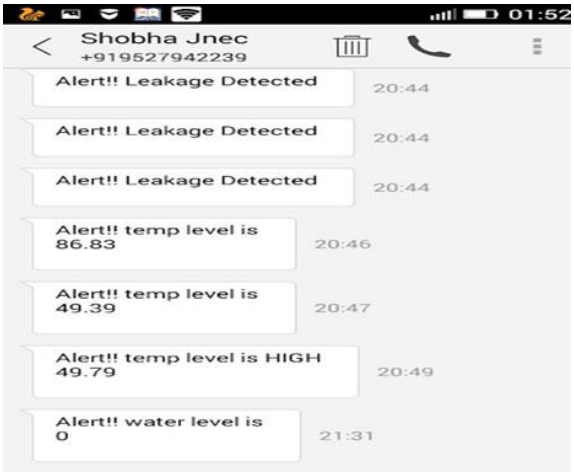
user and if the temperature is greater than 50 then also the GSM send the message to the user.

5.2 Flow check

In the water measuring system for measuring the flow, we use the flow sensor to measure the flow of the water. In our system, we use flow sensors to measure the flow of water. Using the flow of water we are calculating the water in liters.

5.3 message send

We are sending messages to the user by GSM module with the desired output.



7.3 Conclusion

The system can monitor water quality automatically, and it is low in cost and does not require people on duty. This system is used to avoid the huge amount of water is being wasted by uncontrolled use of home/offices etc. So the water quality testing is likely to be more economical, convenient and fast. This designed smart water system can be easily applied to home, offices, and schools and at any places where water tanks are used. By placing this system in a smart building, we will be able to collect and analyze the water usage patterns of the residents and save a lot of water from wastage. This is the small contribution from our side to save and supply good quality of water.

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