

Automated Water Management and Leakage Detection System using IOT

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Abstract: Water is essential to human life. It is most precious not only for the human race but also for all the living things in the planet. It serves us in 360 degrees starting from households to hydroelectric plants of our life and so on. So it is very important and responsibility of everyone to manage the water in an efficient way. In this paper we propose an efficient water monitoring system based on the Internet of Things. If we keep wasting water continuously it can be very dangerous problem in future. We should start saving water from ourselves. There are various ways through which water get wasted. Leakage plays a vital role in water wastage. Whenever there is leakage somewhere we couldn't get it in initial stage but when it becomes a huge problem it causes large wastage of water. So it is better to take action immediately as soon as leakage takes place. In order to give a solution, we put forward a system that monitors the water level, water quality and water leakage using various sensors. The ultrasonic sensor and flow sensor senses the water level and the water leakage respectively. Once the flaw is identified, it is informed to control room through the internet (Email, twitter, SMS) and also nearby people can be informed in time. By placing this system, we will be able to collect and analyze the water usage patterns of the residents and save a lot of water in small as well large scale in future.

Keywords : Water, IoT, Sensors, Internet

I. INTRODUCTION

Water is an essential need for human survival but due to rapid pace of industrialization and greater emphasis on agricultural growth combined with latest advancements, agricultural fertilizers and no enforcement 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.

Water quality refers to the chemical, physical, biological, and radiological characteristics of water. In this work Water quality is calculated by considering waters physical (temperature. Water pollution monitoring system can help to detect the water pollution that means temperature of the water.

The pipe leakage detection is also the important thing to avoid the wastage of water. A lack of appropriate leakage analysis and monitoring can result in repairs that are ineffective in controlling or reducing leakage

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. To ensure safe supply of drinking water and to avoid wastage of water we are proposing a Water monitoring automation System using the techniques of different sensors (Internet of Things).

II. RELATED WORKS

Various efforts have been made up till now in monitoring water level & accordingly controlling dam gate. The input of work in this area is mentioned below IOT based water supply monitoring and controlling system^[1]

The paper is mainly based on the nonstop and real time monitoring of water supply in IOT platform. Water supply with continuous monitoring makes a proper distribution so that, we can have a record of available amount of water in dams, flow rate, abnormality in distribution line. Monitoring is performed from anywhere as administrative center. The free server pushes data continuously on cloud so that we can see and manipulate the data in real time operation. Using different sensors with controller and raspberry pi as Minicomputer can monitor data and also control operation from cloud with efficient client server communication.

Advantages:

Using this system ,we can have a secure and continuous monitoring

No need to go on field for monitoring so manual work has reduced it makes system more efficient, reliable, low cost and accurate

we can monitor the data from anywhere and controlling is possible from a remote server

Disadvantage:

Need of continuous monitoring, water supply scheduling and proper distribution

Water Level Monitoring and Dam Gate Control over IOT^[2]

A dam is a barrier that arrests water. Dam serves the purpose of storing water while other structures such as floodgates are to prevent water flow into specific land regions. The dam gate collapse when the water level in the dam exceeds certain level. Water level in a dam needs to be maintained effectively to avoid such complications. The quantity of water released

is hardly ever correct resulting in wastage of water & it is impossible for a man to precisely control the gates without knowledge of exact water level and water inflow rate. Water level sensors are placed in dam to serve the similar purpose automatically and forward the status to raspberry pi. Raspberry pi unit checks that input and upload the status of water level on web. Each and every variation of water level is informed to control room through the internet (using blynk application) and nearby people can be informed in time thus saving lots of lives and avoiding the unpleasant scenarios

Advantage:

Saving lots of lives avoiding unpleasant scenarios .It is possible to have real prototyping of this module in river by using float sensors which will monitor & control the water level & take necessary decisions according from any place

Wireless Disaster Monitoring and Management System for Dams^[3]

Radical change in environmental conditions and geographical conditions causes big disasters. To save lives, monitoring of these changes is a big challenge. Along with monitoring, corresponding action to be taken within time limit is also important. To achieve this objective timely information about it is required. In this paper a Zigbee based system is proposed for disaster monitoring and management. Paper talks about wireless monitoring of water levels of group of dams and due to drastic change in water level in any river/lake, when to open the gate of which dam and upto which limit. It is decided with the help of sensory data collected from different nodes, placed over an area. The system comprises three parts, sensor nodes, local control room and centre control room. The monitoring is done with the help of data collected from sensor nodes (comprising water level sensor and rain sensor) and discharge sensors are used to control the opening of gates up to certain limit. All the decisions are taken through centre control room, by giving commands to different local control rooms after observing conditions of all areas. A hooter is also available with local control room node to indicate danger alert if water level crosses danger level.

Smart water leakage detection system using wireless sensor network^[6]

This paper focuses on an application of wireless sensor networks for leakage detection in underground water pipes to overcome the problem of water dispersion in water distribution networks. Leakage prevention and breaks identification in water distribution networks are fundamental for an adequate use of natural resources. To address this problem, and simplify the leakage identification process, the authors have designed a wireless network system making use of mobile wireless sensors able to detect breaks and save energy, time and cost with having Smart Water Leakage Detection (SWLD) in pipelines, measure water level in tank and control in pump to turn it on when water level is low. It focuses mainly on two parts: The first part is alarm based on Global System for Mobile technology (GSM) to send Short Message Service (SMS) to the owner. The system is made up of basic components: sensors, GSM module, Adriano, relays to control the device. The second is the controlling part; it uses Android application mobile to control the pump. The result of using the proposed system is improving the

efficiency of operation, reducing delay time and cost of maintenance pipelines after leakage detection.

Advantages:

Reduced delay time and cost of maintenance pipelines after leakage detection.

Water Quality Monitoring System Using Zigbee Based Wireless Sensor Network^[7]

The application of wireless sensor network (WSN) for a water quality monitoring is composed of a number of sensor nodes with a networking capability that can be deployed for an ad hoc or continuous monitoring purpose. The parameters involved in the water quality determination such as the pH level, turbidity and temperature is measured in the real time by the sensors that send the data to the base station or control/monitoring room. This paper proposes how such monitoring system can be setup emphasizing on the aspects of low cost, easy ad hoc installation and easy handling and maintenance.

The use of wireless system for monitoring purpose will not only reduce the overall monitoring system cost in term of facilities setup and labor cost, but will also provide flexibility in term of distance or location. In this paper, the fundamental design and implementation of WSN featuring a high power transmission Zigbee based technology together with the IEEE 802.15.4 compatible transceiver is proposed. The developed platform is cost-effective and allows easy customization. Several preliminary results of measurement to evaluate the reliability and effectiveness of the system are also presented.

III. SYSTEM ARCHITECTURE

The control system is designed in such a way that it automatically monitors and control's the water levels, water quality and leakage detection in tanks, dams, pipe, home etc. We are using the Arduino Nano to control the management and leakage detection in any type of objectives

The measured sensor details will be send to control room and are display on mobile app, laptop. The condition about this system is updated to the web server using IOT through Blynk app.

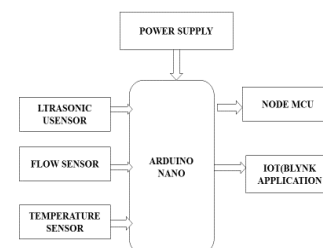


Fig 1.1 Block Diagram

IV. IMPLEMENTATION RESULTS

Water Level Monitoring

The Ultrasonic sensor is used to monitor the level of the water. It is achieved by measuring the distances. The distance can be calculated using the given formula

Distance=(speed of sound*time taken)/2 objects

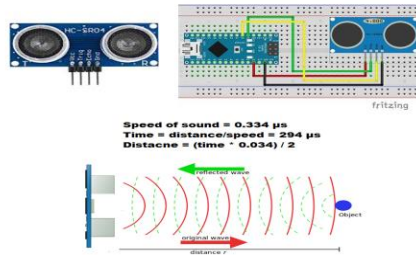


Fig 1.2 Water Level Monitoring using Ultrasonic sensor

WATER QUALITY MONITORING

The water quality is monitored by the DHT11 sensor. In this the impurities ,chemical compositions and the temperature of the water are monitored

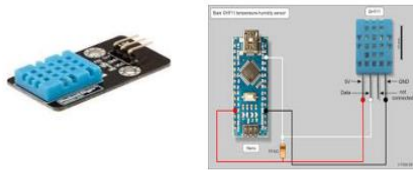


Fig 1.3 Water Quality Monitoring using DHT11

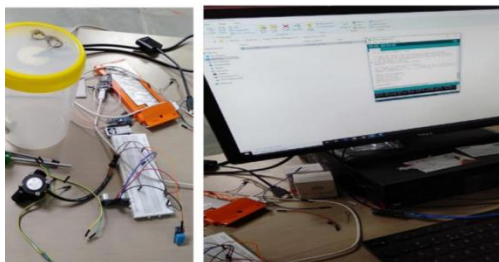
WATER PIPE LEAKAGE DETECTION

In this ,the leakage of water is detected using flow sensors and the reports are send to corresponding control rooms and the necessary reactions are taken



Fig 1.3 Water flow sensor

WORKING MODEL



Final Output

S.No	Source	Destination	Ultrasonic Sensor	Temperature Sensor	Flow Sensor	Status
1	A	B	20	10	0	No Leakage
2	C	D	80	25	5	Leakage
3	E	F	40	55	15	Leakage
4	G	H	55	35	50	Leakage
5	I	J	95	60	40	Leakage

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. The water quality testing is likely to be more economical, convenient and fast. As each and every variation of water level is informed to the

cloud through the internet and nearby people can be informed in time. Thus saving lots of lives avoiding unpleasant scenarios.

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