International Journal for Modern Trends in Science and Technology, 9(03): 147-151, 2023

ISSN: 2455-3778 online
DOI: https://doi.org/10.46501/IJMTST0903021
Available online at: http://www.ijmtst.com/vol9issue03.html

IoT Enbled Smart Water Control and Monitoring System

[1]Dr. D.Arulanantham, [2]S.V.Raguram, [2]S.Sridhar, [2]K.Madavan, [2]T.Bhavanvithyathi

[1]Associate Professor, Department of ECE, Nandha Engineering College, Erode 638052, Tamilnadu, India
[2]Department of ECE, Nandha Engineering College, Erode 638052, Tamilnadu, India

To Cite this Article
Dr. D.Arulanantham, S.V.Raguram, S.Sridhar, K.Madavan and T. .Bhavanvithyathi. IoT Enbled Smart Water Control and Monitoring System. International Journal for Modern Trends in Science and Technology 2023, 9(03), pp. 147-151. https://doi.org/10.46501/IJMTST0903021

Article Info
Received: 18 February 2023; Accepted: 8 March 2023; Published: 15 March 2023.

ABSTRACT

It is a recognized fact that 70% of the Earth's surface is covered by water, but that only 3% of that water is freshwater fit for human use. Additionally, there is a critical need for water conservation in the modern environment due to the growing population in cities. The majority of the time when filling up the overhead tanks, water spills, and water theft also occur so it resulting in significant water loss. An iot has been designed in this research to address this issue. By monitoring the amount of water in the overhead tank and alerting the user to turn on or off the engine using their cell phone, this effectively lowers water waste. The user can manage the motor with this system

1. INTRODUCTION

Only 1% of the water on Earth's surface, which makes up 70% of its surface, is used by humans. In India, access to clean drinking water has always been a national concern. Importance based on the information provided by the department demonstrates that out of 1.42 million people, Only 1.27 million rural homes are completely covered, 0.1315,917 are not covered, for a total of million partially covered are not provided with access to a supply of clean drinking water. Yet this is simply considering capacity, ignoring quality, and average supply into consideration in urban areas. There are many causes of water leaking in pipelines, including pipeline ageing, roadvibration brought on by vehicles, metal pipe rusting, pipeline hammering, etc. Aside from those, water leakage from pipes is also caused by people breaking them to steal water. One approach that can make a big difference and address the problem water scarcity in India and other countries is the detection of water theft.

With this using water flow sensors, which will identify the pressure in a pipeline, both inside and outside, that will be helpful in order to identify theft or leaking.The suggested technique explains the notion and concept of using flow sensors and wireless communication technologies to reduce leakage, water theft, and provide information on when water can be provided. The plan envisions carrying out the project at the municipal level, with kilometers-long pipelines across the entire city.

2. TECHNOLOGY STACK

Due to benefits like leak identification without altering any pipeline structures, without impairing the serviceability of the distribution, or without removing dirt from above the pipeline network, non-destructive

technologies are typically utilized in leak detection. Radar that enetrates the ground and detects leaks based on acoustic noise are examples of nondestructive methods Acoustic noise is used in some approaches to find leaks in subterranean pipes. When employing tools like microphones and sound recorders, the some type of sound is heard. There are rods and other objects on the ground. Regardless, another study demonstrates that the accuracy of leakage detection employing. This approach is dependent on how much water is flowing in the pipeline, pipeline pressure, etc. Although, there is, One such technique made use of an electric transmission line instead of using the acoustic wave equation, formulate leaks of water. With this technique, the sound of dripping water was a model for pattern recognition and an isolated from noise signal auto regressive modeling was created for water leaking model of moving average (ARMA). A different approach which employs two pressure sensors to capture leaks that have occurred Radial pressure and a pressure sensor are used ina different method that MIT has suggested to find the leak. As was seen and shown, the radial pressure rises as you get closer to the leakage and decreases as you move away from it. In addition to these methods, other techniques have also been employed to locate water leaks. Leakage-detection robots were sometimes installed inside pipelines. These robots collected data from the pipeline and transmitted it via wireless sensor networks (WSN) to a central server, where it was further reviewed to look for leaks or anomalies. Data transfer from the robot below the surface to the central server was occasionally reliable, but occasionally wireless signal did not reach the WSN above the earth. Additionally, a robot being stuck in a pipe could also happen, which could cause pressure problems in the pipeline.

However, have not yet been successful in assisting the water distribution department in determining the site to send out repair personnel in real-time. Consequently, a reliable System is needed that can monitor quantity, detect theft, and produce data that can be used to understand how much water is needed in a given location.

3.LITERATURE SURVEY

TITLE: Automated Household Water Supply Monitoring and Billing System

This document serves as the project's final report for BRAC University's fall 2017 session's Computer Interfacing. Here, in this project, they are creating a home water control system using double switch relays that enables automatic motor switching based on the reservoir's water level. Additionally, valves for regulating the amount of water usage on each floor were used. For a very long time, switching the motor has been a significant problem in housing, such as apartments. Frequently, it appears as though the residents of the residence lack access to water. the motor was not turned on at the right time or the motor was damaged. Water shortage is also a pressing issue in modern day. This system allows you to efficiently use water shortage. Utilizing only the necessary amount of water is possible with this technology. The tank is never empty because water is poured into the reservoir tank before it runs out completely, which overcomes both this issue and the annoyance of having to crank the motor frequently. Measuring the amount of water utilized by each floor of the building is one of the elements we utilized in this project. Set a maximum capacity for each floor, which they will receive with an additional 30% to 50% as backup; provided, however, because of the need to pay an extra fee and manage the flow of water with motor-driven valves to cut off the supply

TITLE: Automated Water Supply Systemand Water Theft Identification Using PLC and SCADA

.The automated system that has been integrated into urban utilities that provide water offers new methods of monitoring. Continuity of the water supply and the prevention of water theft are ensured by the network's global monitoring in the central dispatching unit, which also monitors measurement data dependability. The development of PLC and SCADA-based water monitoring and theft prevention is proposed for this project. SCADA unit is additionally connected to the control system. The control system for controlling and monitoring a water distribution system is the main subject of this research. System for automating processes using a PC and an industrial PLC The automated system integrated into the water distribution network ensures that updating the refurbis

systems to include all network elements is the best approach to advance the technical process of water distribution.

TITLE: Towards Smart Agriculture Monitoring Using Fuzzy Systems

Traditional farming requires a lot of labour, and having to constantly check crops can be difficult for farmers. Farmers can watch and track air humidity, air temperature, and soil moisture using mobile application by implementing the idea of smart farming based on Internet of Things (IoT) technology. These variables can have an impact on plant growth. Additionally, in actual situations, using timers to control the pumps in typical watering systems is not always feasible. In this paper, a framework for controlling a pump's switching time using advanced fuzzy logic and user-defined variables is proposed. Sensors serve as the system's main component and input. Our suggestion has the potential to operate superbly as an interface between sensors serving as the input and the Internet of Things serving as the output medium. The suggested system and manual handling are contrasted. The outcomes demonstrate that there has been a significant decrease in both water use and watering time.

4.TECHNOLOGY STACK

MICROCONTROLLERS

One of the most well-known microcontrollers in the business is the PIC microcontroller PIC16f877a. It is quite easy to code or programme this microcontroller, and it is also very convenient to use. The fact that it employs FLASH Memory Technology is one of its key benefits because it allows for unlimited write-erase cycles. There are 33 input and output pins out of a total of 40 pins on it. Many pic micro controller designs use the PIC16F877A. PIC16F877A are also widely used in digital electrical gadgets. Numerous gadgets use the PIC16f877a. It is utilized in several industrial instruments, home automation, security and safety equipment, and remote sensors. Additionally, it has an EEPROM that enables the permanent storage of some data, including transmitter codes, reception frequencies, and other pertinent information. This controller has a modest price and is simple to use. It is adaptable and can be utilised in applications for microprocessors, timers, and other devices that have never before employed microcontrollers. This microcontroller integrated circuit has 40 pins, as has already been explained. It has two 8-bit timers and one 16-bit timer. Modules, serial ports, and parallel ports should be recorded and compared. and five input/output ports are also present in it.

NODE MCU

An open-source software and hardware development environment dubbed NodeMCU (Node Micro Controller Unit) is based on the ESP8266, a low-cost SoC. TheESP8266, created and produced by systems, includes all of the essential components of a computer, including a CPU, RAM, networking (Wi Fi), and even a contemporary operating system and SDK. This makes it a fantastic option for all types of Internet of Things (IOT) projects. The ESP8266 chip is challenging to access and use

GSM MODULE

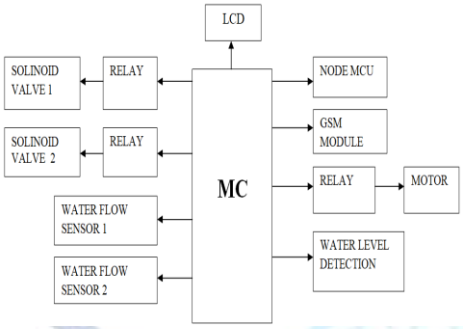
A customized Global System for Mobile Communication (GSM) module is created for Short Messaging Service wireless radiation monitoring (SMS). This module may send text SMS data to a host server after receiving serial data from radiation monitoring devices like survey metres and area monitors. GSM converts data to an electronic form, compresses it, and delivers it along with two other streams of user data, each in its own time slot, down a channel. Either the 900 MHz or 1,800 MHz frequency band are where it works.

FLOW METER

The flow meter utilized here, the YF-S201 sensor, operates on the Hall Effect theory. When water passes through the sensor, an internal pinwheel sensor that is connected to a Hall Effect sensor rotates, creating a series of electrical pulses. After that, we may determine the flow rateof water passing through the sensor by counting the number of pulses. Arduino Nano is used to count electric pulses. You have a choice between counting the leading edges or the trailing edges for a predetermined amount of tim. According to the sensor's datasheet, the flow rate per pulse is approximately 2.2 millilitres per second as long as the sensor's dimension or radius remains constant. The flow meter's accuracy is around +-10%, which won't significantly impact our application. When flow rate comparisons are more important in system work.

5. WATER FLOW DETECTION

The law of conservation of mass, which asserts that mass cannot be created or destroyed, is the basis for the system presented in the suggested technique. Thus, assuming there is no leak, we may deduce that the amount of water entering and exiting a pipeline should be the same. Once more, the mass flow rate and this mass are connected.



A perpendicular plane's mass flow rate is simply the amount of mass moving through it at any given time. The mass flow rate of fluid through a tube remains constant according to the law of conservation of mass. Let's assume that a fluid ismoving through an area A at a velocity V to get the equation. As a result, equation (1) can be used to express the volume (v) of fluid swept in a time t:

$$v = A*V*t \qquad (1)$$

Now, mass (m) is nothing but density (r) ties volume, which can be given by (2):

$$M = A*V*t*r \qquad (2)$$

Now that we have got mass, dividing it by time will give us mass flow rate (mfr) in (3):

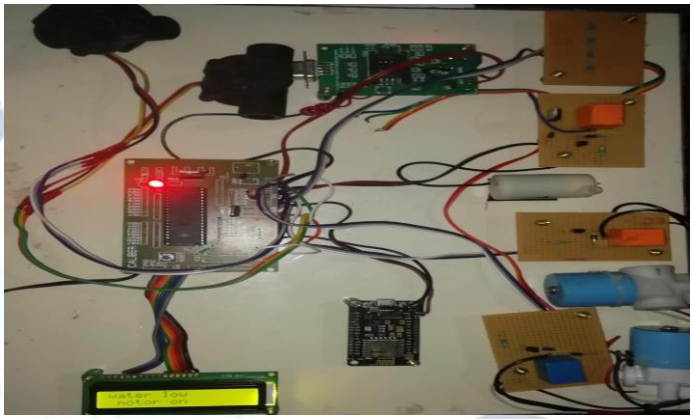
$$Mfr = A*V*r \qquad (3)$$

We know from the rule of conservation of mass that mfr across a tube remains constant as long as mass remains constant. The mfr at the starting end of the tube will be higher than that at the leaving end of the tube if there are leaks in the pipe or tube, as the mass flowing into the tube will be more than the mass flowing out. Assume that m1 is the mass of water entering the pipeline and m2 is the mass of water leaving it. Let's assume that the pipeline let out a lot of water—say, m3 of water. It is clear that m1 is larger than m2 as a result. Due to the constants in area, density, and time for the specified duration, incoming velocity (V1) will be. less quickly than the takeoff speed (V2). Let A3 be the location and V3 be the rate of water leaking.

$$m_1 = A*V_1*r + A_3*V_3*r \qquad (4)$$

$$m_2 = A*V_2*t*r \qquad (5)$$

Given that we know that m1 is bigger than m2, we may divide equations (4) and (5) by time to obtain mfr1 and mfr2, which are equal to 1. It isobvious that mfr1 exceeds mfr2. Following the adjustments, Leakage-related velocity and mass flow rate are described. It is possible to explain the water leak detecting system better.



6. RESULT

The intended result was achieved after the design was successfully implemented. The water supply was gradually increased while the leakage diameter upheld by the pipe and the matching the difference between the input and output flow rates was calculated suitably.

INITIAL STAGE OF FLOW CHART

THIS FLOW CHART SHOWS THAT DURING WATER FLOW

This flowchart chart shows how water can be flow through the pipe and when the water can be starts to flow. It gives the detailed report of the water flow and when the water can be flows and also its shows the any water theft can be occur during flow of water.

MOBILE NOTIFICATIONS USING GSM MODULE

NOTIFICATIONS THROUGH LCD DISPLAY

7. CONCLUSION

In places where pipeline connections are used, the approach suggested in this research has the potential to conserve water resources. India needs to handle its water resources intelligently so that it isn't wasted. Major communities in a region are once more unable to get water due to an increase in water theft and leakage. The system under consideration can lessen the government's problem. As smart cities spread across the globe, it is crucial that they havesmart ways to conserve essential resources like water. Smart is more than just having access to free WiFi and utilizing a Smartphone to simplify life; it also refers to the ability to consider basic human needs in a more effective and strategic manner. Hopefully, this IoT project will result in significant change and provide water access to everyone.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

[1] [1]Anil Gantala, PaparaoNalajala, N.Vasudheva Reddy, Bhavana Godavarthi – "Public water supply monitoring to avoid tampering and waterman fraud" , International Journal of Mechanical Engineering And Technology, Vol 8,Issue 8,August 2017.

[2] Anubha Pachal, Ketakee Dagade, Kiran Pawar – "Automated water supply system and water theft identification using PLC and SCADA", International Journal of Engineering Research and Application,ISSN:2248 – 9622,Vol 4, Issue 4,April 2014.

[3] Arulanantham, D., et al. "Automatic gas leakage detection and management." International Journal on Engineering Technology and Sciences 7 (2020): 92-96.

[4] A.Mancharkar and K. Rakesh, "Automated water distribution system for smart city using PLC and SCADA", International Journal of Emerging Technologies and Engineering(IJETE),ISSN 2348-8050, vol.3, Issue 3, March 2016.

[5] B.Sasikumar – "Automated water conservation and theft detector using IOT", International Research Journal of Engineering and Technology,ISSN:2395 – 0056,Vol 5,Issue 4,April 2018.

[6] G.M.Tamilselvan, V.Ashishkumar, S.Jothi Prasath, S.Mohammed Yusuff – "IOT Based Automated water distribution system with water theft control and water purchasing system", International Journal of Recent Technology and Engineering(ISSN:2277 – 3878)Vol.7,Issue 4S,November 2018.