# System for Monitoring and Identifying theft from Domestic Water Supplies

*Shanthini* R [1], *Sowmiya* Y[1*], *Swetha* M[1], *Lakshmanan* M[2], *Ashokraj* M[3]

[1]Electronics and Instrumentation Engineering, M.Kumarasamy College of Engineering, Karur, India
[2]Electrical and Electronics Engineering, M.Kumarasamy College of Engineering, Karur, India
[3]Electronics and Communication Engineering, K.Ramakrishnan College of Technology, Trichy, Tamilnadu, India

**Abstract.** This system for monitoring and identifying theft from domestic water supplies utilizes advanced sensors and machine learning algorithms to detect and analyze patterns of water usage, identifying anomalies and potential instances of theft. The system can be easily installed and integrated into existing water supply infrastructure, allowing for real-time monitoring and analysis of water usage data. By providing actionable insights and alerts, the system enables water supply companies to quickly respond to instances of theft, reducing losses and ensuring a more equitable distribution of resources. It utilizes various sensors and algorithms to detect anomalies in water usage patterns, which could indicate theft. The system includes a dashboard that allows water supply companies to monitor usage and receive alerts in real-time. By using this system, water supply companies can improve their efficiency, reduce water losses, and save costs associated with theft. The system is easy to install and can be integrated with existing water supply networks. The system has the potential to significantly reduce water losses due to theft, improving water supply sustainability and reducing costs for water providers. The system has the potential to significantly reduce water losses due to theft, improving water supply.

## 1 Introduction

A system for monitoring and identifying theft from domestic water supplies is a technology-based solution designed to detect and prevent unauthorized water use or theft [1]. This system utilizes a variety of sensors, meters, and data analytics tools to monitor water flow and detect any anomalies in usage patterns. Water theft is a significant issue for many communities, particularly in areas where water resources are limited. This type of theft not only impacts the availability of water for legitimate users but can also result in financial losses for water providers. The system for monitoring and identifying theft from domestic water supplies offers an effective means of addressing this problem by providing real-time monitoring and detection of unauthorized water use [2]. This technology can help water providers to identify and prevent theft, thereby ensuring a reliable and sustainable water supply for all. This system employs various sensors and data analysis tools to monitor water flow and pressure, detect anomalies, and alert the authorities to possible theft attempts. The system is particularly useful in areas where water scarcity is a pressing issue, and where unauthorized tapping of water pipelines can result in significant losses to the water utility company and the community [3]. The system not only helps prevent water theft but also promotes water conservation and sustainable use of resources. The system can be implemented in different ways, depending on the specific needs and infrastructure of the area. It may involve the installation of sensors and cameras at critical points along the water distribution network, or the use of satellite imagery and machine learning algorithms to detect changes in water usage patterns. Overall, a system for monitoring and identifying theft from domestic water supplies is an essential tool in ensuring the efficient and equitable distribution of water resources, and in promoting responsible use of this valuable resource. To address these difficulties, the proposed study develops low-cost models for continual water circulation monitoring on an Internet of Things platform.

IoT is a scenario that might be used to monitor billions of objects, send data, and share knowledge. The Arduino controller is linked to the flow meter and solenoid valve before continuing through Internet Protocol (IP) systems to do all of these tasks. They will continuously gather information, which they will then communicate with the server [4]. The system is designed to work with existing water meters and can be easily integrated into existing water supply networks. Once unusual usage patterns are detected, the system sends alerts to the relevant authorities, allowing them to take action and prevent water theft. The system is an important tool in the fight against water theft, and its widespread adoption could help conserve precious water resources and ensure that everyone has access to clean and safe water. Standard amounts have been created as recommendations to determine how much an individual requires (see below). To improve the accuracy of the estimate, they have been divided into several categories. For instance, not all of the water will be used at

* Corresponding author: sowmiyayogananth@gmail.com

the residence. It could be better to offer separate water sources for animals, hospitals, feeding facilities, and schools in addition to water for bathing, cleaning, and other uses. Near restrooms, water will be required for hand washing.

## 2 Existing methods

Automatic water distribution system. Automated household water supply monitoring & billing system. Water leakage and theft detection has become increasingly important in recent times due to the growing scarcity of water resources. The efficient use of water resources is a pressing concern for many countries, and the detection and prevention of water leakage and theft is an important part of making sure that water resources are used responsibly. The emergence of Internet of Things (IoT) technologies provides a new way to detect and prevent water leakage and theft [5]. In this article, we will discuss the existing system for the Network connected Iot Smart. Freshwater Spillage and Detection of Stealing. Flow detectors can be installed at key points in the fresh water delivery network to measure finally amount water that flowing through the pipes to gauge how much water is passing via the pipes. Any significant deviations from normal flow rates can indicate leaks or theft.Water meters are installed at each household and are read periodically to determine water usage [6]. Unusual spikes or drops in water usage can indicate a leak or theft. Water supply personnel may periodically inspect the water supply network for signs of illegal connections, tampering, or other abnormalities. Water pressure sensors can be installed throughout the water supply network to detect changes in pressure that may indicate a leak or theft. Advanced systems may use electronic sensors and software to monitor water flow and pressure in real-time. These systems can provide alerts when abnormalities are detected [7].

## 3 PROPOSED METHOD

The suggested system is planned and developed to accomplish a low cost dependable and effective way to produce adequate Continual observation is used to distribute water and also taking control of it from a centralized server so that we can address fresh water related issues. This platform uses sensors like flow sensor and an Arduino micro controller. Data from sensors is gathered by Arduino and sent to a server for speech recognition [8]. This method addresses the issues of overflow, overconsumption, and adequate distribution. This solution allows for continuous monitoring and control from a central server. IoT based water leakage and theft detection systems are designed to detect and prevent water leakage and theft. The system utilizes IoT devices such as sensors, cameras, and other monitoring devices to detect water leakage and theft [9]. The system is able to detect water leakage and unauthorized use of water resources, and alert the proper authorities of any possible water theft or leakage. The system includes a central server that is connected to multiple IoT devices, such as sensors, cameras, and other monitoring devices. These devices are connected to the central server, which is responsible for collecting and processing the data from the devices [10].

The data is then analyzed to detect water leakage and theft. The system is able to detect any changes in water usage, and alert the proper authorities if any water resources are being used without authorization. One of the main disadvantages of the system is that it requires a huge volume of information that to be handled in order to detect water leakage and theft. This can cause the system to be slow and can sometimes lead to false positives. In addition, the system requires a large number of IoT devices to be installed in order for it to work, which can be expensive and time-consuming [11]. The proposed system for domestic water supply monitoring and theft identification is an advanced technology solution designed to track and manage domestic water usage in households, identify potential water theft, and provide actionable insights to water supply management authorities. The system aims to optimize the management of water supply resources and curb water theft, which can result in significant losses for the water supply company. The system made up of a network of sensors installed at various points in the supply of water, including water storage tanks, pipelines, and distribution points. These sensors continuously monitor fluid flows, velocity, and quality, and transmit real-time actual info to a central monitoring system [12]. The monitoring system uses advanced analytics and machine learning algorithms to analyze the data and provide insights into water usage patterns, anomalies, and potential theft. The system also includes a mobile app that allows homeowners to monitor their water usage and receive alerts if there are any unusual spikes or decreases in usage. The app also provides tips on how to conserve water and reduce wastage [13].

## 4 Proposed block diagram

Each block in the system—Arduino UNO atmega328p, Nodemcu, flow sensor, relay, and GSM module—is described below. We are developing a prototype. Hardware utilized in the system is usually depicted in the block in the form of a diagrammatic picture above.

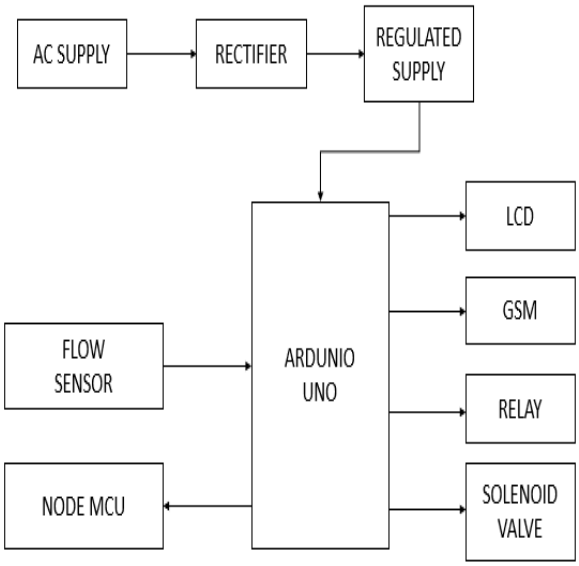


**Fig.1.** Block diagram of the proposed methods

In Fig.1 Design a system using Arduino, flow sensor, LCD, GSM, relay, solenoid valve, and IOT to monitor domestic water supply and identify water theft. Connect an Arduino microcontroller to the water supply source, and use a flow sensor to determine the amount of water flowing through pipe. Connect an LCD screen to the Arduino to display the amount of water flowing through the pipe. Connect a GSM module to the Arduino to enable remote monitoring and control of the water flow. Connect a relay and solenoid valve to the Arduino to control the water flow in case of water theft. Connect an IOT device to the Arduino to enable remote monitoring and control of the water flow. Create an algorithm that can detect any changes in the water flow and alert the user in case of water theft. Develop a mobile application that can be used to monitor and control the water flow remotely. Test the system to ensure that it is functioning properly and can detect water theft. Deploy the system to the domestic water supply source and monitor it for any unauthorized water usage. The flow utilized a sensor to measure the volume the fresh water passing through the domestic water supply system. The detector sends with respect to the Arduino servo controller which then processes the data and sends it to the LCD display. The LCD display will show the total amount of water used in the system. The GSM module is used to send alerts when the water usage is above a certain threshold. This alert can be sent to the system administrator or to the user. The relay is used to control the solenoid valve. The solenoid valve can be used to cut off the water in case of any water theft or excessive water usage. The IoT device is used to send the data to a cloud server. This way, the system administrator can monitor the water usage from any location. The system also has a provision to store the data so that it can be accessed later for analysis. Overall, this system can be used to monitor domestic water supply and identify any water theft. It can also be used to control water usage and manage the water supply system efficiently.

## 5 Results and discussion

The Domestic Water Supply Monitoring and Theft Identification System is a system designed to monitor the use of water in a residential area. The system consists of sensors and a monitoring system that can detect when water is being used, when it is being wasted, and when it is being stolen. The sensors are placed at strategic points in the water supply network, and the monitoring system is connected to a central server. The server is then able to detect and alert users of any suspicious activity, including possible theft of water. Additionally, the system can also be used to identify areas of wastage, identify and alert users of any water leaks, and even detect faulty plumbing. This system can help ensure that all water resources are used efficiently and cost-effectively. A system created to track water use in a home area is the Domestic Water Supply Monitoring and Robber Detection Method. The system, which consists of sensors and a monitoring system, is able to identify when water is being consumed, wasted, or stolen. The monitoring system is connected to a central server, and the sensors are positioned at key locations in the water supply network. The server is then able to identify any suspect behavior, including potential water theft, and notify users of it. The technology can also be used to spot wasteful regions, spot water leaks and notify users of them, and even find broken plumbing.

Hardware Implementation:

Water supply monitoring can help detect leaks in the system, which can be repaired to prevent water wastage. Theft of water can be identified by monitoring the water supply system for irregularities, such as sudden drops in pressure or unexpected spikes in water consumption. Non-revenue water refers to water that is lost through leaks, theft, or other factors before it can be sold to customers. By identifying and repairing leaks and preventing theft, water utilities can reduce non-revenue water and improve their financial sustainability. Monitoring water supply systems can help identify potential contamination sources and enable early intervention to prevent waterborne illnesses. Timely identification and resolution of water supply issues can improve customer satisfaction with the utility's services in Fig.2.

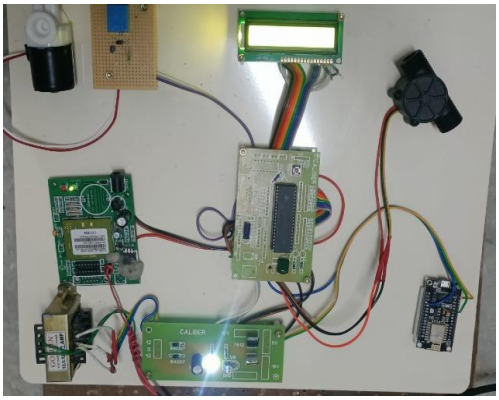


**Fig. 2.** Hardware implementation

Water supply monitoring and theft identification systems are a crucial part of ensuring that everyone has access to clean, safe water. These systems are designed to track and record the amount of water that is used by households and businesses, as well as identify any illegal water usage or theft. They are also used to detect water leaks and faults, which can help to prevent costly water waste and repair costs. The systems can be automated and remotely monitored, making them easy to use and efficient. Furthermore, they can provide valuable information to water companies to help them improve their services and identify areas of inefficiency. All in all, these systems can help to ensure that water is used responsibly and fairly, helping to preserve this valuable natural resource. Systems for tracking water supply theft and supply monitoring are essential for guaranteeing that everyone has access to clean, safe water. These systems are made to monitor and keep track of how much water is used by homes and businesses, as well as to spot any unauthorized water consumption or theft.

Software Implementation

The IDE is compatible with the majority of popular download the installer for Windows, Mac OS X, and Linux correct version OS. Do not to be downloaded the if you have Windows 7 or later, you may use the Windows app version. earlier, because it needs Windows 8.1 or Windows 10. After downloading the installer, proceed to install the IDE. Possibility to activate all installer options, including any USB drivers and libraries. It is the Arduino IDE a software package. quite simple, yet, it provides a near-complete environment for most Arduino-based projects applications. The primary menu bar offers then normal choices, containing "File" (new, load save, etc.), "Edit" (font, copy, paste, etc.), "Sketch" (for compiling and programming), "Tools" (useful options for testing projects), and "Help". Similarly, IDE's midpoint area contains a simple text editor where computer code can be entered in Fig.3.

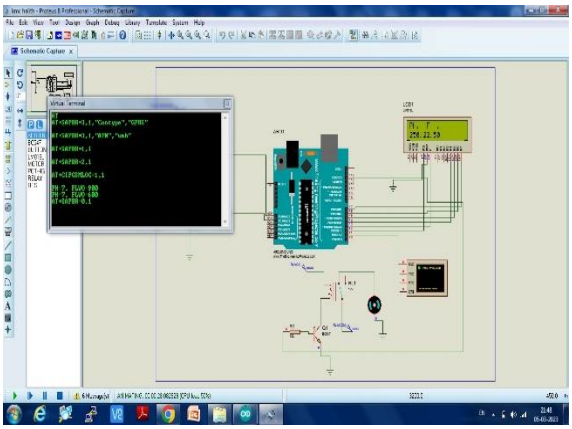

**Fig. 3.** Simulation of proposed system


**Fig. 4.** PH level of the water

Fig.4.represents the simulated output of a proposed system and shows the PH level and flow level of a system. By knowing the increase in the flow level, the alarm will go on and can detect the water theft. The GSM module will send an alert message to the owner.


**Fig. 5.** Flow level of the water theft identified

The output window, positioned at the bottom of the IDE, is where you may see the results of your work data, such as the compilation progress, apologies for the delay, programming issues, as well as various other useful messages in Fig.5. The sketches used to create projects for Arduino are microcontrollers often expressed in a formal manner condensed form such as C++ that omits a number such as C++ capabilities. There are several Because programming a microcontroller differs differently from programming a PC, device-specific libraries are required (e.g., changing pin modes, output data on pins, reading analogue values, and timers). Users who believe Micro controller is written in a "Arduino language" might occasionally be confused by this. The sketches used to create projects for with the Sensor often composed in a condensed form as for C++ that omits number of the C++ capabilities. There are several since programming

a microcontroller is a little different from programming a PC, there are device-specific libraries (e.g., changing pin modes, output data on pins, reading analogue values, and timers). Users who believe Arduino is written in a "Arduino language" might occasionally be confused by this.

## 6 Conclusions

The proposed effort is a necessary prerequisite for people in the current world to solve water-related problems. The system's best feature is its ease of design, and the hardware is inexpensive. By implementing automatic theft control, the central server's dependable data monitoring assists habitats in receiving appropriate freshwater. The whole above-mentioned amenities are only possible because of the usage of a Solenoid valve with flow sensor. They manage the water flow across a certain prohibit both at specific pace, without it, the system is turned out of. Water theft in government pipes can be completely eliminated by implementing the recommended study effort, and habitats can meet their increased water requirements by purchasing. So that acquiring water for those in need is not a difficult task. Let's hope, the intended Projects involving IoT will about significant alter by connecting all domestic households and many more cities with an inadequate water supply been established. This suggested the work is not simply suited the provision of water, but it may also be used in the future to liquid petroleum gas and other fuels are supplied via infrastructures. Intelligent IoT detection of water leakage and theft is an exciting technology that can assist in the detection and prevention of water leakage and theft. The system is inexpensive, simple to install, and quick to maintain, making it a viable solution for detecting water leaks and theft in a variety of settings.

## References

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, **8**, 8 (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, **4**, 4 (2014).
3. A. Mancharkar and K. Rakesh, "Automated water distribution system for smart city using PLC and SCADA", International Journal of EmergingTechnologies and Engineering(IJETE), **3**, 3 (2016).
4. B. Sasikumar – "Automated water conservation and theft detector using IOT", International Research Journal of Engineering and Technology, **5**, 4 (2018).
5. 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, **7**, 4S (2018).
6. J.P.ShriTharanyaa, A.Jagadesan, A.Lavanya – "Theft indentification and automated water supply system using embedded", International Journal of Advanced Research in Electrical,Electronics and Instrumentator Engineering, ISSN:2278 – 8875, **2**, 8 (2013).
7. Krishna Anandkishor Tiwari, Sanket Tukaram Jadhav- "Water Management and Theft Detection System", The International journal of analytical and experimental modal analysis, **12**, 9 (2020).
8. Mrs. Gaikwad Sonali Ashok, "Water antitheft and quality monitoring system by using PLC and SCADA",International journal of electrical and electronic engineering research, **3**, 2 (2013).
9. S.Kiruthika, P.Sakthi, N.Gokul, G. Praveen Kumar, S.Praveenkumar, R.Prem, Monitoring Soil Quality and Fertigation System Using Iot, Turkish Journal of Computer and Mathematics Education, **12**, 9 (2021).
10. S.Kiruthika, P.Sakthi, M.Kaviya, S.Vishnupriya, "Blood Bank Monitoring and Blood Identification System Using Iot Device", Annals of R.S.C.B., **25**, 6 (2021).
11. S.Kiruthika, M.Mathan, G.Manoj Babu, Ramkumar, "Smart Glucose Drip Bottle With Patient Monitoring System", in Journal Bioscience Biotechnology Research Communications, **13** (2020).
12. Bhuvaneshwari C, Manjunathan A, "Advanced gesture recognition system using long-term recurrent convolution network", Materials Today Proceedings, **21** (2020).
13. C Bhuvaneshwari, A Manjunathan, "Reimbursement of sensor nodes and path optimization", Materials Today: Proceedings, **45** (2021).