VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI-590018

Synopsis report on the project titled

"Domestic Water Supply Monitoring and Water Theft Identification System"

Project Proposal Reference Number: 46S_BE_0701

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INTRODUCTION

In urban territories with enormous monetary development, the water request of individuals is additionally expanding. Water is a critical asset for every one of the living things on earth. In that, a few people are not getting an adequate measure of water in view of the unequal distribution of water. The water wastage is because of numerous reasons, for example, we are utilizing drinking water for planting, and water consumption is not checked accurately. There is an additional issue of inconsistency in the water supply. So as to actualize the proposed water supply framework the ESP32 controller is associated with the flow meter and solenoid valve, and afterward the relay circuit.

At whatever point the water flow surpasses the relay circuit will be shut and the supply to the valve will be cut-off. At that point, we can likewise set the measure of water to be brought to the specific habitat and it is additionally given an electrically worked solenoid valve to supply water to the purchasers. The valve turns on/off to stop the water supply at whatever point the flow rate surpasses a predefined restrain. The solenoid valves are likewise controlled by relay circuits to control the flow of water as needed for a settled span of time.

This framework is proposed to utilize an Ethernet for wireless correspondence with the goal that the data can be exchanged with the individual who is checking the framework. In past techniques, an individual who is keeping up will touch base with the place and check the association.

Once the time is over again the in-control individual will go to a similar place and close the valve. It is a waste of time. The proposed automated framework is completely programmed thus human work and time are diminished. Water leakages and identifying the leakages and operating errors can be avoided. To solve these problems, the proposed work plans and builds up a low-cost model for continuous checking of water circulation in the Internet of Things platform. IoT is a scenario that can be used to detect billions of objects, and impart and share data; all are organized in a manner over Internet Protocol (IP) systems.

OBJECTIVES

- To monitor the domestic water supply.
- To allow authoritarians to set the normal rate(threshold) of water consumption.
- To detect water theft by observing the flow rate for individual users.
- To shut down the water supply valve automatically, after detecting the water theft.
- To notify the user about the water theft by sending messages.
- Upload the flow rate information to the cloud using ThingSpeak.
- To provide statistics on water consumption to government officials.
- To Inform consumers and concerned government officials about water theft.
- To Reduce manpower for regulating water flow.
- To distribute the amount of water equally to all the consumers.

METHODOLOGY

- **System Design and Architecture:** Begin by designing the overall system architecture. Identify the components required, such as ESP32 boards, water flow sensors, relay modules, and GSM modules. Determine the data flow and communication between these components.

- **ESP32 Setup**: Set up the ESP32 boards by installing the necessary firmware and libraries. Program the ESP32 to read data from water flow sensors and transmit it to the cloud platform.

- **ThingSpeak Integration:** Create a ThingSpeak account and set up channels to store and analyze the data received from the ESP32 boards. Configure the ESP32 to send the water flow data to ThingSpeak using the appropriate APIs or protocols (e.g., MQTT or HTTP).

- **Water Supply Management:** Implement features for water supply management. Determine the desired water flow rates, maximum allowed consumption, and any other relevant parameters. Program the ESP32 boards to monitor the water flow and control the relay modules to manage the water supply accordingly.

- **Water Theft Identification:** To detect water theft, you can use additional sensors such as ultrasonic sensors or pressure sensors at critical points in the water supply network. Program the ESP32 boards to monitor these sensors and identify any anomalies or sudden changes in flow patterns that may indicate water theft.

- **Telegram Integration**: Set up a Telegram bot to receive notifications and commands. Use the Telegram API to connect the ESP32 boards to the bot. Program the ESP32 to send notifications to the Telegram bot regarding any irregularities or water theft incidents detected.

- **Data Analytics and Visualization:** Utilize the data stored in ThingSpeak to perform analytics and generate meaningful insights. Use ThingSpeak's built-in visualization tools or integrate with

external tools like MATLAB to create charts, graphs, or reports for water consumption patterns, trends, and any suspicious activities.

- **Alerts and Notifications**: Based on the analyzed data and water theft identification, program the system to send real-time alerts and notifications to relevant stakeholders via Telegram. This could include messages to water supply authorities, security personnel, or any other concerned parties.

- **Testing and Deployment:** Test the entire system to ensure proper functionality, data accuracy, and reliable communication. Deploy the ESP32 boards and sensors at appropriate locations in the water supply network. Continuously monitor and refine the system based on real-world data and user feedback.

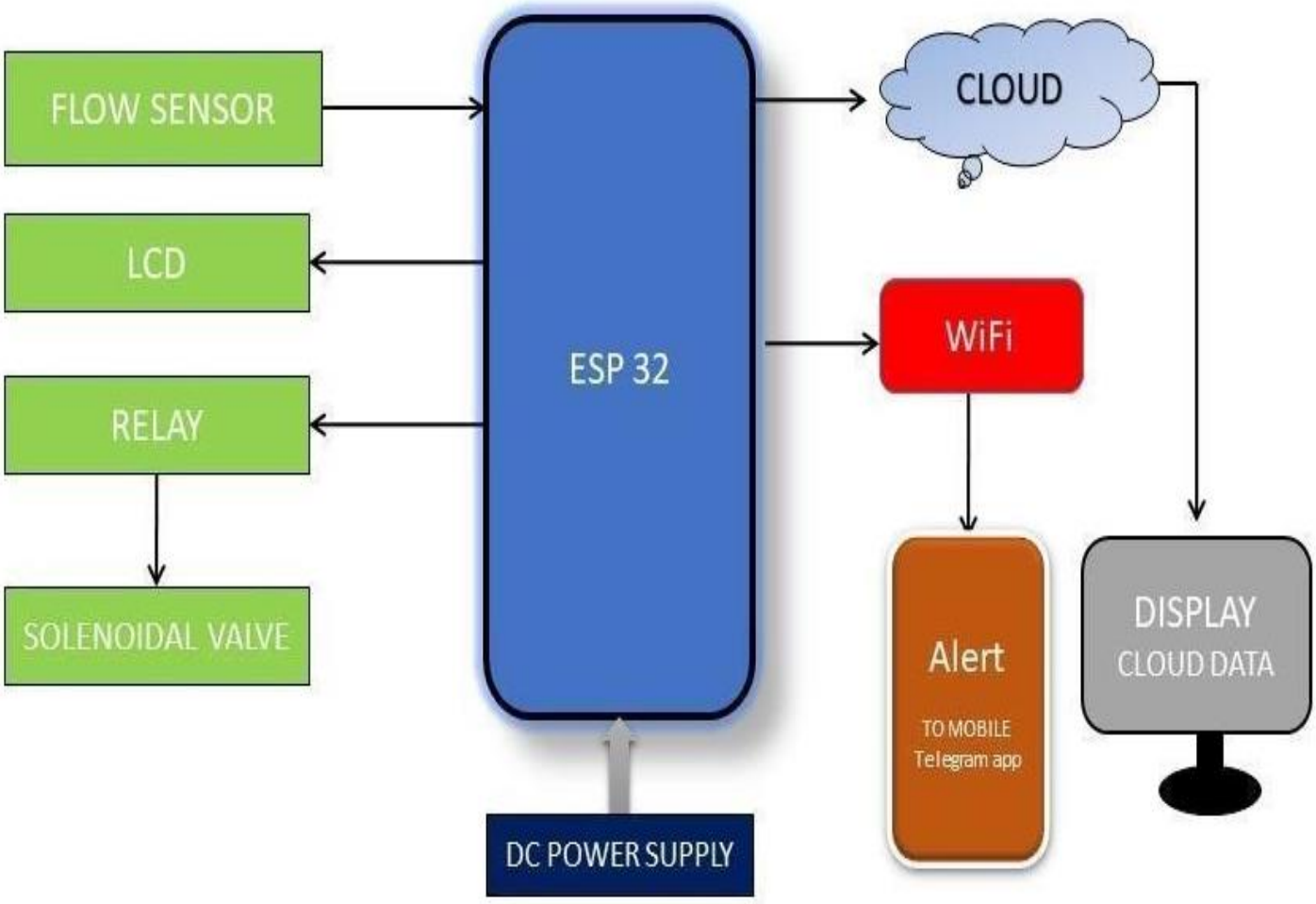

Figure 3.1: System Architecture of the Proposed System

RESULTS AND CONCLUSIONS

RESULTS

The result of implementing the proposed system is that it allows for real-time monitoring of water usage and can identify potential water theft or leaks. By using sensors to measure water flow and a solenoid valve to control the water supply, the system can detect any anomalies in the water supply and alert the user through a variety of methods, including an LCD display and a Telegram alert.

This system can help to conserve water and prevent wastage by detecting leaks early and shutting off the water supply to prevent further damage. It can also help to prevent water theft by detecting when water is being used outside of normal usage patterns. Overall, the implementation of this system can lead to improved water management, reduced water wastage, and cost savings for the user.

Overall, the system proved to be effective in monitoring domestic water supply and identifying instances of water theft. The flow sensor and solenoid valve were able to accurately measure and regulate water flow, while the ESP32 microcontroller and LCD display provided real-time data on water usage and alerts for potential leaks or theft. The integration with the Thingspeak platform allowed for easy remote monitoring and analysis of water usage trends over time.

Furthermore, the alert system via Telegram was found to be a convenient way for users to receive notifications and updates on their water usage and system status. The instant alerts for leaks and water theft were particularly useful in preventing wastage and unauthorized use of water resources. Overall, the proposed system has the potential to be a valuable tool for households and communities in managing their water supply and ensuring its sustainable use.

Addition of LCD display

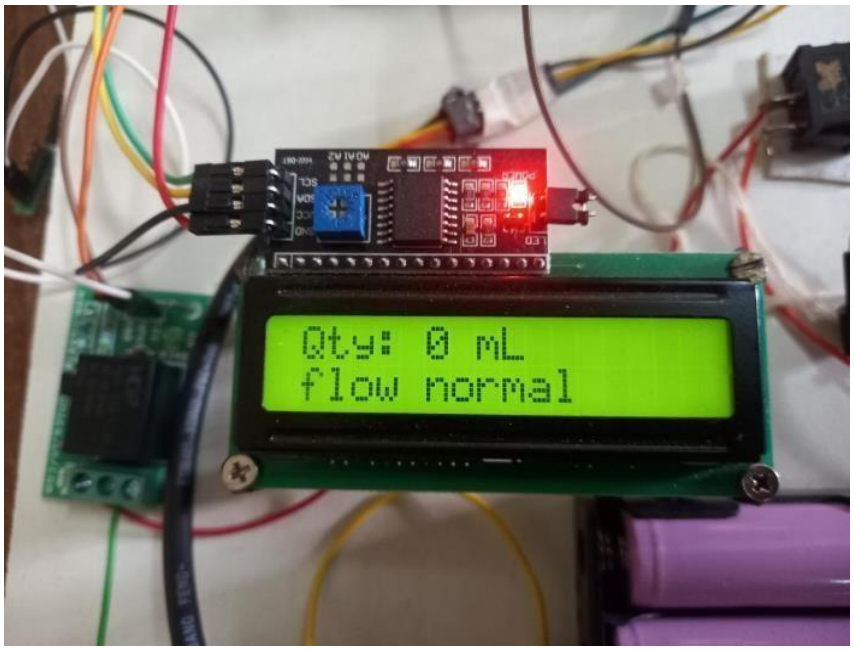

Fig 4.1 LCD Display Before Theft Identification

Displays the initial readings of the proposed system

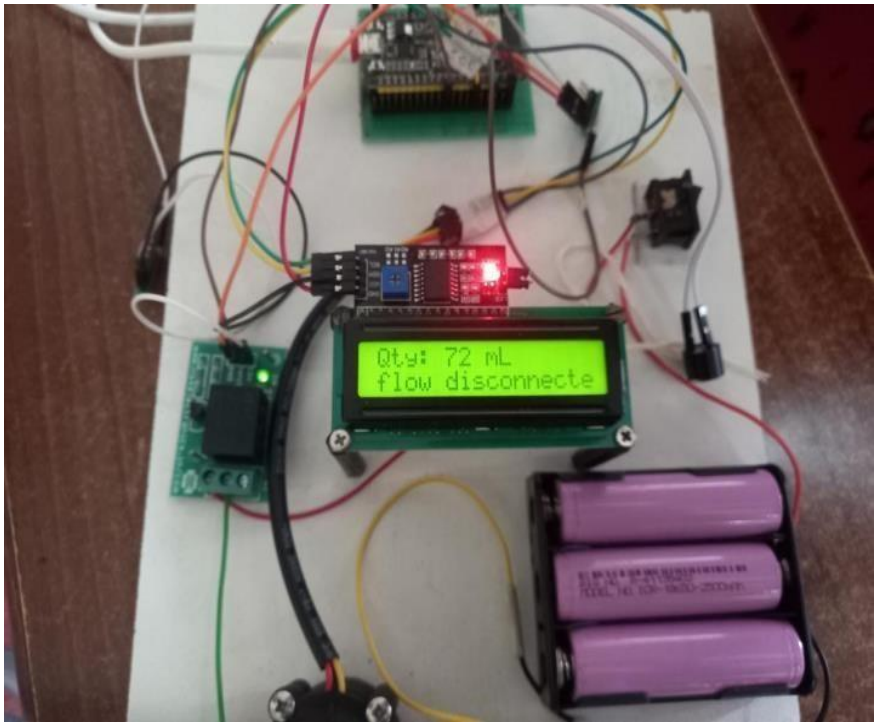

Fig 4.2: LCD display after theft identification

Displays the readings of the limit reached on exceeding the limit set

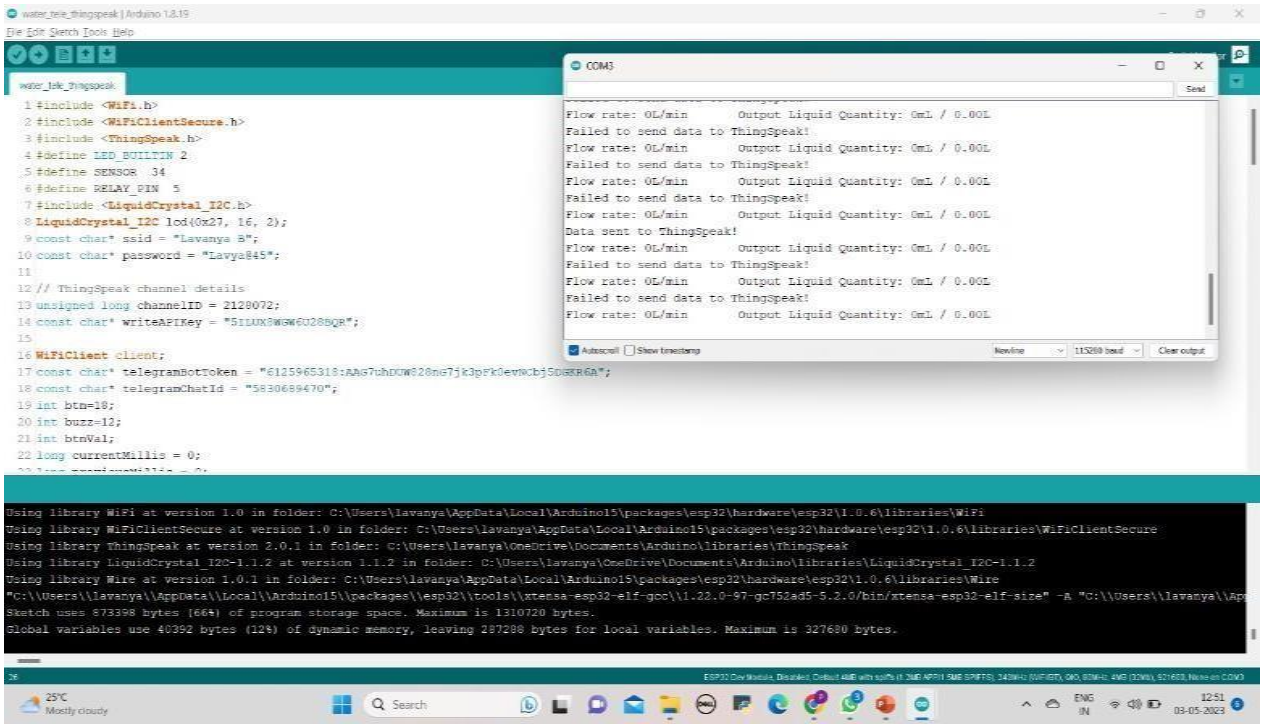

Fig 4.3: Serial Monitor Display

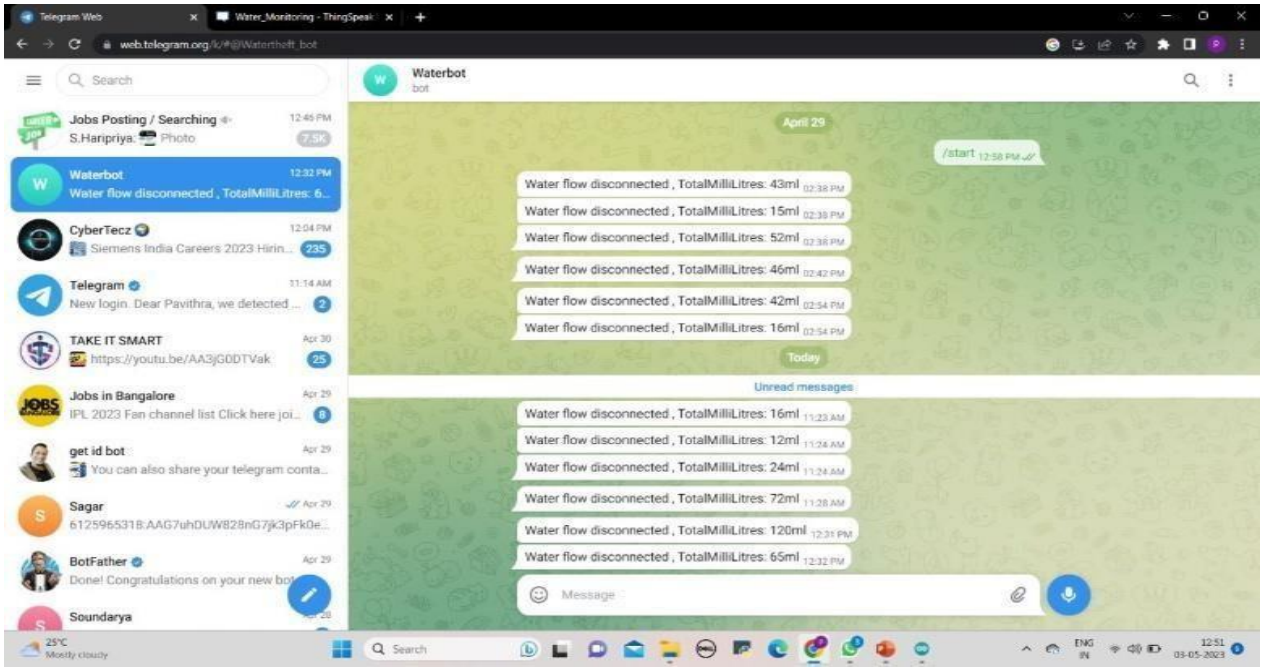

Fig4.4: Telegram alert sent after the theft detection to turn off the water flow

THINGSPEAK GRAPHICAL DATA:

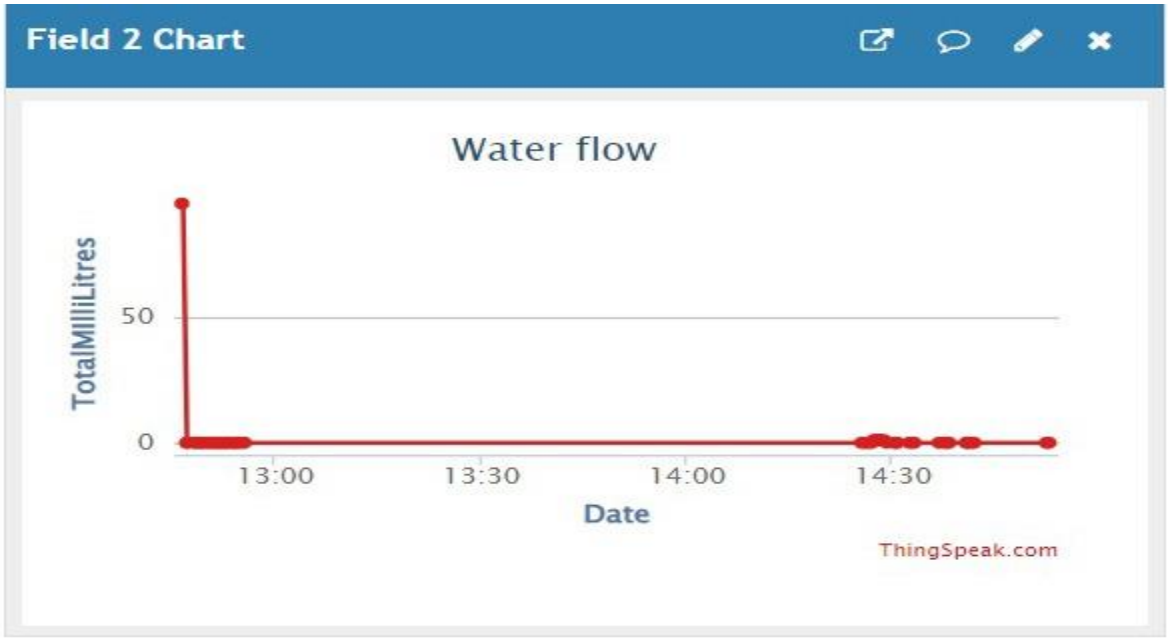

Fig 4.5: Flowrate of water Before Theft Detection

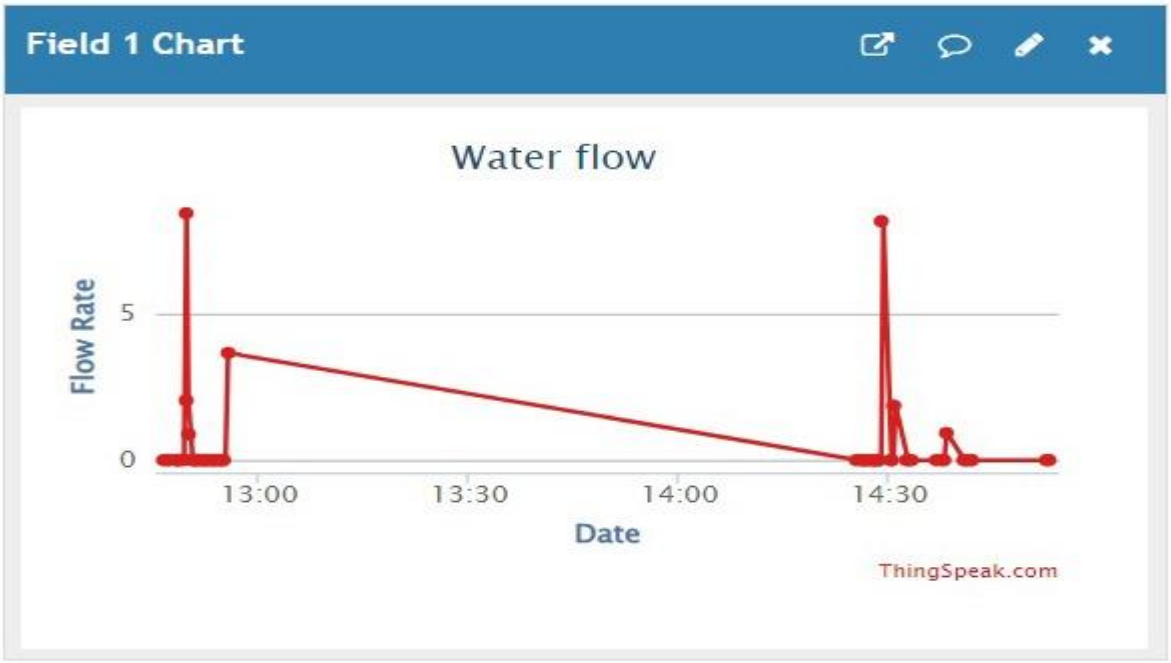

Fig 4.6: Flowrate of water After Theft Detection

CONCLUSION

In conclusion, the Domestic Water Supply Monitoring and Water Theft Identification System presented in this project provides an effective and efficient solution for monitoring domestic water supply, detecting water theft, and controlling water supply through a mobile application. The use of an ESP32 microcontroller, flow sensor, solenoid valve, and Telegram API integration makes it possible to detect and prevent water theft while ensuring a steady water supply to households. The system is easy to install, operate, and maintain, making it suitable for deployment in various settings. By implementing this system, water utility companies can save on costs associated with water loss due to theft and ensure efficient water management for the benefit of all stakeholders.

In addition, this system can also help reduce water wastage by detecting theft and other tampering methods in the water supply system. By promptly identifying such issues, repairs can be carried out quickly, which can help prevent water loss and save resources.

Overall, the proposed system is a cost-effective solution that can help water management authorities and consumers monitor their water usage and prevent water theft. By providing real-time information on water usage, and detecting water theft, this system can help conserve water resources and reduce costs associated with water supply and management.

SCOPE FOR FUTURE WORK

1. **Mobile Application:** A dedicated mobile application can be developed for the system, which would allow users to monitor their water consumption and receive alerts in real time. This would provide greater convenience for users, as they would be able to access the system's features on the go.
2. **Integration with Smart Home Systems:** The system can be integrated with smart home systems like Amazon Alexa or Google Home, which would allow users to control the water supply and monitor usage through voice commands. This would provide an additional level of convenience for users, particularly those with disabilities.
3. **Implementing in other areas:** This system can be implemented in several other fields such as in gas pipelines and fuel pumps that equally provide a rate of accuracy and generates the bill.