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Smart Water Billing System Using Arduino

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ABSTRACT: In recent times, water demand has increased in houses. Technology and Communication constantly try to fabricate people's life easier. Presently, water operation has come one of the most controversial issue in the world due to limitation in natural resource, and the dimension of consumption by means of water meter measuring water consumption has been considered a serious matter in order to control and manage the resource of water. Therefore there are multitudinous approaches, which have been offered analogous as ultrasonic electromagnetic, and mechanical medium. still, there have been a lot of restrictions in them analogous as furnishing the power force for the meter, the cost of performance etc. These paper uses and approach automation using GSM for dimension of water consumption.
The implementation of the Smart Water Billing System offers numerous benefits, including improved billing accuracy, reduced manual intervention, increased transparency, and enhanced water conservation. By harnessing the power of IoT and intelligent algorithms, this project presents a cost-effective and eco-friendly solution that can be adopted by water management authorities, utility companies, and individual consumers to streamline water billing processes, promote sustainable practices, and foster efficient water resource management.

KEYWORDS: Automated Meter Reading;Accurate Billing and Consumption;Real-time Notifications;Water Conservation; Arduino UNO

I. INTRODUCTION

Water is not important only for living things but also for economic development. Many countries are concerned with water management and recycling. Currently, water Management of scarcity has become one of the most controversial issues in the world. Metering has been considered a critical issue in controlling water use. Continuous measurement of water consumption by electronic water meter is required. A source of power that causes a waste of power.
Wastage of water during distribution is considered a major destruction. It has been observed that a large quantum of water is being wasted hard A source of clean water, indeed before the distribution network. A measure of per capita water vacuity shows that India is presently passing water failure; unborn protrusions show that India may face water failure by 2050.

In this situation, Leaks in water distribution systems can have a major impact on water vacuity. Water inflow Conservation includes strategies, programs and conditioning to manage fresh water as a sustainable resource. Water terrain, and to meet current and unborn mortal demands.

II. RELATED WORK

1. Look for studies or projects that focus on smart metering technologies and their application in utility billing systems. These resources can provide insights into different approaches, methodologies, and challenges in implementing smart billing systems for utilities like water.
2. Investigate research papers or articles that discuss the integration of technologies in water management systems. This can include monitoring water consumption, leak detection, remote data collection, and communication protocols used in water systems.
3. Explore studies that apply data analytics and machine learning techniques to water billing systems. These resources may discuss data processing, pattern recognition, anomaly detection, and predictive modeling to improve billing accuracy and customer engagement.

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4. Look for articles or case studies that highlight innovative billing systems or practices implemented by water utilities or municipalities. This can include advanced billing platforms, customer engagement strategies, and new billing models aimed at improving efficiency and customer satisfaction.
5. Investigate research on water conservation programs and behavior change interventions related to water usage. Understanding how consumer behavior impacts water consumption and exploring strategies to incentivize conservation can inform the design and implementation of a smart water billing system.
6. Examine policy documents or publications that discuss regulations and standards related to water billing systems. This can provide insights into legal considerations, privacy concerns, data protection, and regulatory compliance in the context of smart water billing.

III.PROPOSED WORK

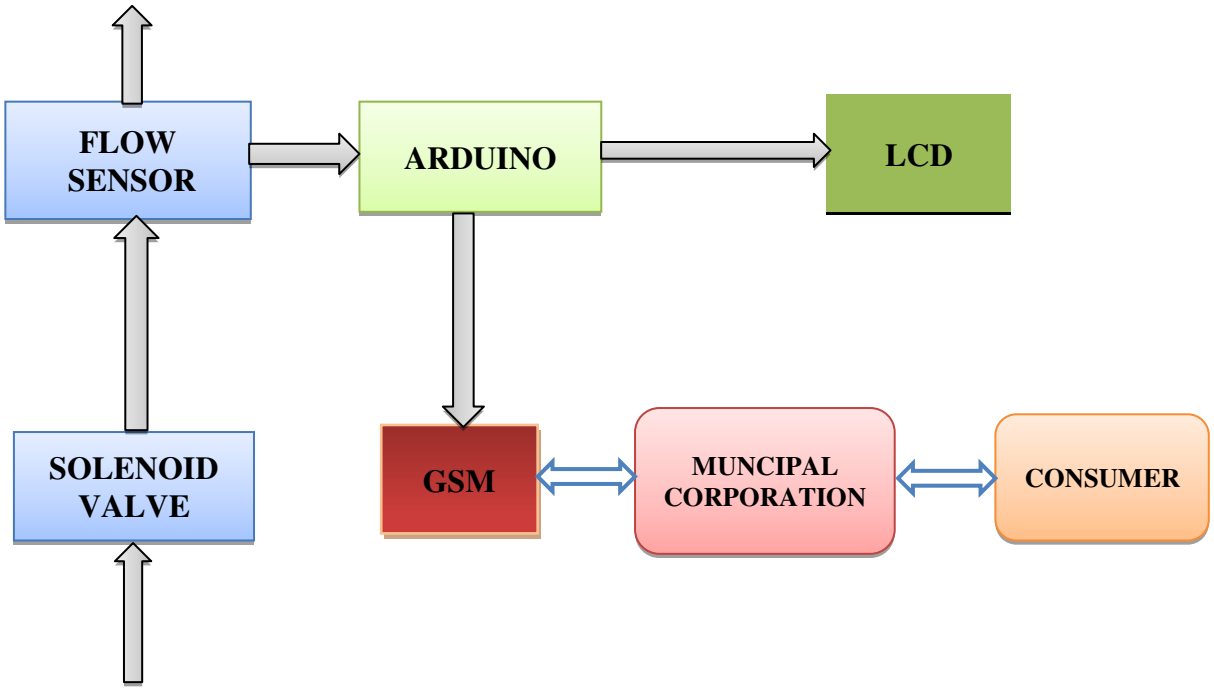

Fig.1. Block Diagram of Proposed Work

A. WORKING OF PROJECT:

The block diagram gives us an idea of how the system is going to work. The water meter has a water flow sensor used to sense the flow of water. The sensor sits in line with your water line, and uses a pinwheel sensor to measure how much liquid has moved through it. There is an integrated magnetic Hall Effect sensor that outputs an electrical pulse with every revolution. A turbine wheel with magnet is placed on a closed plastic envelop. When the water flows through the pipeline, it makes the turbine wheel to rotate and hence the magnet flux interferes the hall sensor.

The Arduino will play a major role in regulating and giving the final outputs to the respective user in the form of SMS and LCD display. The monthly water consumption is sent wirelessly to the base station. The receiving mobile phones at the base station receives the monthly consumption. Hence the bills are created automatically and sent to the user through SMS without human interference and display on LCD.

When the monthly water consumption is sent wirelessly to the base station and the user then the base station give particular time to the user for pay the bill. When user not pay the bill in particular timing then meter is automatically cut off.

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B. HARDWARE PART:

Arduino UNO: We chose the Arduino UNO as the main hardware component of the project due to its low cost, small size, and compatibility with various operating systems.
GSM Modem: GSM is a "Global System for Mobile Communication". GSM modem can accept any GSM network operator SIM card. And act just like a mobile phone with its own unique phone number.
Power supply: A 5V/12V power supply was used to power the Arduino UNO and GSM module.
Display screen: A display screen was used to show the Water usage and water price.

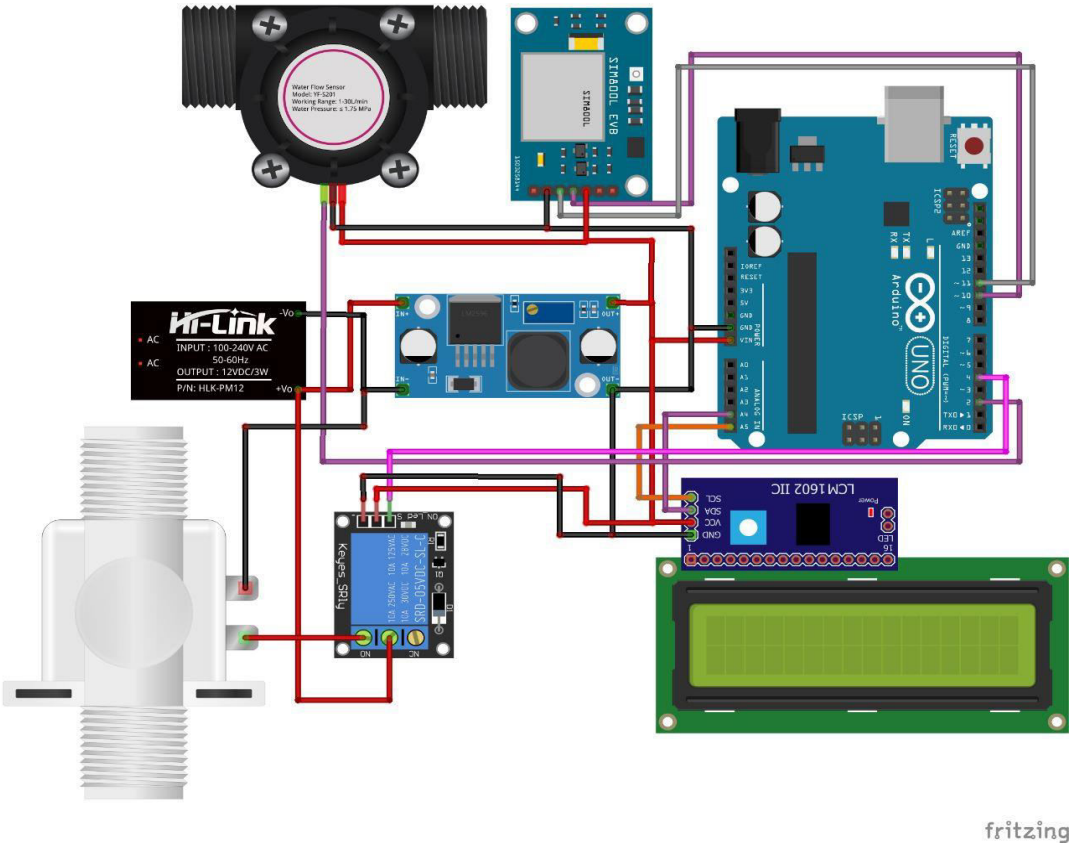

Fig.4. Hardware Requirement

C. SOFTWARE PART: Transaction SYS application is used for bill payment. The base station provide a QR code paying bills. This application scan the provided QR code and pay the bill.

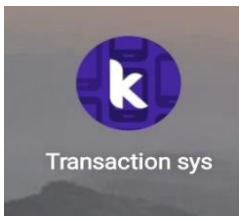

Fig.5. Application

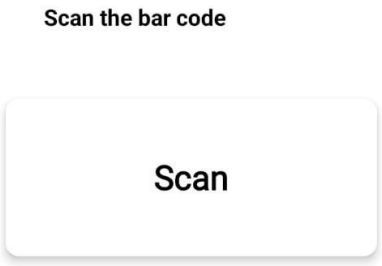

Fig.6.Overview of Application

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D. DEPLOYMENTS

Conduct a thorough analysis of the existing water billing infrastructure, including data collection methods, billing procedures, and consumer communication channels.Define system requirements and design the architecture of the Smart Water Billing System, considering factors such as scalability, security, and integration capabilities.

Hardware Setup:
Install and configure smart water meters equipped with IoT sensors and communication modules at consumer premises.Establish a secure and reliable network infrastructure to facilitate data transmission between the smart meters and the centralized server.

Software Development:
Develop the backend system, including the centralized server, database management, and data processing algorithms. Design and implement a user-friendly web or mobile interface for consumers to access their consumption data, billing details, and additional system features.

Full-Scale Deployment:
Roll out the Smart Water Billing System across all targeted areas, gradually transitioning from the previous billing system to the new solution.Monitor system performance, address any issues or challenges encountered, and ensure a smooth transition for all stakeholders.

Ongoing Maintenance and Updates:
Establish a maintenance plan to monitor the system's performance, conduct regular updates, and address any technical or operational issues that may arise. Stay updated with emerging technologies and industry standards to incorporate enhancements and new features into the system.

IV. SIMULATION RESULT

Let's consider a residential area with 1 households equipped with smart water meters as part of the smart water billing system. The meters accurately measure water consumption in real-time and transmit the data to a centralized server for processing. The billing system applies tariff rates based on the water consumed and generates billing statements for each household.The smart water meters collect water consumption data at regular intervals, say every hour, for all 1 households.The system calculates the total water consumed for each household over a specified billing period, such as a month.The generated billing statements are delivered to the customers through their preferred communication method, such as SMS.

The smart water meter system ensures accurate billing as it eliminates the need for estimated readings or manual data entry, reducing the chances of billing errors.The system's data analysis capabilities can help identify abnormal consumption patterns that may indicate leaks or water wastage. Timely detection allows for prompt repairs, minimizing water loss and promoting conservation.The availability of detailed billing information, real-time consumption data, and convenient payment options through customer portals enhance customer satisfaction. Customers can easily track their usage, understand their bills, and make payments hassle-free.

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A. Implementation

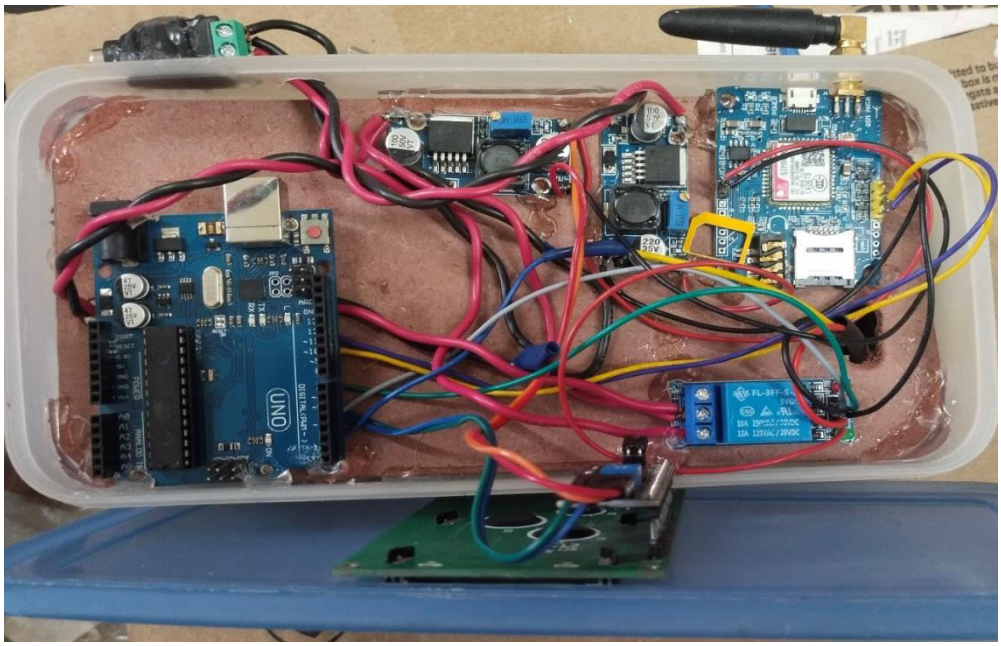

Fig.7. Hardware Implementation

B. Output

Fig.8. Start the project

Fig.9. Water usage and Price

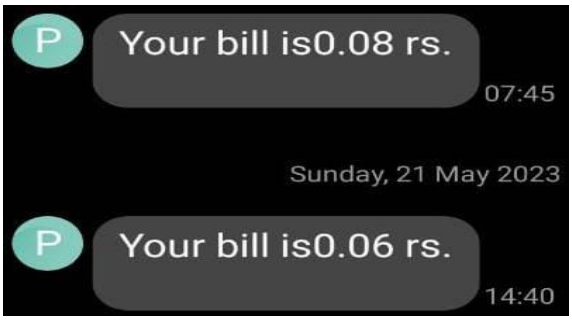

Fig.10. Mobile SMS

Fig.11. Main result of project

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V. CONCLUSION AND FUTURE WORK

Smart water meters provide precise and timely data on water consumption, eliminating estimation errors and ensuring accurate billing. This helps both consumers and utility providers to have a clear understanding of water usage patterns. With access to real-time consumption data through customer portals or mobile apps, customers can actively monitor their water usage and make informed decisions to conserve water. This promotes awareness and encourages responsible water consumption.

Improve the meter's real-time monitoring capabilities to detect leaks, unusual water consumption, or equipment malfunctions. The meter can send instant alerts to consumers and utility companies, enabling prompt action and minimizing water wastage or damage.Develop user-friendly mobile applications that allow consumers to monitor their water usage, receive billing information.

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