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Smart Water Metering and Billing System Using IOT

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ABSTRACT: This project focuses on implementing an efficient water management system using Internet of Things(IoT).The purpose of this project is to present a product designed to assist with urban home water billing system in India. Utilizing essential components like water flow sensors, water level, and an Arduino-based minicomputer, the system aims to ensure a consistent water supply while addressing issues such as overuse and irregular distribution. Users can easily monitor and regulate their water consumption.This project integrates a water flow rate sensor, designed to create a carefree solution to urban water metering and monitoring of the water usage using cloud, In addition to that, detailed water usage shown in the data sheet and “LCD” display can be obtained from a cloud platform called “Thingspeak”.A mobile app is also designed to serve as a user interface helping to access the cloud through a website.By leveraging IoT technology, this system modernizes water monitoring, offering a user-friendly approach to ensure efficient water resource management in urban areas.

KEYWORDS: Arduino UNO, Flow sensor, Water level sensor,Pump,IOT

I.INTRODUCTION

In recent times, development in computing and consumer electronics technologies have triggered Internet of Things (IoT) paradigm. Internet of Things (IoT) is described as enabler that links seamless objects surrounding the environment and performs some sort of message exchange among them. The Internet of Things (IoT) is a collection of objects that work jointly in order to serve consumer tasks in a federated manner. It binds computational power to deliver data about the surrounding environments. In current water billing system, each building consists of one analog water meter and the total bill amount is equally divided to each home in that building, irrespective of what amount of water that home has consumed, with meters being placed open to outside environment, mechanical water meters are prone to corrosion as they are made of metal. With more electronics and less mechanical hardware, system can be made less prone to environmental changes as they have large range of working conditions. Also an android app is built to act as a user interface to above said features. The Internet of Things aims to link to a physical as well as computer generated world through data interaction and exchange over the internet. Internet of Things stages assist compound actual time controlling process, which linked a utilization of statement infrastructure, hardware, software, logical methods, as well as presentation information joined into several layers. Water distributing process are currently facing a significant test to save water, not only for mechanical and economic causes, but also to enhance an overall presentation of a scheme due to scarcity of water assets in several areas also its raising required for maintainable managing systems. A water management techniques which integrates IoT is used to reduce water waste while also being more efficient in terms of water availability and conservation. The most significant benefits of IoT- based smart water management is that it improves transparency across the entire water supply chain. Considering the existing demands, an implementation strategy for managing a rural water supply network in India using IoT technologies is outlined in this methodology.

II.LITERATURE SURVEY

[1] In 2020, Sudip Misra developed AgriSens: IoT-Based Dynamic Irrigation Scheduling System for Water Management of Irrigated Crops.The design of an ternet-of-Things (IoT)-based dynamic irrigation scheduling system (AgriSens) for efficient water management of irrigated crop fields and proposes an algorithm for automatic dynamic-cum-manual irrigation based on farmer requirements.It lacks the Billing functionality for the amount of water used.

[2]The IoT based Smart Water Quality Monitoring System was proposed by G J Hossain in 2020.It is an IoT (Internet of things) based smart water quality monitoring (SWQM) system that aids in continuous measurement of water condition based on four physical parameters i.e., temperature, pH, electric conductivity and turbidity properties can

successfully analyze the water parameters and classify whether the test water sample is drinkable or not. This Project doesn't employ Leak Detection and prevention Mechanism and Remote management.

III. PROPOSED SYSTEM

The proposed system introduces an automated water management approach through the integration of IoT devices such as motor pumps, flow sensor, level sensors, and smart monitoring systems. This automated setup eliminates manual intervention, ensuring precise and automatic water monitoring, distribution, and leak detection. By leveraging IoT technology for real-time data collection and analysis, this system ensures efficient management and provides accurate insights into water usage patterns. It enables continuous monitoring without human involvement, significantly reducing water wastage. Our system was designed to collect data from the water pipes, of any diameter, whose water flow rate is to be monitored. In real time, the data would be pushed from the data acquisition units at regular intervals into the cloud platform for processing.

System Design:

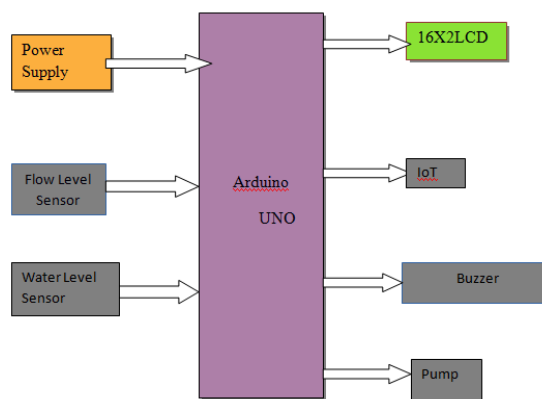


Fig.(1)

The prototype for the flow conservation is to measure inflow and outflow of water. Water supplied from water distribution Water flow rate sensor which is used to calculate amount of water consumed more accurately than the prevailing analog meters. Based on the amount of water consumed bill is generated. At the same time this bill details are updated on the water board server (Thingspeak Server) in our case, thus preventing delay in the process. Website is available to the consumer where he/she can daily monitor the amount of water they used.

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Arduino UNO is a standard Arduino board. UNO means "one" in Italian. The initial release of Arduino Software was labelled as UNO. It was also the first USB board made available by Arduino. It is regarded as a powerful board that is employed in a variety of tasks. The Arduino UNO board was created by Arduino.cc. The Arduino UNO is built on the ATmega328P microprocessor. In comparison to other boards, such as the Arduino Mega, it is simple to use. The board is made up of digital and analogue I/O pins, shields, and other circuitry. The Arduino UNO has six analogue input pins, fourteen digital pins, a USB connection, a power jack, and an ICSP (In-Circuit Serial Programming) header. It's written in IDE, which stands for Integrated Development Environment. It is compatible with both online and offline platforms.



Fig.2

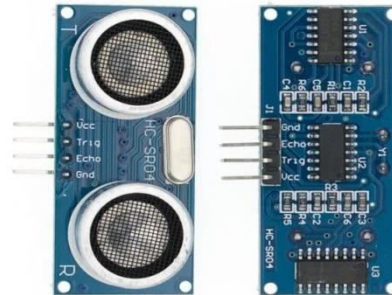


Fig.(3)

Ultrasonic / level sensors, as the name implies, use ultrasonic waves to measure distance. The sensor head generates an ultrasonic wave and detects the reflected wave from the target. The period between emission and reception is used by ultrasonic / level sensors to calculate the distance to the target. A transmitter and receiver are used in an optical sensor, but an ultrasonic / level sensor employs a single ultrasonic element for both emission and reception. A single oscillator generates and receives ultrasonic waves alternately in a reflecting model ultrasonic / level sensor.



Fig.(4)



Fig.(5)



Fig.(5)



Fig.(6)

An ESP8266 Wi-Fi module is a SOC microchip mainly used for the development of end-point IoT (Internet of things) applications. It is referred to as a standalone wireless transceiver, available at a very low price. It is used to enable the internet connection to various applications of embedded systems. It Measures and communicate water usage from consumer to provider to facilitate water management and proper billing. This dynamic billing help utilities reduce operational complexity and cut costs associated with manual billing procedures. Based on the amount of water that a

house uses every day, the IoT system can automatically calculate the bill and displays in LCD and data sheet automatically.

A flow sensor is a component that measures the flow of a fluid such as a gas or liquid. Flow sensors utilize both mechanical and electrical subsystems to measure changes in the fluid's physical attributes and calculate its flow. A water flow sensor is a specific type of flow sensor designed to measure the flow rate of water. It finds applications in various sectors, including plumbing, irrigation systems, water treatment plants, and industrial processes where water flow monitoring is crucial.

The water level sensor measures the level of water in a tank or reservoir, providing information about the water storage status. The water level sensor is a device that measures the liquid level in a fixed container that is too high or too low. According to the method of measuring the liquid level, when the sensor is put into a certain depth in the liquid to be calculated, the pressure on the sensor's front surface is converted into the water level height.



Fig.(7)

The main application of pump is to move fluids, such as gases, oils, and water. An impeller or propeller is a part of a pump that helps move fluids through the device.

IV.RESULT AND DISCUSSIONS



Fig.(8)

With traditional water meters, customers are billed based on estimated usage, which can result in inaccurate billing and disputes. Smart meters provide accurate readings, allowing customers to pay for only the water they use, resulting in fairer and more efficient billing practices.



Fig.(9)

When the Level of Water in the Tank is Low, It Indicates that the tank is empty.

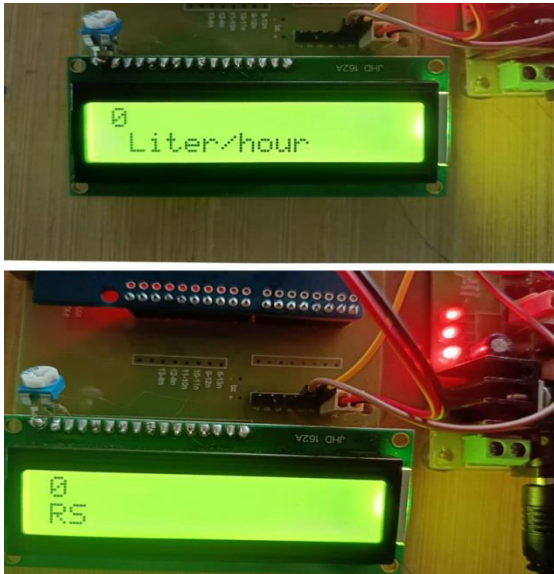


Fig.(10)

Smart metering technology can help promote water conservation by providing consumers with real-time information on their water usage. By monitoring their usage, consumers can identify areas where they can reduce their consumption and make changes to their habits to conserve water

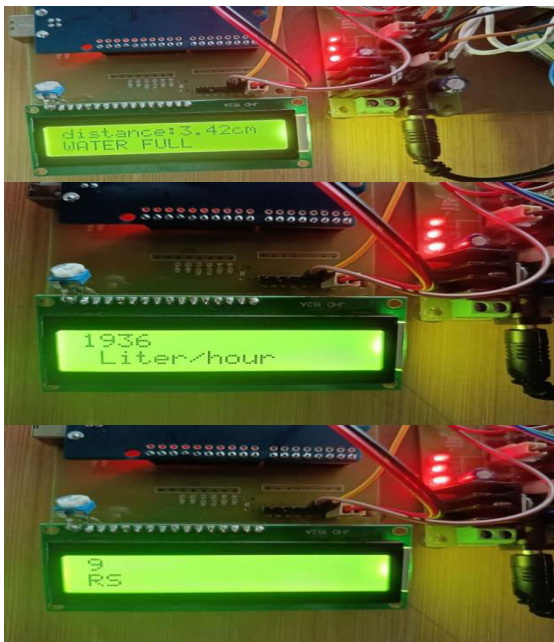
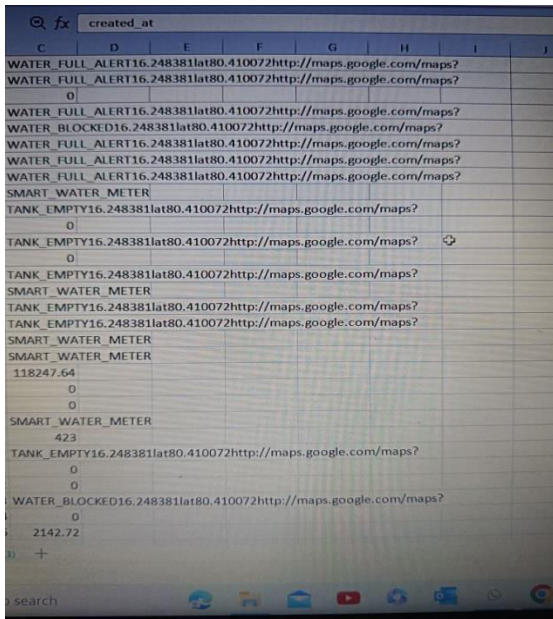


Fig.(11)



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Fig.(12)

V.CONCLUSION

Our smart water meter has low infrastructural cost, as only Arduino UNO and the water flow sensor was used in recording, visualizing and analyzing the water flow patterns. For a large scale implementation, it would encumber a cost of accessing the Cloud facilities. We have proposed a server less architecture that would ensure reliability of the data once recorded in the cloud. We deploy the use of Cloud Computing for recording, visualizing and analyzing flow patterns, analysis specific to each water pipe made possible through a single machine learning.

REFERENCES

- [1] Boretti, A., Rosa, L. Reassessing the projections of the World Water Development Report. *npj Clean Water* 2, 15 (2019).
- [2] Gupta, Aditya & Mishra, S. & Bokde, Neeraj & Kulat, K.D.. (2016). Need of smart water systems in India. 11. 2216-2223.
- [3] <https://indiaeducationdiary.in/every-indian-wastes-45-litres-waterper-day/>
- [4] A. Amiraly and A. Kanniganti, The impact of a pilot water metering project in an Indian city on users' perception of the public water supply, *The Journal of Field Actions*, Vol 5, 2011.
- [5] <https://www.livpure.com/blog/10-shocking-facts-about-waterwastage-in-india-you-should-know>
- [6] <https://thewaterproject.org/water-crisis/water-in-crisis-india> [7] The Status of Water Resources in West Bengal, Kalyan Rudra, Posted Date : Wed, 2009-08-12 12:58 hrs, Water India Portal
- [7] Maduranga, M. W. P., and Ruvan Abeysekera. "Machine learning applications in IoT based agriculture and smart farming: A review." *Int. J. Eng. Appl Sci. Technol* 4, vol. 12 (2020): 24-27.
- [8] Júnior, Abílio C. Da Silva, Roberto Munoz, María De Los Ángeles Quezada, Aloísio V.Lira Neto, Mohammad Mehedi Hassan, and Victor Hugo C. De Albuquerque. "Internet of water things: A remote raw water monitoring and control system." *IEEE Access* vol. 9 (2021): 35790-35800.
- [9] Kamienski, Carlos, Juha-Pekka Soinen, Markus Taumberger, Ramide Dantas, Attilio Toscano, Tullio Salmon Cinotti, Rodrigo Filev Maia, and André Torre Neto. "Smart water management platform: IoT- based precision irrigation for agriculture." *Sensors* 19, vol. 2 (2019): 279.



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