LoRa Based Smart Water Meter System

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ABSTRACT

With the increasing problem in the water management and billing system, it's becoming important day by day to introduce a digital multimeter water system. Our Major Project topic, "Smart Water Meter System" is a huge step towards making India digital.

Our project is based on the Long-Range communication system, popularly known as LoRa communication and IoT (Internet Of Things). Our project initiative is to either reduce the manual work to its minimal or to exclude it completely if possible. This would provide us two major benefits. Firstly, it would give the accurate bills and would be a great help to municipalities and other water associations and private companies. And secondly, it would eliminate the corruption which happens often at the higher firms.

It would involve many components including Arduino Nano and YFS water flow sensor to give us the accuracy we are in need where water usage is at its prime and availability of water is decreasing.

This Project assembles at the water associations and companies and municipalities at one end and in the respective houses of people in the other end. In the end it would bring us one step closer to our aim of Digital India and help us achieve a milestone in victory over corruption.

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KEYWORDS: *LoRa, IoT, smart water meter, Aurduino nano*

INTRODUCTION

The main goal of the research paper is to read, analyze and design a smart water system using IoT and Long Range (*LoRa*) communication. The main aim is to facilitate and ease the task of water reading in corporate and residential area and to contribute our efforts in Digital India and Digital Globe.

Not only are we focusing on making maximum usage of Long Range communication along with application of IoT, we are trying to make it cost efficient as well as easy to available and access. So that it's not complex in nature, and hence easily accessible by majority of the parts of our country.

The smart cities mission isn't just a project discussed over the world but also a practice we are trying to inculcate in our daily practices, eliminating the ancient methods of calculating water readings, which not only had many errors and manmade mistakes but was also embedded by corruption and faults; and trying to introduce a much feasible and beneficial method.

Need For Smart Water System Over The Ancient Metering System?

According to the survey of India and the Government revised policies, more than seven states of India, Arunachal Pradesh, Manipur, Meghalaya, Sikkim, Gujarat, Himachal Pradesh are qualified for incentive grants of 2021-22 under Jal Jeevan Mission (JJM) and Delhi under its Chief Minister. Over Rs 465 crore has been invested to provide water in every household of the state. Where this subsidy is promising *almost free* water to every household, it's also increasing the *unsupervised* use of water. With increasing rates, an individual realises the availability of the resource. But when subsidy helps the poor, it's also blinding us from the ever decreasing water resources.

Hence Smart Water Metering system would calculate the accurate amount of water used by every household and hence we can limit the usage of water efficiently, over the members per household.

Literature Survey:

The current status of Smart Water Metering System in India and the World is important to learn for the designing of the system. We can have a glance at the current stage we are standing in, in the following part.

India:

As per the reports of Time of India, economic times and smart energy analysis, four new projects of smart water metering system is introduced in Noida, nearly after a delay of four years. This system is promising at ending the water wastage and bringing more transparency from the translucent system of billing.

Deputy General Manager of the *Authority's water and sewerage works department,* a Bengaluru-based company, *BCITS* will be finalizing and executing the project. And the aim of completion is *10 year*, i.e. 2031.

They will be using *AMI (Advanced Metering Infrastructure).* And the budget is set for 9.50 crores.

The losses can now be monitored during the supply and revenue collected through the consumption.

Similar projects have been initiated in Delhi, Gurugram, Bengaluru and Hyderabad and many more cities.

It is been promised that 250 million meter will be rolled out for Smart Water Metering by year 2025, though states are promising it until year 2035.

Over 1.7 million of this smart water metering system has been installed by IntelliSmart and EESL in six of our states and union territories. The journey is still long pending but we are heading towards it slowly.

World:

Europe, North America, Canada, are the major countries contributing to the smart water metering system, with Europe leading at the first.

China, Southeast Asian countries are on their path of progress.

Nearly 47% of residential, 38% of industrial and 18.8% of commercial water metering system is now smart, based on LoRa and IoT, all over the world.

Proposed System:

The Smart Water Meter System would be using NRF24L01, two LCD display (16*2), YFS water flow sensor, buzzer, 7805 voltage regulator, BC547 transistor, DC power socket, Relay and push button switch.

The sensor using Hall effect which enables the sensor to work even without immersing completely inside the water.

The flow rate is around 1 to 30 litres per minute, with the maximum capacity of 500 litres.

With a country with varied temperature and seasons, it's important to keep the temperature range in mind while designing any project. Hence the temperature range fixed is: -25 to +80 degree Celsius.

Transmitter Side: 12V of power is supplied in the transmitter side through a regulator of 5V, connected to Arduino Nano.

NRF24L01, flow meter, LCD and Relay are interfaced with Arduino Nano

Buzzer and indicating LED is connected with the Arduino Nano.

Receiver Side: 12V of power is supplied through a regulator of 5V, connected to Arduino Nano.

Interfacing NRF24L01 with Arduino Nano

Interfacing, LCD and Relay, Buzzer and indicating LED with Arduino Nano.

Advantages:

➢ Monthly charges would now be replaced by the charges according to the actual usage. No flat would have to pay for the entire building's usage but their own consumption.

➢ Reduced human labour

➢ Quick and accurate reading

➢ Prepaid metering available (Government of Bihar is working on it)

➢ Digital India

Scope:

To decrease the inaccuracies caused by two stage transmission, we are concentrating on using sensors (*pinwheel sensors*). A trans-receiver system to combine LoRa and IoT based infrastructure to receive and record the reading.

The decrease use of traditional metering system as well as the expensive ultrasonic, electromagnetic sensors, we are trying to introduce the use of LoRa, inexpensive, fast and accurate metering system.

To advance our steps towards the digital India and globe; and to educate people over the benefits of smart watering system and how it is beneficial in long run.

Reduced water wastage and a correct use of subsidy with accurate amount of water being used.

Application:

➢ Smart Water Meter Reading

➢ Reduced Water Wastage

➢ Combining Water Meter reading with Ultrasonic and Electromagnetic components, to yield more efficient result

➢ Can initiate pre-paid water services.

Conclusion:

Use of sensors to transmit the data to the base station using LoRa WAN trans-receiver, using microcontrollers. The received data is then confirmed and displayed on the LCD of both, the supplier and the receiver.

The accurate readings are stored as date for future reference or to introduce any changes as the technology is advancing. If the system is designed properly and executed with proper precautions, the result would only be beneficial in long run.

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