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IoT-Based Prepaid Energy Meter

Afreen[1], Macherla Sri Vishnu[2], Pentam Prashanth Kumar[3]
[1, 2, 3]*Students of Embedded Systems, Department of Electronics and Communication Engineering Jawaharlal Nehru Technological University, Hyderabad*

Abstract: India uses electromechanical or electronic energy meters. The main problems with these energy meters are recovering the electricity bills and more manpower being used in billing processes. An IOT-based prepaid energy meter would be able to address some of the challenges currently available in the existing energy meter. Smart Metering with its unique performance with the Internet of Things (IoT) tends to be an efficient system for electricity management. This can reduce human errors and helps to retrieve the real-time meter value via IOT and send it to the customer's mobile phone through IOT. This energy meter consists of ATMEGA328, a Current sensor, and a Wi-Fi module. It also consists of a mobile app through which consumers can monitor the electricity used by them.

I. INTRODUCTION

We use energy meters to measure the energy consumed by consumers. There are different types of users domestic, commercial, and industrial. With the growing population of energy consumers, energy meters are modified. Now it's time to introduce smart energy meters which ease energy management systems.

The conventional method of electricity billing involves a person from the distribution unit who has to go area by area and read the energy meter of every house and hand over the bills. Based on that reading, a consumer will pay the bill. Challenges in this existing system are Recovering electricity dues from Government departments, Apartments, and Rural areas, Electricity theft, a Complicated billing process, etc. And many times, errors like extra billing amount or notification from the utility are given even bills are paid regularly. To overcome these Challenges, we are proposing an IOT Based prepaid Energy meter.

II. LITERATURE REVIEW

SMART CARD-based Prepaid Energy Meters: Smart card is a credit card-sized plastic card embedded with an integrated circuit (IC) and usually it consists of a ROM, EEPROM, and a CPU. A smart card provides both memory capacity and computational capability. Access to data stored on the card is under the control of the smart card operating system. In this method, the consumer has to have the smart card recharged for the amount he chooses and enter the card into the card reader of the energy meter. Then the meter stores the number of units recharged and starts to measure the energy consumption. When purchased units are used up the meter disconnects the power supply until the next recharge.

III. PROBLEM STATEMENT

As we mentioned above several advantages of digital energy meters, but always there are chances for innovation or modification in different instruments for ease of consumer and supplier. Following are some problems observed in those energy meters which should be rectified.

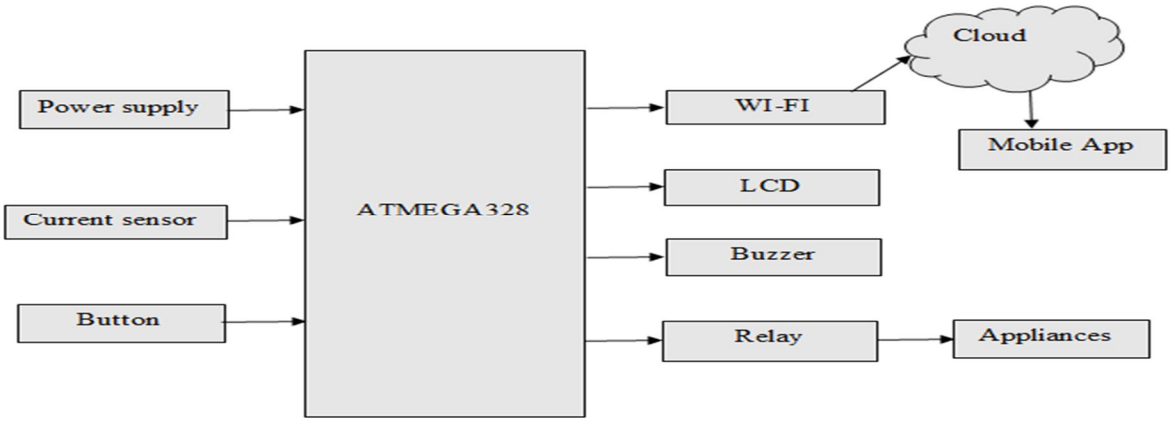
1) Meter reading and other related tasks like bill payment are performed by a large number of staff i.e., a large number of employees are required.
2) An expansive number of staff is utilized for meter readings and other related assignments like bill payment.
3) Billing errors due to carelessness of meter readers during meter reading and sometimes billing estimation.
4) Consumer has to stand in queue for hours for bill payment.
5) Careless usage of electricity by a consumer who is unaware of its cost.

IV. PROPOSED SYSTEM

The concept of the Prepaid Energy Meter is very similar to the prepaid mobile system. Once we recharge, can spend accordingly. When the purchased units are used up by the consumer, the meter disconnects the power supply until the next recharge. The system will automatically notify the consumer to recharge before zero balance; unit recharge will be done by the service provider through the mobile app or at the service provider's office.

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This system allows the consumer to estimate electricity expenses. And upfront payment for electricity and hence low overheads for a service provider. This system will first register the user. For making a recharge the consumer must have to log in to the system. The username and password must create to log in then it will check for the user is valid or not through the server. It can able to recharge through the user's phone app only if the user is an authorized user. As recharge ends it will cut off the electricity.



Block diagram

V. WORKING PRINCIPLE

When we give the power supply to the circuit, The current sensor detects the current and performs load measurement. The current sensor detects the electric current in a wire and generates an analog signal proportional to that current, and forwarded it to the microcontroller. Microcontroller converts the analog signal given by the current sensor into a digital signal and gives it to LCD. Current units used and available are displayed on LCD. Microcontroller communicates with the WI-FI module and gives an indication to a mobile app. When available units reach the set point the user gets a warning as the buzzer sounds.

VI. ADVANTAGES

1) Cost of manpower for billing and collection is substantially reduced.
2) Upfront payment for electricity and hence low heads for service providers.
3) No need to wait for the month-end bill.
4) Allows consumers to budget electricity expenses. They know exactly how much power is being utilized.
5) Remote access to meter readings.

VII. CONCLUSION

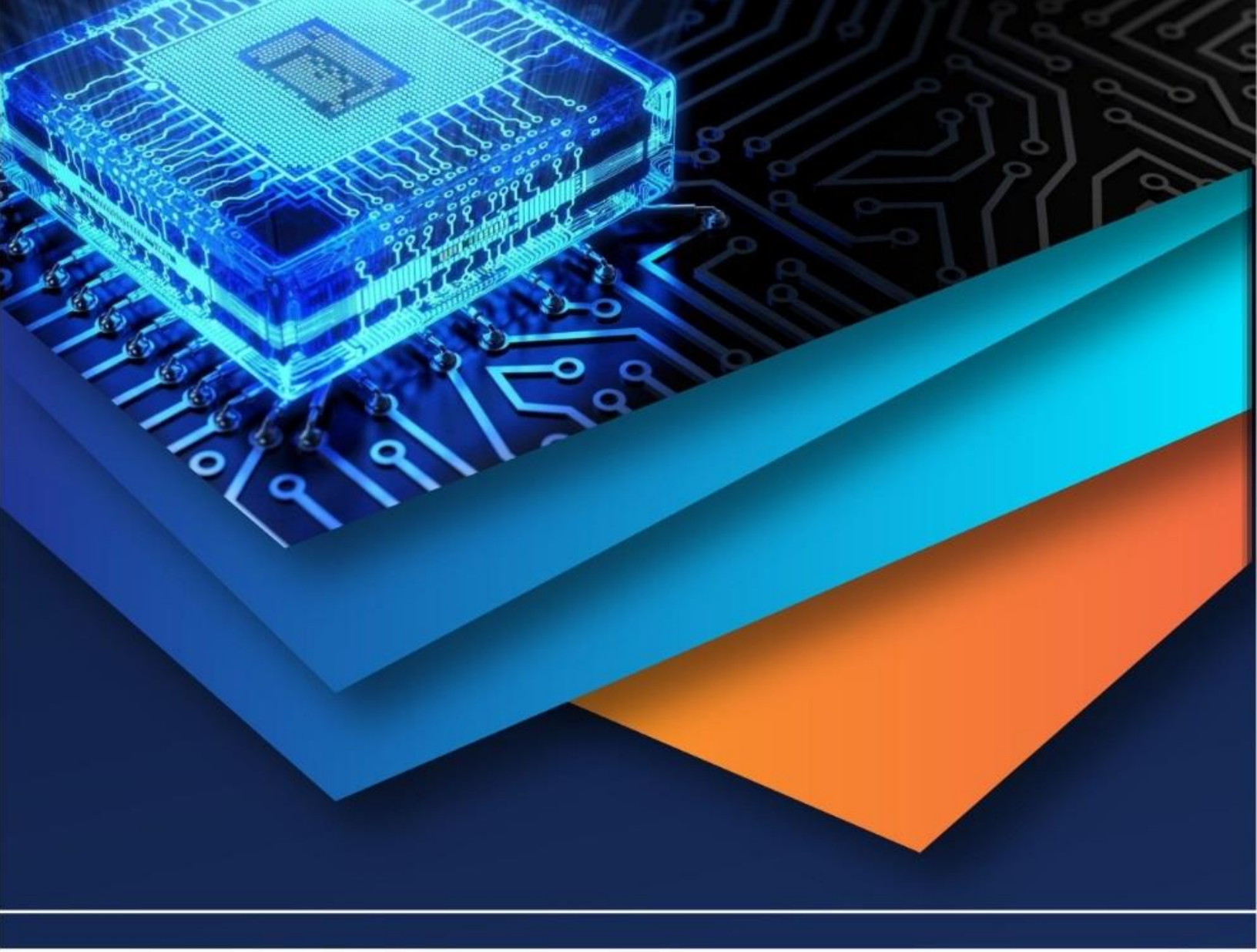
Helps consumers to contribute towards energy conservation. Recovery from the Government and apartment blocks will get easy. Prepaid energy meter minimizes Electricity in a cost-efficient manner. The users are not bound to pay an excessive amount of money, users can pay accordingly.

VIII. FUTURE SCOPE

In this advanced century, there is no space for errors or faults either in any technical system or in general applications. A prepaid energy meter is a beneficial concept for the future. In the future, this project can be used to measure natural gas or water consumption. A consumer can operate electrical devices through the app. like ON and OFF.

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