Automatic Intelligent Energy Metering and Digital Billing an Android App and Notification

Marry Josi Ceciliyah.A[1*], Priya.V[2], Amutha.K[3]

[1,2,3] *Assistant Professor,Department of Computer Science and Engineering, St.Joseph's College of Engineering and Technology, India.*

*Corresponding author

Abstract

Recently, it is observed that the huge revenue loss in Electricity Department is due to the metering and billing system. Errors get introduced at every stage of billing like, human errors while noting down the meter reading, or error while processing the bills or faulty meters. As per few study reports, it is concluded that 40% of the electricity in India is unpaid. Around one-fourth of the power generated is either stolen or lost in transmission in the country. The solution to these problems is a smart electricity measuring system. The aim is to design a smart electricity measuring system with an android based payment system. We proposed a wireless system for smart electricity meter and billing system using IOT (Internet of Things). We also used the relays to cut down the power supply of unpaid user which would be controlled wirelessly using IOT concept. Reading will be taken automatically and users get the notification through message using cloud notification.

Keywords: Internet of Things, Electricity Department, Cloud Notification.

1. Introduction

Now a day's most of utility service provider companies use manual process for taking readings. Those readings are maintained in record book. Due to manual processing of data there are possibilities of generating an incorrect bill. This process because extra work load on person

who is capturing meter readings and there is no such way by which customer can easily report a complaint or file complaint, if any problem occurs. To solve this problem we are proposed an android application which will carry by meter reader to take readings and web portal for electricity users to interact with electricity Distribution Company. Meter reader simply captures image of meter, then application performs OCR operation (extraction of text from image) and send captured readings to server. The sever will generate bill according to customers meter reading, after updating database, PDF is send to customer via registered email address. Thus this process reduces manual work, so wrongness in thebill generation is decreased. Thus, that time consuming process is turned into completely accurate automated process.

2. Literature Survey

2.1. Reviews on Smart Electric Metering System Based on GSM/IOT

Arduino and GSM based smart energy meters for advanced metering and billing system is able to read and send data via wireless protocol using GSM technology through GSM modem, capable of managing the meters as well as the line connections. For GSM module uses the network coverage of the SIM. Smart Energy Meter uses SMS or/and Wi-Fi to send the power/unit data to cloud, so that user can access the data room module Apps and websites. Using cutting edge technology smart energy meters will save money, labour, efforts and time and at the same time it will effectively monitor the electricity consumption, usage and fraud. It is safe and easyto use and user friendly. The metering system uses cheap components which will decreasethe overall cost of the equipment increasing its affordability and penetration in nonmetered areas.

2.2. Smart Energy Meter

This paper proposed and demonstrated Smart Energy Meter that the users will be able to monitor their current power consumptions (bill) anytime from anywhere by using their mobile phone via. This concept provides a cost efficient manner of electricity billing. The present energy billing systems are discrete, inaccurate, costly and slow. The major drawback of traditional billing system is power and energy theft. The GSM technology is used so that the consumer would receive messages about the consumption of power (in watts) and if it reaches the minimum amount, it would automatically alert the consumer to recharge.

2.3. Android Application for Meter Reading Using OCR

This paper approaches both conceptual design and implementation for Android Based Meter-Reading using OCR system for reading water and power consumption meters; concepts and techniques for the evolution of the system, which might be extended to it, are also explore. This Application has been designed basically to reduce the tedious work and avoid the Human errors. The Application is built essentially to monitor the energy usage and accessing the daily energy data which can result in better energy management. Enabling accurate data stored, analyzed and presented to a customer on demand. The android based meter reading using OCR suggests: Android application and a Web application. Android app is for meter reader for reading the meter. This solution gives best benefits to meter readers. Meter reader from start of the day carries android device having android app in it which enables a route map called customer meter map which has the route of customer houses that he has to read the meters within a day. Once the meter reader reads the meter the color of pointer on map is changed so that reader can know the meters that are read. This is very helpful for new meter readers for reading the meter.

2.4. Mobile Based Electricity Billing System

Billing is a critical function of both the Electricity and the Water Boards towards getting a meter read. Meter reading, even though it looks simple, is far from simple and involves processes that can give various problems. Most problems, currently seen, result from the manual processes followedCalculation errors, delays in system updating and fault tracking issues are the major problems that companies find difficult to find answers for. This paper suggests a mobile based system to collect, process and notify consumers about consumption. This system will be reliable, efficient and accurate to suit the requirements of these companies. The proposed solution uses evolving Mobile Technologies, over a solution which uses Mobile applications to handle a company's day today work. The burden on the Meter Reader is lessened and other new features have also been introduced. Customer interaction with the company is improved and customers can easily view their current electricity usage using their mobile phones. However, the feasibility of such a project for a third world country like Sri Lanka, is a concern with tregard to the cost factor involved. The project demands substantial investments. Will the country be able to meet the costs involved? Yet, most of the problems related to Electricity Billing are addressed through this system and this might prove to be the best solution for specific companies to optimize services on a low budget.

2.5. GSM based Automatic Meter Reading and Billing System

Owing to high electricity cost these days it becomes necessary for the consumer to know as to how much electricity is consumed to control electricity bill within his budget. In this proposed system, the consumer will get his energy consumption data on real time basis on a LCD display. The same data is sent through GSM modem to the electricity department via SMS. Arduino is interfaced to the energy meter to get the Watt Hour pulses. The Arduino then processes these pulses according the program written in it, to calculate the units consumed and cost involved.

Further it gives command to the SIM loaded GSM modem for sending the data to the customer/consumer via SMS. Further this work can be enhanced to control the electrical appliances remotely via SMS. Also it can be used to monitor the power consumption or any other factor like pressure, temperature etc. with appropriate changes.

3. Problem Description

3.1. Existing Framework

The existing system is an electricity distribution company which gives contract to collect meter reading of customer's electricity reading. Then theworker of third Part Company takes reading and submits it to the administrator office. Administrator office sends that data to electricity distribution system. Electricity Distribution Company delivers the generated bill to the customers according to their meter reading. The companies who used to perform manual work for this process assumes that the process of bill generation is easy and they do not require skilled worker so they don't need invest on adapting new technology for billing. In case of incorrect bill and device failure customer has to face difficulties for lodging complains. There is no communication channel provided by company for broadcasting different information such as power failure.

3.2. Proposed Framework

We are developing the Solution for meter reader and a web portal for customer. By using Android application, reader will get the meter reading. Meter reader carries handheld device with android Operating system in which our android application is installed. This process of bill generation is very simple. Meter reader needs to capture image of meter, then the application perform OCR operation on captured image, outcome of OCR operation i.e. reading are send to server for bill calculation and bill generation process. The sever will generate bill

according to customers meter reading, after updating database PDF is send to customer via registered mobile number.

4. Implementation

4.1. User Modules

Here an android application is developed for consumers, so that they can login to it using a consumer id and password provided by the administrator. The Consumer can request the meter readings by simply pressing a button and capturing image in the android application. The bill amount to be paid for power consumption is automatically generated in the App. The consumer is provided with the facility to remote disconnect and reconnect to mains. Another feature is that; the consumer can make the online payment of electricity bill through the App.

4.2. Server Module

Energy provider side is a web portal where the administrator can add users, update cost per unit, filter unpaid users, cut the power supply. The administrator assigns a user id and pass-word forthe user for accessing the mobile application. The readings from the energy meter will be updated in the energy provider server with the help of user module. After generating bills, the admin can see the users with payment status. If they are not paid, then the administrator can disconnect the power supply to the corresponding user by sending Messages to the energy meter.

4.3. Bill Generation

The system designed reduces the efforts of manual data collection of energy meter. Also, data which is received at service provider side is easy to manipulate for bill generation and other such tasks. With this system we can collect the reading as well as control the supply to the user.

With addition of software at service provider side, the customer can be informed of current meter reading, bill for current cycle, status of the line and other parameters to the customer with message. The technology used in energy meter is expanding to the power distribution transformers. So that we can cut the power supply from anywhere in case of any emergency or maintenance, find areas with power distribution failure.

Figure.1. System Architecture

5. Conclusion & Future Work

Thus the process system with high efficiency and robustness. The user needs to register first, and then the data of user will be stored at the cloud. The access to the internet is via android which has unique MAC id so the exchange of meter can't be possible. The billing will be automatic through the server-based unit. For defaulter, customer electricity connection can be cut through the relay on the electric meter. Thus, manual work gets avoided. In future the work of instant messaging and further module development can be done which will make our project fully automated and alsomore reliable software for the event should be provided.

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