Automation of Electricity Management

Sayali Gore[1], Anmol Bhegade[2] , Priyanka Dhaybar[3]

NMIET, Department of Computer Engineering, Pune University,
Talegaon Dabhade
29sayaligore123@gmail.com

NMIET, Department of Computer Engineering, Pune University,
Talegaon Dabhade
anmolb123@gmail.com

NMIET, Department of Computer Engineering, Pune University,
Talegaon Dabhade
priyankadhaybar7@gmail.com

Abstract: *Nowadays electricity has become the most important aspect of life without which no work can be performed or completed. So this paper introduces about electricity management via Android application. As to manage electricity in a very efficient way, we are providing postpaid and prepaid billing system to customer. Also task of human intervention will get reduced as there will be no manual reading. The meter reading will be transmitted wirelessly to the local server along with the meter number. This data will be fetched by the server and generate bill automatically .The user will be able to view updated power consumption as well as billing information in provider web services. When bill is generated SMS alert will be send to the owner's mobile number. If in case the owner has not paid his bill, cut-off warning messages will be send to users via e-mail and SMS.*

Keywords: Android handset, Network communication, Embedded system**.**

1. Introduction

Our project entitled Automation of Electricity Management aims at generating information regarding electricity usage to the user with advancement of mobile device support. Proposed system will be providing not only post-paid billing system but also prepaid billing system as well as cut-off warning messages which will be send to user via Email and SMS. The system helps the electricity provider to reduce the operation cost as the system could cut off electricity automatically when the usage limit is exceeded. No need of taking extra efforts for hiring a meter reader and paying allowances to him. Also the user will be able to ON/OFF the electricity via single click of mobile app.

1.1 Background

Automation lowers the human judgment to the lowest degree possible but does not completely eliminate it. Depending on the location of its usage, electricity management differs in its name as industrial management, home management etc. With the development of low cost electronic components home automation migrated from being an industrial application to home automation. The billing automation is our basic point of concern that deals with the control of electricity. Market researches claim that most of the homes will be equipped with home automation systems in the very near future.

1.2 Motivation

The old manual system was suffering from a series of drawbacks. Whole system was maintained with process of keeping, maintaining and retrieving the information which was very tedious and lengthy work. If any information was to be found it was required to go through the different registers, documents. There is always unnecessary consumption of time while entering records and retrieving records. Another problem was that it was very difficult to find errors while entering the records and also difficult to update these records. So by analyzing all these problems, we got motivated to this project in order to cure all above real time problems.

1.3 Idea of project

The technology of e-metering has gone through rapid technological advancements. So there is increased demand for a reliable and efficient Automatic Meter Reading system. The proposed system replaces traditional meter reading methods. It enables remote access of energy meter via energy provider. Authentically, users can access the developed web page details from anywhere in the world. The complete monthly usage and unpaid bill is messaged back to the customer after processing data.

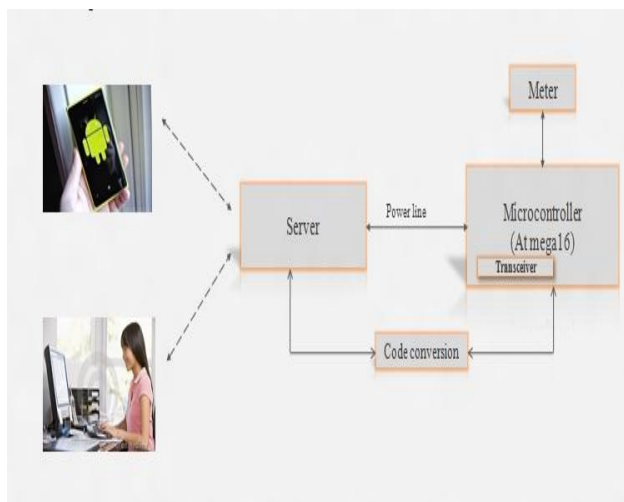## 2. System Architecture

Figure 2. System Architecture

The proposed system is most effective and secure. This proposed system actually uses client server architecture which includes single central server and so many clients which uses the smart meter. After receiving meter reading, reading is stored in database for further task. Then bills are generated and accordingly notifications are sent to user's mobile number and e-mail id. In this there will be logic of Code Conversion that is nothing but embedded coding. It will consist of binary to decimal conversion. And after this it will display data on LCD display.
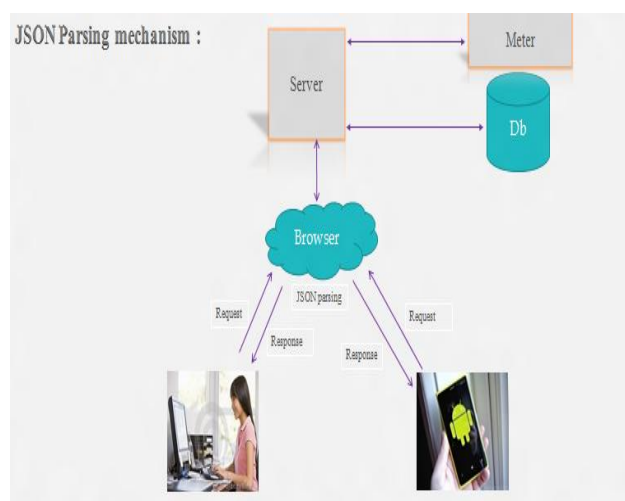
3. Design of system

Figure3. Design of system

Firstly user will send request on browser. It will then invoke JSON parsing mechanism. In this mechanism, whenever user requests any data, it will be transmitted on browser which will invoke JSON parser. It will then call Representational State Transfer web service which will accept data by calling HTTP GET() method and post response by calling HTTP POST() method. In this it will do task of converting message into packets and vice versa. It will be transmitted to server and then server will do process of authentication. If valid, then it will provide required data to user else not.
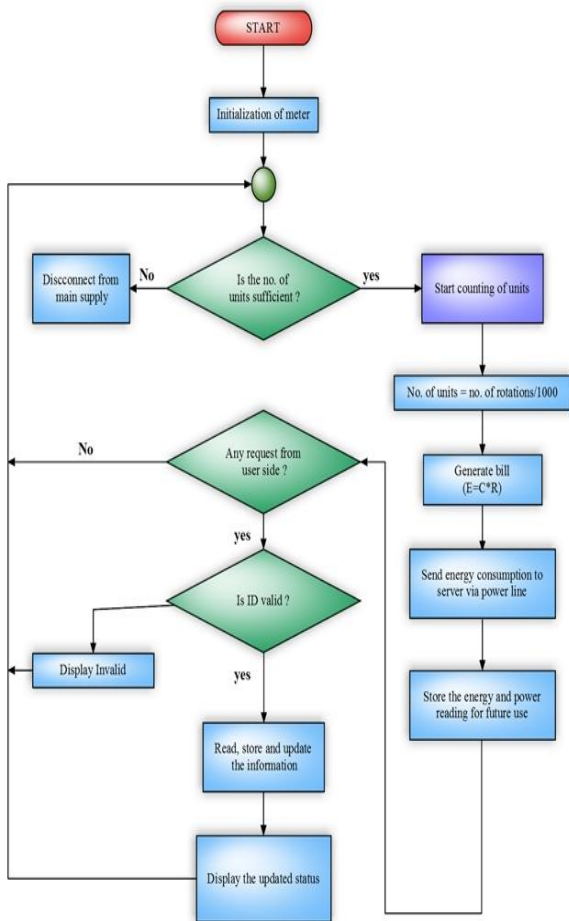
4. Proposed Design

Figure 4. Control flow of proposed system

Since from the last few decades, the main concern of human has been about energy consumption. People utilizes more power than what they actually need which results in huge loss of energy. Thus we are preparing a **prepaid electricity billing system** so that people can buy only that much of electricity which they are really in need of. Continued electric service is completely dependent on prepaying of service on timely basis. The warning message for next electricity recharge is send to customer's mobile number and E-mail ID after reaching nearer to limit or as well as exceeding the due date. If your current balance falls below the disconnection units criteria, your services will get disconnected until next recharge.

5. Algorithm

Algorithm for bill calculation:

Step 1: Start

Step 2: Initialize the meter

Step 3: Check for sufficient units goto step 5

Step 4: If units are not sufficient then it will cut main power supply

Step 5: Start counting number of units

Step 6: Calculate energy consumption
$$E = C*R$$

Where,
C = consumption of units
R = rate of electricity

Step 7: Send to server and store in database

Step 8: Stop

6. Technology Overview:

6.1 Android Development Tools (ADT)

Android Development Tools is a platform that provides a framework to develop new interactive applications. With the help of this tool, new developer can build various applications in very efficient way.

6.2 Android

It is a mobile operating system based on Linux kernel. It is low cost, modifiable and readymade operating system which helps the user to develop applications at user level. Main advantage of this system is that it provides default user interface which helps for direct manipulation without any developer interference. It has various functions as ability to create applications, develop and publish new applications as per user expectations.

6.3 Java

Java is a functional computer programming language that provides high protection of data. It is a platform independent language. It is used as object oriented language which helps to create applications in a very efficient manner. It is **Write Once Run Anywhere** type of language which reduces the task of compiling code each time it is executed on new system. It is also used for creation of web based applications or develop business applications.

6.4 Eclipse Luna

It is an **Integrated Development Environment.** It contains a base workspace and extensible plug-in system for customizing environment. Java is mostly preferred for eclipse that can be used to develop interactive applications. It can also be used to develop packages for the software calculations.

7. Mathematical Model

1. Let S be a system.

   S= {....}

2. Identify input as I

   S= { I,....} Let I = {i1,i2,....id}

   where I is registration details.

3. Identify output O

   S= { I,O,....}

   O= { Output | Authenticated. }

4. Identify Constraint C

   S= { I,O,C....}

   C= The user should have android handset. He must get registered with app in order to get benefit of this application.

5. Identify the processes as P

   S= { I,O,C,P,....}

   P= { o, a, s, m, p, t, d}

   • o : OTP algorithm.

   • a : Android handset.

   • s : Server.

   • t : Transceiver

   • d : Dummy bank

   • p : Power line for connection between server and meter

   • m : Meter consisting of microcontroller in-built

6. Identify failure cases as F.

   S= { I,O,C,P,F,....}

   F= { Failure occurs if user is not valid and server fails.}

7. Identify Success cases as s .

   S= { I,O,C,P,F,s....}

   s= { Success occurs when user gets access to application as well as it gets connected to server. Also when automated bill is precisely generated and billing system works properly.}

8. Identify Initial condition as Ic.

   S= { I, O, C, P, F, s, Ic }

   Ic= { User should get registered by providing all details as well as documents.}

8. Applications

In this, according to security perspective, it will be providing a very high security as compared to existing system. Also theft perspective is achieved at a high level. No need of standing in a long queue. No need of extra budget for hiring meter readers.

9. Conclusion

This application will be pretty much useful to the user in various aspects. The user will get the capabilities of performing various tasks from single application in hand. It will enable user to perform history checking, monitoring current usage. Thus, we can conclude that the usability and performance of application can be a great use for anyone who accesses this application.

References

[1]   Prof. Devidas Thosar, Pratiksha Gadekar, Tejsahri Kadam, Neelam Jadhav **Remote Automatic Meter Reading System with Instant Billing For MSEB**, International journal of emerging trends in science and technology, April 2014, ISSN 2348-9480.

[2] Shraddha Male, Pallavi Vethekar, Kavita More, Prof. V. K. Bhusari **An Intelligent and Smart Wireless Electronic Automatic Energy Meter Reading System**, March 2014, International Journal Of Scientific Research And Education, Volume Issue Pages 398-406 pp, 145-147.

[3] Jignesh Somabhai Prajapati, Ashwin. P Patel, Vyom. M bhankhariya **Prepaid electricity billing system**, Journal of Information Knowledge and Research in Electronics and Communication Engineering, ISSN: 0975 – 6779, Nov 12 to OCT 13, volume – 02, issue – 02.

[4] Deepali Javale, Mohd. Mohsin, Shreerang Nandanwar, Mayur Shingat **Home Automation and Security System Using Android ADK**, International Journal of Electronics Communication and Computer Technology (IJECCT), Volume 3 Issue 2 (March 2013), ISSN:2249-7838 IJECCT.

[5] Ali Ziya Alkar, Umit Buhur **An Internet Based Wireless Home Automation System for Multifunctional Devices**, IEEE.