

Electricity Supply Monitoring and Billing

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ABSTRACT

Now day's electricity consumption has increase in domestic as well as in industrial purpose. The electricity meters are used to measure the energy consumption. The current system of taking the reading of meter is manual i.e. an employee of Electricity board has to travel for a long distance and take reading manually in-order submit the reading to respective Electricity Board according to that bill is generated. This process required more time and human power and chances of error is more. The proposed system provides a efficient way to avoid this problems. The main objective is to develop a meter system and control the load through Wi-Fi. The proposed system provides a efficient system to avoid this problem. The board will get reading hourly/daily/weekly/monthly.

Keywords: Electricity meter, Node MCU, Relay, Wi-Fi, GSM.

ARTICLE INFO

Article History

Received: 22nd March 2019

Received in revised form :

22nd March 2019

Accepted: 23rd March 2019

Published online :

24th March 2019

I. INTRODUCTION

Online An electricity meter is a device that measure the total amount of electrical energy consume by a business, residence or an electrically power device. In the traditional system of electrical meter a person from electrical department has to go each house and capture the images of the meter units at each house and take that picture to the Electricity Board. A Lot of human errors are involved in the existing system as picture gets interchanged. A lot of systems were proposed using camera attachment at metering unit, but major drawback of that is the camera images are affected by external parameters and thus may not get clear picture of meter ad hence processing of captures image won't be possible. In the advance system, the meter communicates directly with your energy supply via wireless connection [2]. Smart meter can be install at each and energy house, where the state electricity department going to supply the conventional energy. With the help of this system lot of manpower can be reduced and power supply can be controlled [3]. In this proposed system, we are connecting electrical meters of each and every house to the system which will be monitored by a person of electricity department. The person can monitor power energy of each house.

II. RELATED WORK

In this section, the previous work related with this technique is given below.

A. GSM Based Automatic Energy Meter Reading System with Instant Billing.

In a study [1]. In this paper the GSM energy meter is constructed using the microcontroller PIC16F877A, IC MCP3905A and a Display to view the readings. To measure the time stamped of usages of meter RTC (Real Time Clock) is integrated in the module. GSM modem is used to send the meter reading to the main office. GSM unit is present in the office which will receive these data and calculation of the total consumption of each user will be done by the software. Microsoft Visual Studio 2008 IDE is used to design the web portal. The meter reading is store in the databases and calculation of units is done. The generated bill is send to the respective customer through SMS. In addition the Printed postal mails can also be provided through the portal. The developed system is highly effective in which it eliminate the drawback of serial communication. i.e. if acknowledgement is not received then also system performance is not affected.

B. Wireless Controlled Smart Digital Energy Meter and theft control using GSM with GUI

In a study [2]. In this paper GUI based smart meter is developed. GSM technology is used as communication between meter and the service provider. There are various types of thefts such as stealing electricity, unpaid bills, Billing irregularities, Fraud. These types of theft are reduce or control by the proposed system. The meter used is Digital meter where two identical current transformers are used. These two transformers are at neutral and at phase. They measure the current entering in the meter and current leaving from the meter. If the current value of the two transformers are same then there is regular supply. But if the current value is different then it indicates theft has occurred. The SMS is send to the Service provider and alert message is send to the customer. If customer not take necessary action, then Service provider cut or off the meter using the Relay. This research is developed for only single phase power supply and can be further modify for the three phase power supply.

C. Arduino and GSM Based Smart Energy Meter for Advanced Metering and Billing System.

In a study [3]. This paper uses the Arduino Uno R3, Relay, Optocoupler, Display Unit, Control Unit and GSM modem in the Smart meter. When there is power supply and load connected to the meter the Arduino measures the usages of electricity in kWh. The measured energy is send to the Service Provider through GSM modem. It sends the reading according to specific time span. The meter reading calculation is done at the admin side and the bill is generated. The bill is send to the customer registered mobile through SMS. If the bill is not paid within the due date, then the admin send the OFF value to the arduino. The Relay connected between energy meter and the Load will OFF the meter. In this way the service provider can control the ON/OFF of the meter remotely. For simulation of the project PROTEUS 8.0 software is used and for programming the Arduino IDE is used.

D. An Innovative Cost-Effective Smart Meter with Embedded Non-Intrusive Load Monitoring.

In a study [4]. Domestic energy consumption accounts for approximately 20% of worldwide energy consumption thus it is essential to optimize the efficiency in houses by eliminating wasted energy and by promoting actions that can match people consumption. Usually domestic energy uses is invisible to the user the amount of energy used by consumer for different purposes is just a vague idea. Electricity bill is usually monthly or bimonthly feedback. The emerging smart metering infrastructure has the potential to address some of these goals, by providing both households and electric utilities useful information about energy consumption, with a detailed breakdown to single appliance contribution. The methodology used to overcome this problem namely NILM, event detection and load disaggregation algorithm that executes real time using only RMS current sample. This demonstration gives good

accuracy in detecting individual loads running inside a households.

III. PROPOSED SYSTEM

The main aim of the project i.e Electricity Supply Monitoring and Billing reduce the human power and increase efficiency of billing in current system. The proposed system is divided into three module i.e User, Meter, Admin.

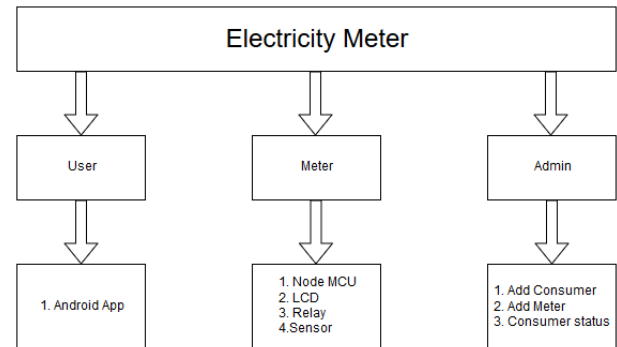


Fig. 1: Module Split-up of the System.

A) User:

User is customer of electricity board. For the user, Android application is developed. User can view the bill and also payment can be done through mobile application.

B) Meter:

Meter module consists of hardware part in which NodeMCU, Current sensor, Relay and LCD is used.

C) Admin:

Admin consist of web application which consists of customer registration, meter registration, Status of consumer.

The system consists of following hardware's:

A) NodeMCU:

It is open source IoT platform. NodeMCU includes firmware which runs on the ESP2866 Wi-Fi System On Chip (SoC) from Espressif Systems and hardware which is based on the ESP-12 module. It is singled board microcontroller which has memory 128 bytes and storage 4 MB. It includes 16 GPIO (General Purpose Input Output) lines. Two pins are reserved for Rx and Tx. Only 9 GPIO pins are generally used i.e. D0 to D8.

B) ACS 712 sensor:

ACS 712 consist of Hall-effect sensor circuit with a copper conduction path. It operates from 5 V supply and output sensitivity is 185mV/A. The strength of magnetic field is proportional to the magnitude of the current. At zero current, the output voltage is half of the supply voltage (VCC/2).

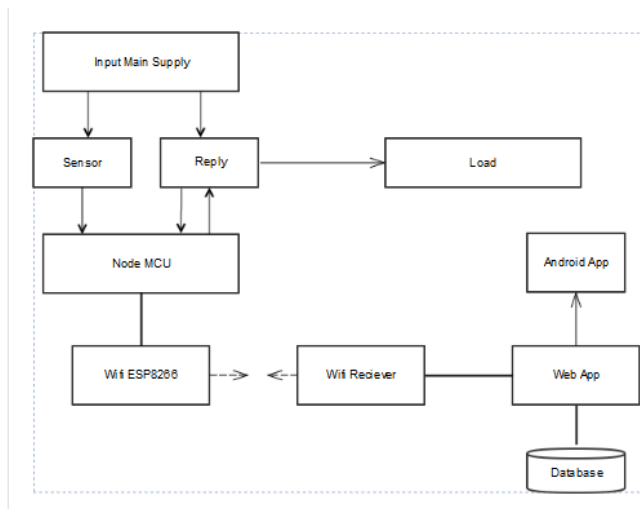


Fig. 2: Architecture of the System.

When there is power supply and load connected to the meter the ACS 712 sensor measures the usages of electricity. The measured energy is send to the Service Provider through Wi-Fi ESP8266 which is build on NodeMCU. Service Provider receives the reading on customer status page. The meter reading calculation is done at the admin side and the bill is generated. The bill is send to the customer registered mobile through SMS and also user can view the bill using android app. If the bill is not paid within the due date, then the admin send the OFF value to the NodeMCU. The Relay connected between energy meter and the Load will OFF the meter.

IV. RESULT AND DISCUSSION

After implementing this system Electricity Monitoring will become more transparent as user can also view the usages of the appliances. Also the precision of measurement will increase. Human errors which was occurring in previous system also be reduce. Our system consist of NodeMCU which is low cost hardware which reduce the overall cost of meter.

V. CONCLUSION

In the world of Digitalization, the traditional system has to be replace by the new technology. The system is on new technology which has more advantages. The use Wi-Fi has increase and our system is based on the Wi-Fi modem which increases the data transmission faster than the GSM. When we implement this project commercially the cost may reduce more than the demo project. Proposed system will provide the smart and secure infrastructure.

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