IOT BASED SMART ELECTRICITY METER AND BILLING SYSTEM

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Abstract - *Electricity is the heart of today's world. And now the world is going to be digital so electricity is very much important aspect. Generation and supply of electricity is the primary task of electricity board but it is also important to measure the power used by the consumer that is taking readings and generate the bills. In current scenario taking a reading and generating bills is manual work. It is very time-consuming. Power theft is the one of the biggest problems in India. Sometimes user did not pay the bills on time so the electricity board worker cut the power supply manually. In this case, sometimes corruption done by the user or that worker which leads to the loss of electricity board. In some areas cameras also used to take a reading but it is a very complicated system and not so user-friendly. To avoid all these problems, 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 GSM.*

***Key Words*: Arduino, IOT (Internet of Things), android, Wi-fi module, Bluetooth module.**

1. INTRODUCTION

The world is changing towards automatic wireless technologies, which prefer not only reducing human efforts but is helping in making systems automatic and efficient. A system is said to be intelligent when it can decide what to do without any instruction and can work automatically. An Electric or Energy meter measures the total electrical energy in units used by the appliances which consume electrical energy from the main power supply. Electromechanical and Electronic meter are two types of meter Available in the market to measure the unit consumption. Electromechanical meters are commonly used in village areas, where the uses of modern technology are not as high as it is in cities. Electromechanical meters have become out of date nowadays. Electronic meters replace electromechanical meters. This meter consists of LCD/LED to display the reading. Calibration Led is used on the meter which shows the units consumed. Manpower is required to read the meter and note down the reading. The reading on the meter is increasing which is used to generate the electricity bill. An IOT Based Smart Electricity Meter and billing System does the same task without human efforts. IOT Based SEM system is controlled using Arduino Mega, which is a microcontroller board. The purpose behind choosing this board is its efficiency and memory. It is more efficient in terms of memory and GPIO.

The data obtained is then sent to the cloud through the internet. Data obtained can be easily sent wirelessly over long distance without any noise disturbance using the internet. As the data is directly sent to the cloud there is no occurrence of range and distance problem and is highly accurate and efficient because of no human interference. Other wireless technologies such as Zigbee, Bluetooth etc. have limited range thus cannot be used over very long distances effectively. This project envisages the use internet and the concept of IOT by which the base station, as well as users, remain updated with the current consumed units, changing the present problems faced by the electricity board and the user.

1.2 History of Electricity Meter

The first accurate recording electricity consumption meter was DC meter by Dr. Hermann Aron, who patented it in 1883. Hugo Hirst of the British general electric company introduces it commercially into Great Britain from 1888. An electricity meter, electric meter, electrical meter or energy meter is a device that measures the amount of electric energy consumed by a domestic, agriculture, a business, or an electrically powered device.

2. LITERATURE SURVEY

1. Title: Smart Electricity Billing System.

Author: Krishnarao.Kundeti, Saikumar Pallagani.

Abstract:

In this project, the idea of a smart electricity billing system using an ARM-7 microcontroller has been developed. Due to this concept, it provides a well-planned cost management of electricity billing. The existing energy billing systems are discrete, inaccurate, expensive and time-consuming. They are also time and labor consuming.". This system measures

the power consumption through the IR sensor unit. After getting the power consumption the ARM processor will detect the unit pulse and the unit will be converted as per our currency based on government tariff values and displayed on the LCD screen for a specific user. Smart electricity billing system also reduces the error made by humans while taking readings to a large extent and there is no need to take the reading in it. According to the power consumption, the amount will be displayed on the LCD screen. A relay system has been used which shut down or disconnect the energy meter and load through supply mains when the consumer doesn't pay his bill within the given time. Buzzer and LED's are used for indicating the payment of the bill by the user.

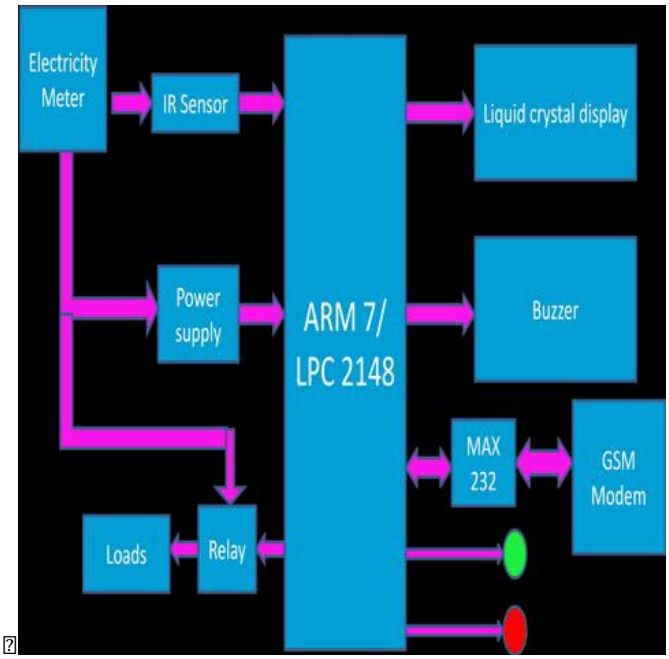

Fig.1. Block Diagram

Advantage: It can reduce problems associated with billing consumers living in isolated areas and reduce the deployment of manpower for taking meter readings.

Limitations: It is a time-consuming and complex system. It does not save the data**.**

2. Title: Camera Click Energy Meter Reading System.

Author: Manisha V Shinde, Pradip W Kulkarni.

Abstract:

Nowadays, electricity power consumers have increased in every sector like rural, urban, residential, commercial and in an industrial area. Thus it is very important to take care of the proper use of energy to generate accurate bills, invoices and try to reduce the frauds. Electromagnetic watt meter reading is done manually and it requires a huge number of manpower. It is difficult to access the meters at rural area, indoor meters and meters with obstacles. To overcome this here we are going to introduce automatic meter reading concepts (AMR) which automatically collect the consumption of energy and then the system transfer that collected data to a central database for billing. Because of these expenses are reduced on the meter reader, his periodic trips to each house to read a meter in the case when in the first trip reading is not available. Here transistor-transistor logic (TTL) serial camera is used to take the image and wirelessly send this to server Personal Computer (PC) where it undergoes processing to extract digits and with reference to a previous month database new bill is generated with tariff consideration.

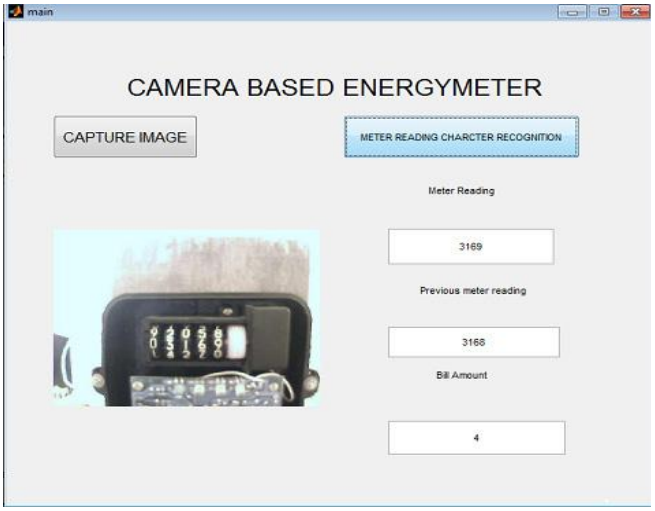

Fig.2.Camera Meter Reading

Advantage: This system overcome human work. This system also takes an automatic reading and create a database.

Limitation: Zigbee is used in the system so there is a limitation of range. Also faces the problem of image processing.

3. Title: Design and implementation of the smart electricity meter.

Author: V. Preethi, M. Tech, Student Department of ECE, G. Harish, Assistant professor Department of ECE.

Abstract:

Electricity is one of the fundamental necessities of human beings, which is commonly used for domestic, industrial and agricultural purposes. Power theft is the biggest problem in recent days which causes a lot of loss to electricity boards. In countries like India, these situations. are more often. If we can prevent these thefts we can save a lot of power. This is done using Smart Energy Meter (SEM). SEM is an electric device having energy meter chip for measuring the electric energy consumed and a wireless protocol for data communication. This paper presents a smart energy meter for an automatic metering and billing system. In this meter energy utilized and the corresponding amount will be displayed on the LCD continuously and communicated to the controlling base station. The feedback

from the user helps in identifying the usages between authorized and unauthorized users which helps in controlling the power theft. Communication between user/household and substation is done using Zigbee. GSM network is used for sending SMS to the local authorities regarding the theft cases. This meter can work as either prepaid or post-paid meter. The proposed system replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider. Also, they can monitor the meter readings regularly without the person visiting each house.

Advantage: This paper is useful for overall improvement of the traffic flow and safety conditions.

Limitation: Its limitation its work for the limited time.

4. Title: Arduino Mega and IOT based Intelligent Energy Meter (IEM) to Increase Efficiency and Accuracy in Current Billing Methodology

Author: Osmi Jaiswal, B.E, Student Department of ECE, Dilip Chaubisa, B.E, Student Department of ECE.

Abstract:

One cannot imagine life without electricity, as it is one's prime requirement. Thus, there is a high need not only an efficient generation and transmission of electricity but the way itis being used and measured at the time of billing. As per the current scenario, manpower is required to collect data from meter reading and accordingly, the bill is being generated. As there is an involvement of human, it can be erroneous. Likewise, a human is involved in cutting the power line if the bill is due or unpaid by the consumer which could be hazardous and risky. Not only this, a quite good amount is paid for such task every month which is a waste of money. Thus, the present methodology needs to be converted into an intelligent and efficient mechanism which would benefit both the ends i.e. the base station and the consumer. In this paper, a wireless method is proposed which puts emphasis on Intelligent Energy meter (IEM) reading and bill generation using Arduino Mega and Ethernet Shield. The monthly generated bill will be sent to the consumer through SMS using GSM900 and power of unpaid consumers would be disconnected using a relay which would be controlled wirelessly using the concept of the Internet of things (IoT).

Advantage: This system uses Arduino so processing fast. also, use GSM system so the user gets notifications through massage.

Limitation: Complex system, Data based handling is difficult.

5. Title: Smart Energy Meter Billing using GSM with Warning System

Author: P. Loganthurai, A.Vanmathi, M.Veeralakshmi, M.Shalini, V.Vivitha**(**Final Year, Department of EEE, K.L.N College of Engineering***)***

Abstract:

The main idea of the project is to modernize our billing system using GSM. The GSM is a technique works on the principle of TDMA – time division multiple access and operates at the frequency off 900MHZ. The details of power displaced in the energy meter are transferred to the mobile using GSM and it also shows the units consumed by the load. If the number of units consumed by the total load exceeds certain limit means it will give a warning based on tariff and also we are doing to turn ON and turn OFF the load by setting a password to each load using GSM technique. Thus, with the help of this project, we can reduce the electricity bills.

Advantage: Uses TDMA technique. Load management system

Limitation: uses GSM system.

3. PROPOSED SYSTEM

In the existing system have many drawbacks such as manual work, Human errors, inaccurate meter reading, in some cases camera used to read the meter reading but it also faces environmental issues, corruption, Power theft. To overcome from these drawbacks. In the Proposed system with high efficiency and robustness. the user needs to register first, 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.

4. ADVANTAGES

[1] Prevention from power theft.

[2] Tackle of human error.

[3] Power consumption devices control.

[4] Cost effective.

[5] Easy connection without corruption.

5. LIMITATIONS

[1] The calculation of the electric unit is on a time basis.

6. APPLICATIONS

[1] The system can be used in the Domestic and Commercial area for electric supply.

[2] For Gas supply lines as well as Water supply.

7. CONCLUSION

The existing system has some of the problems like manual work, Human errors, inaccurate meter reading, corruption, Power theft. In the proposed system the electricity connection to each user will be given only to the registered user and the smart billing will be done via IoT (Internet of Things).

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