

EB MONITORING SYSTEM USING IOT AND ENERGY CONSUMPTION FOR LOAD

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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 lot of loss to electricity boards and the customer faces some payment problems. In our country these situations are more often. If these thefts are prevented then lot of power can be saved. 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 project presents a smart energy meter for an automatic metering and billing system. In this energy meter the power utilized and the corresponding amount will be sent to both the customers & electricity board using android application and web application respectively and communicated to the controlling base station. An additional policy measures and proposals are included to support suppliers in investigating, detecting and preventing theft. The entire system is useful for prevention of thefts and globally connected medium to portray the meter reading to its customers effectively. The communication between the user/household and substation is done using IOT devices.

Key Words: GSM, ARDUINO, IOT CLOUD.

INTRODUCTION

Electricity is one of the vital requirements for sustainment of comforts of life. It should be used very judiciously for its proper utilization. But in our country we have lot of localities where we have surplus supply for the electricity while many areas do not even have access to it. Our policies of its distribution are also partially responsible for this because we are still not able to correctly estimate our exact requirements and still power theft is prevailing. On the other hand consumers are also not satisfied with the services of power companies. Most of the time they have complaints regarding statistical errors in their monthly bills. Thus we are trying to present an idea towards the minimization of technical errors and to reduce human dependency at the same time. With the help of this project we are aiming to receive the monthly energy consumption from a remote location directly to a centralized office. In this way we can reduce human efforts needed to record the meter readings which are till now recorded by visiting every home individually. This results in considerable loss of human hours and also provides considerable details regarding the average consumption of a locality so that power supply can be made according to these data. This will help the officials in deciding the specifications of transformers and other instruments required in power transmission.

This idea is economically efficient as well because we can get the meter reading at a very low cost. The implementation is done in such a way that a SMS is delivered to the Modem whose reading is to be noted and then that meter replies to the server in the SMS format and it is known that SMS costs are very low. The purpose of this project is to remote monitoring and control of the Domestic Energy meter. This system enables the Electricity Department to read the meter readings regularly without the person visiting each house. This can be achieved by the use of Microcontroller unit that continuously monitors and records the Energy Meter readings in its permanent (non-volatile) memory location. This system also makes use of a GSM modem for remote monitoring and control of Energy Meter.

The Microcontroller based system continuously records the readings and the live meter reading can be sent to the Electricity department on request. This system also can be used to disconnect the power supply to the house in case of non-payment of electricity bills. A dedicated GSM modem with SIM card is required for each energy meter. The GSM AMR takes the advantage of available GSM infrastructure nationwide coverage and the Short Messaging System (SMS) cell broadcasting feature to request and retrieve individual houses and building power consumption reading back to the energy provider wirelessly. The Store and Forwarding feature of SMS allow reliable meter reading delivery when GSM signal is affected by the poor weather conditions. The stored message is archive in the mobile operator and can be later retrieve for billing purposes.

EXISTING SYSTEM

Although there are variety of industry definitions, Radio Frequency based Pulse Detection and Electric Metering System is generally regarded as the reading of a utility meter by a means that does not require physical access and visual inspection of the meter. Traditional meter reading for electricity consumption and billing is done by human operator from houses to houses and building to building. This requires huge number of labor operators and long working hour to achieve complete area data reading and billing. Human operator billing are prone to reading error as sometime the houses electric power meter is placed in a location where it is not easily accessible. Labor billing job is sometime also restricted and slowed down by bad weather condition. The increase development of residential housing and commercial building in the developing country such as for example Malaysia require more human operators and longer working hours to complete the meter reading task. This increases the energy provider operation costs for meter reading. In order to achieve efficient meter reading, reduce billing error and operation costs. This system play an important role to addressed the above mentioned problems. Radio Frequency (RF) based Pulse Detection and Electric Metering is the system of automatically collecting data from energy meter and transferring that data to central database for billing and analyzing. With the advent of digital technology analogue electro-mechanical meter is continuously replaced by digital electronic meter. Digital electronic meter offer greater convenience to implement and establish automatic meter reading system electronically. Efficiency and reliability of retrieving meter reading in this system was a major challenge.

PROPOSED SYSTEM

This system described to measure energy consumption in the house and generates its bill automatically using telemetric communication using GSM this can help in reducing energy consumption in-house as the owner is continuously being notified about the number of units that are consumed. It objective is to generate bill automatically by checking the electricity unit's consumption in a house and in a way to reduce the manual labor. The calculations are

performed automatically and the bill is updated on the internet by using a network of Internet of Things. The bill amount can be checked by the owner anywhere globally. Design and implementation of project is mainly based on ARDUINO controller using IOT concept. In electricity transmission human involvement is not required. Consumer pays the electricity bill for the consumed power. If in case consumer fails to pay the bill on time then electricity transmission can automatically turned off. Also power theft can be detected if any tampering happens it will send the information to the server as well as it will cut the electricity automatically. GSM performs the IOT operation where and through which the information is sent to the Web server.

METHODOLOGY

This project was developed by analyzing the requirements and by fully understanding the problems. The solution was made by using advanced methods implemented for the next level to give appropriate results.

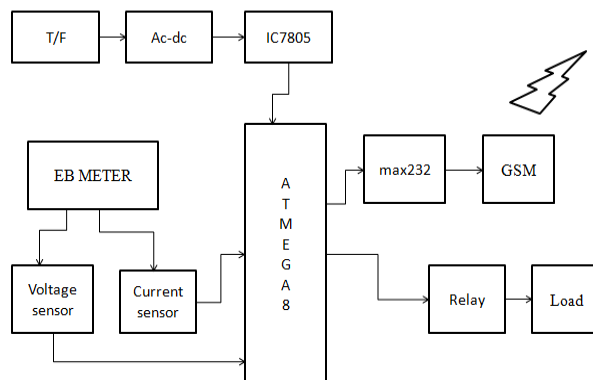


Fig.1

This block diagram shows the entire system for the development of the paper. This shows the total control is based on the micro controller (ARDUINO). It includes the components are power supply, GSM, IOT cloud, personal computer, Mobile.

1. ARDUINO

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits.

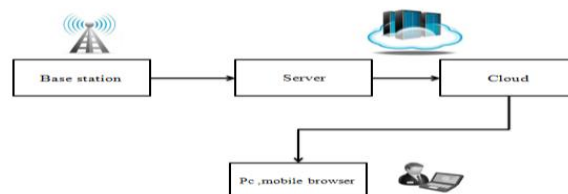
The project's board designs use a variety of microprocessors and controllers. These systems provide sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ("shields") and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. The microcontrollers are mainly programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino project started in 2005 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.



2.IOT (Internet of things)

To address Industrial Internet of Things (IoT) projects, Ethernet connectivity becomes the most reliable and stable technology. The IoT Ethernet Kit powered by AWS IOT uses an Ethernet LAN8740A driven by a 32-bit microcontroller with 2 MB of Flash (PIC32MZ EF) that provides plenty of memory space for your application. On the sensor side, hundreds of different sensors can be plugged into the MikroElektronka mikroBUS™ footprint allowing for prototyping a large variety of IOT proof-of-concepts. This IOT kit takes advantage of the AWS IOT service and provide a smooth user experience coming preloaded with the corresponding firmware. AWS IOT is a managed cloud platform that allows connected devices to interact easily and securely with cloud applications and other devices. Additionally, the firmware in the kit makes use of MPLAB® Harmony, FreeRTOS™, WolfMQTT and WolfSSL allowing you to quick-start your IOT design.



CONCLUSION

As residential homes have installed renewable energy sources to save the energy cost, it is important that both energy consumption and generation are simultaneously considered in HEMS. This paper proposes the smart HEMS architecture that considers both consumption and generation. In the energy consumption, the EMCUs are installed in outlets and lights to measure the energy usages of home appliances and lights based on ZigBee; they transfer the gathered data to the home sever. With this scheme, the home server figures out the home energy usage pattern. In the energy generation, PLC modems are installed in each solar panel to monitor its status. The REG gathers the status data of the solar panels based on PLC and the generation data from inverters based on RS-485; it transfers the gathered data to the home server. This PLC monitoring technology can monitor each solar panel for maintenance. The

home server can estimate the energy generation based on a weather forecast. Using the obtained energy information, the home server can control the home energy use schedule to minimize the energy cost. Users can access the home energy information through smart devices. The REMS provides the comparison and analysis of each home energy usage. By considering both consumption and generation, the proposed architecture is expected to enhance home energy management and to save the energy cost.

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