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IOT BASED SMART ENERGY METER MONITORING AND CONTROLLING SYSTEM

K. KRISHNA REDDY [1], N.V. KISHORE KUMAR [2,] TANAKANTI VANI[3], P MOHAMMAD KHAN[4], C BHASKAR REDDY[5], P MONIKA [6], T.SAMBHAVI [7].

[1]*ASSISTANT PROFESSOR & HOD IN DEPT OF EEE IN* MOTHER THERESA INSTITUTE OF ENGINEERING AND TECHNOLOGY *PALAMANER, CHITTOOR DIST, ANDHRA PRADESH - 517408.*

[2]*ASSISTANT PROFESSOR IN DEPT OF EEE IN* MOTHER THERESA INSTITUTE OF ENGINEERING AND TECHNOLOGY *PALAMANER, CHITTOOR DIST, ANDHRA PRADESH - 517408.*

[3,4,5,6,7.]*B.TECH IN DEPT OF EEE IN* MOTHER THERESA INSTITUTE OF ENGINEERING AND TECHNOLOGY *PALAMANER, CHITTOOR DIST, ANDHRA PRADESH - 517408.*

Abstract

Since today`s energy meters have many drawbacks like two way communication, real time monitoring, energy tampered, etc. To cope up with these disadvantages. This paper projects the means to monitor energy consumption at domestic level. This helps in reducing energy consumptions and monitors the units consumed. The objective is to make the electrical appliances intelligent and provide comfort to consumer and to reduce power consumption in web applications. Design and implementation of the project is mainly based on Arduino UNO controller and IOT technology. If any tampering occurs the controller will send the data to the server as well as it is cut down the energy supply automatically. Ethernet performs the IOT operation through which the data is send to the web page.

Keywords:Arduino, Ethernet shield, HTML page, Cloud.

INTRODUCTION

In the present scenario, the world is facing energy crisis. The optimum solution of this trending problem is to monitor and control the power consumption. In power system, the numbers of consumers are growing speedily and thus the energy requirement. Move the energy requirement more is need to save energy losses. To save losses we need to monitor the power consumption losses, so that we can utilize the generated power. As generation is increasing in turn are the requirements. So there is a technological advancement needed, so we develop a system with faster and advanced technology i.e. IOT. Nowadays we have a burning concept of lot i.e. Internet of Things through this concept or technology the objects are sensed controlled remotely in the existing network infrastructure.[1] The existing energy meter did not perform two way communications. MSEB employee would come and take a photo the energy meter or jot down the reading from the energy meter and would submit this data to the utility. Then there would be a approximation of energy bill and the consumer needed to pay the bill of the amount. Internet of Things (IOT) is new information processing acquisition technology and also referred as the third wave of information technology after internet, mobiles, computer network. In IOT everything is configured with internet protocol addresses and it can monitor controlled and access remotely in accordance with web technology. The main advantage of this technology is that devices are connected smartly with the help of sensors and

transducers and these are again connected to (Local area Network) LAN, (Wide Area Network) WAN, via Ethernet or Wi-Fi connectivity.

II. LITERATURE REVIEW

Recent developments in smart metering applications have led to the conceptualization and construction of a new type of energy meter, operating on the basis of event-driven principles [1]. The event-driven metering concepts are applied to represent the information on the electrical load patterns, which have an integral value [1]. This paper explains why these concepts are different from the ones used for event-based applications in other domains, discusses the principles used in the new type of electricity meter, presents the data formats structured in such a way to provide detailed knowledge representation, and shows a number of results on real-case applications [1]. A specific index is defined in order to represent the effectiveness of the event-driven metering scheme illustrated to represent the details of the metered pattern, comparing the results with the ones that could be reached in the most favorable case through regular timer driven metering [1]. The presentation of specific applications based on real-life datasets highlights the advantages of the event-driven energy metering over the traditional timer-driven metering scheme [1]. The authors propose, design, and implement a low-cost universal smart energy meter (USEM) with demand-side load management [2]. The meter can be used in the postpaid and prepaid modes with flexible tariff plans such as time of use, block rate tariff, and their combination [2]. The smart meter comprises of a potential transformer, current transformer, and microcontroller unit with an embedded communication module [2].

The connectivity among the utility authority, the smart meter, and consumer is established by authority identification number, meter identification number, and user identification number using the cellular network [2]. This paper [3] presents digital implementation of fast discrete Stock well transform (FDST) with automatic scaling for accurate PQ-event detection (ED) and energy metering. Comparative analysis of FDST-based energy-metering algorithm is carried out with existing algorithms such as fast Fourier transform and filter-based design [3].

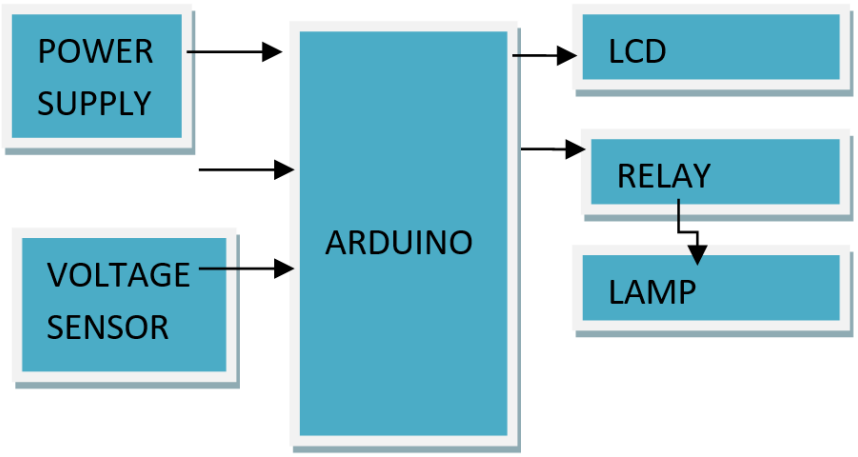
III.EXISTING METHOD

The present system only provides feedback to the customer at the end of the month. Also the meter readings are taken manually. Consumer can kn[WIFI] consumed by seeing their electricity bill only. Also huge manpower is required to take t[illegible]. There is no protection for energy meter tampering. The consumers cannot monitor the everyday energy consumption or usage. The major drawback of this system is the management of power consumption is difficult.

IV.PROPOSED METHOD

In the proposed method, the consumer can manage their energy consumption by knowing their energy usage time to time. This method not only provides two way communications between utility and consumer but also provides other functions that are if the consumer fails to pay the electricity bill the energy supply would be cut down from the utility side and once the bill is paid the energy supply is reconnected. Another huge advantage of this system is that it notifies the consumer & utility at the event of the meter tampering. By this information the consumer & utility can control the tampering are reduce energy crises.

V.BLOCK DIAGRAM



ARDUINO UNO

The **Arduino Uno R3** is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

ENERGY METER

Energy meter or watt-hour meter is an electrical instrument that measures the amount of electrical energy used by the consumers. Utilities is one of the electrical departments, which install these instruments at every place like homes, industries, organizations, commercial buildings to charge for

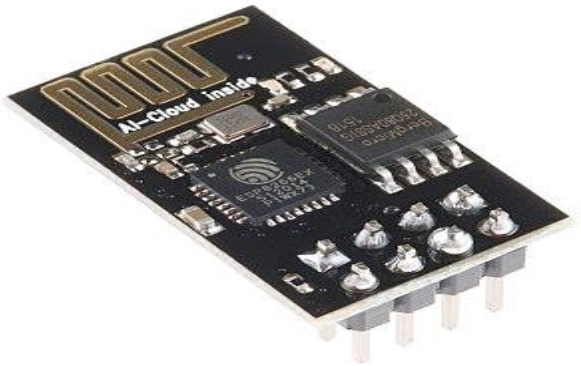
the electricity consumption by loads such as lights, fans, refrigerators and other home appliances. Energy meter measures the rapid voltage and currents, calculate their product and give instantaneous power. This power is integrated over a time interval, which gives the energy utilized over that time period.

RELAY

The main usage of the **Relay** was seen in the history for transmitting and receiving the information, that was called as Morse code where the input signals used to be either 1 or 0, these change in signals were mechanically noted in terms of ON and OFF of a light bulb or a beep sound, it means those pulses of 1s and 0s are converted as mechanical ON and OFF using electromagnets. Later this was improvised and used in various applications. Let's see how this electromagnet acts as a switch and why it is named as RELAY.

The main operation of this device is to make or break contact with the help of a signal without any human involvement in order to switch it ON or OFF. It is mainly used to control a high powered circuit using a low power signal. Generally a DC signal is used to control circuit which is driven by high voltage like controlling AC home appliances with DC signals from microcontrollers.

WIFI MODULE ESP8266



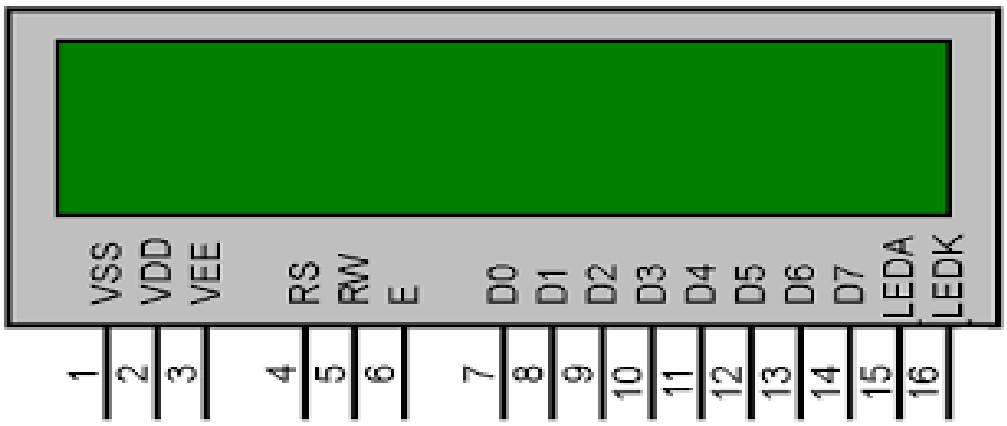
The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces; it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF part.

LOAD

LOAD For this project the load is simple or domestic i.e. CFL bulb, LED bulb, fan, etc this load is interfaced through the controller with help of sensors and other transducers. By using the feedback obtains from sensors and the relay operation the load can be controlled.

LCD



It is called Liquid Crystal Display. We are going to use 16x2 characters LCD. This will be connected to microcontroller. The job of LCD will be to display all the system generated messages coming from the controller. LCD will provide interactive user interface. This unit requires +5VDC for it proper operation. This module is used for display the present status of the system.

BUZZER

A **buzzer** is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications.

There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customized with help of other circuits to fit easily in our application.

VI.RESULT

RESULTS:

Firstly we have to switch on the mains. Current sensor senses the power utilized by the load. Which gives output in analog form? The output of the sensor is supplied as input to the analog input part in the Arduino Nano Board. Arduino board has inbuilt analog to digital convertor which converts analog input of power to digital output. This digital output is displayed on LCD display in form of Watts as shown in Image -1 below. There is a set point value; when the power utilized by the load exceeds the set point value LCD displays.

LIMITATIONS

Installation of Wi-Fi/GPRS enabled meters at consumer end will not be possible over a certain period. It takes a lot time to do. Man power requirement will be high at the time of installation and initialization. The cost of implementation will be high. The requirements of the system vary based on place the consumer need the smart energy meter. According to the requirements given by consumer need to develop the hardware and it should be configured according to the rules and regulations framed by that state government. As the unit charges will be varies according to the category of supply and power distribution units. This system will have many drawbacks in hill stations, forests and the places where the network coverage problems arise.

VII.ADVANTAGES

TO THE CONSUMERS

Can set the monthly electricity billing budget.

They know exactly how much power is being utilized.

Efficient use of energy

VIII.CONCLUSION

An attempt has been made to make a practical model of 'IOT Based Smart Energy Meter.' The propagated model is used to calculate the energy consumption of the household, and even make the energy unit reading to be handy. Hence it reduces the wastage of energy and brings awareness among all. Even it will deduct the manual intervention.

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