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SMART ENERGY METER BILLING, MONITORING AND CONTROLLING SYSTEM

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ABSTRACT:- IOT based energy meter billing, controlling and monitoring system proposes and analyze a system which is used for energy meter billing, controlling and monitoring .The system is fully Internet Of Things based and highly desirable in field of energy .In this system consumer can do power management by knowing energy usage time to time . The customer needs to pay the bill on schedule, if couldn't the electric power connectivity can be turned off autonomously.

Our proposed system uses energy meter with microcontroller system to monitor energy usage using a meter. The meter is used to monitor units consumed and transmit the units as well as cost charged over the internet. This allows user to easily check the energy usage along with the cost charged. Thus the energy meter monitoring system allow user to effectively monitor electricity meter reading and check billing with easy.

KEYWORD:

Electricity energy meter, Internet of things, Atmega328 microcontroller, Bluetooth, ESP8266.

I. INTRODUCTION:

The Internet of things (IOT) concept enables us to connect the normal day to day devices with each other over the internet. The IOT concept provides the basic infrastructure and opportunities to form a connection between the physical world and computer based systems. The concept has been gaining importance with more and more wireless devices that are increasing rapidly in the market. Hardware devices are connected with each other over the internet. The ESP 8266 Wi-Fi module used in the system provides the connectivity with the internet in the system.

Now-a-days the demand for electricity is increasing at a constant rate in the population and is being utilized for various purposes viz, agriculture, industries, household purposes, hospitals etc., So, it is becoming more and more complicated to handle the electricity maintenance and requirements. Therefore there is an immediate requirement to save as much electricity as possible. The proposed system provides a technical twist to the normal energy meters using the IOT technology. Monitoring, Optimized power usage and reduction of power wastage are the major objectives for a better system.

II. SENSOR CONCEPT

The ESP8266 Wi Fi 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 another application processor.

The ESP 8266 Wi-Fi module is a low cost component with which manufacturers are making wirelessly networkable microcontroller module. ESP 8266 WiFi module is a system-on-a-chip with capabilities for 2.4GHz range. It employs a 32 bit RISC CPU running at 80 MHz. It is based on the TCP/IP (Transfer control protocol). It is the most important component in the system as it performs the IOT operation. It has 64 kb boot ROM, 64 kb instruction RAM, 96 kb data RAM.

Wi-Fi unit performs IOT operation by sending energy meter data to webpage which can be accessed through IP address. The TX, RX pins are connected to the 7 and 8 pins of the Arduino microcontroller.

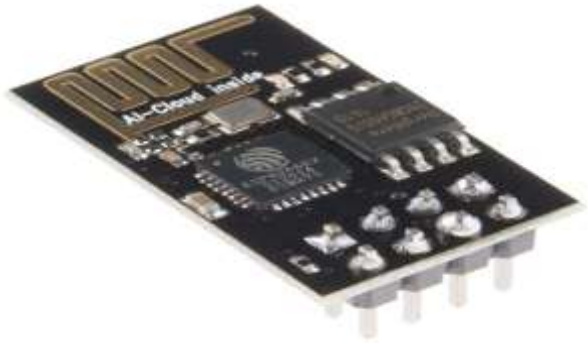


Figure.1. wifi module

III. ENERGY METER

A **digital energy meter** displays the readings of energy used on a digital display (LCD or LED). No moving parts are present in this type of energy meters. Thus, these

are also called as '**static energy meters**'. A digital meter consists of instrument transformers (to sample current and voltage), analog to digital converters, microcontroller etc. The input voltage/current is compared to with a programmed reference voltage and current and then the data gets converted into digital form. The digital data is the processed with appropriate operations in a microcontroller which is then displayed on an LCD or LED display.

Electromechanical meter consists of an aluminum disc positioned between two electromagnets, one of whose coil is connected to the load and is the current coil and the coil of another electromagnet is connected to the supply voltage. The interaction of the fluxes between the two coils is responsible for providing a torque to the disc, which starts rotating, with the revolutions proportional to the load current. The counter records the number of revolutions and displays them, which indicates the energy consumed.

Figure.2.Energy meter

IV. Arduino Uno

The Arduino UNO is an open-source microcontroller board based on the microchip ATmega328p microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform. The ATmega328 on the Arduino Uno comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The Uno also differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

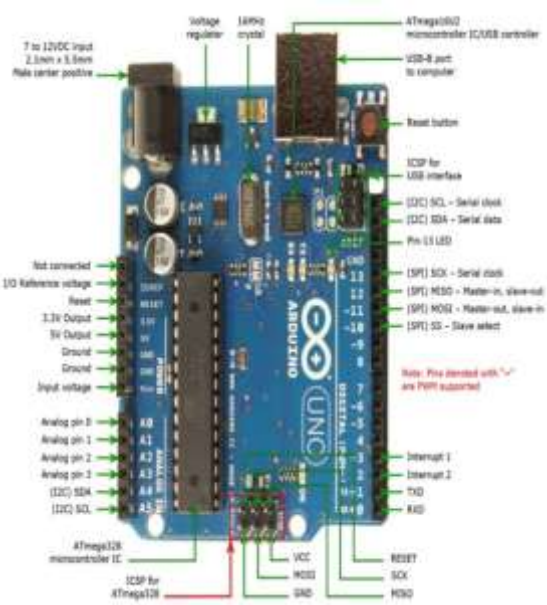


Figure.3. Arduino Uno board

V. Software Details:

Here is some software which is used in proposed system.

1. WEB PAGE:

The proposed system can be used to display load energy usage reading in terms of Watts. Every user would be able to access the information from anywhere on the earth. Thingspeak.com is one such webpage which takes the help of the MathWorks MATLAB analytics to present the device information in a more detailed analysis in both description and visualization. Thingspeak.com provides the user the ability to add any number of channels to one

account and in each account information can be fed into 8 fields. An account can be assigned to one division of an area and n channels can be created to a suite of n meters in the locality. The analytics can be viewed by both the consumer and service provider.

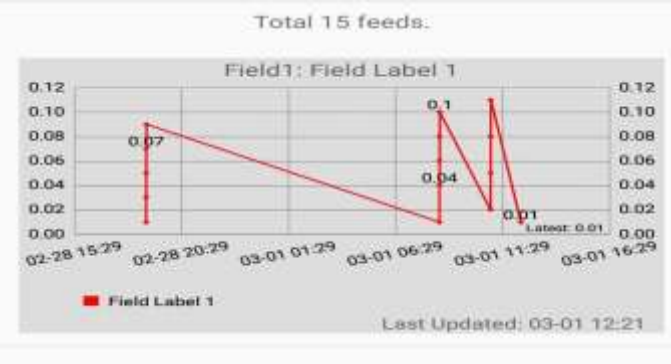
THINKSSPEAK:

ThingSpeak is an IOT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. In ThingSpeak you can perform online analysis and processing of the data as it comes in. Thingspeak web page is used for displaying the information of the project.

ThingSpeak Key Features:

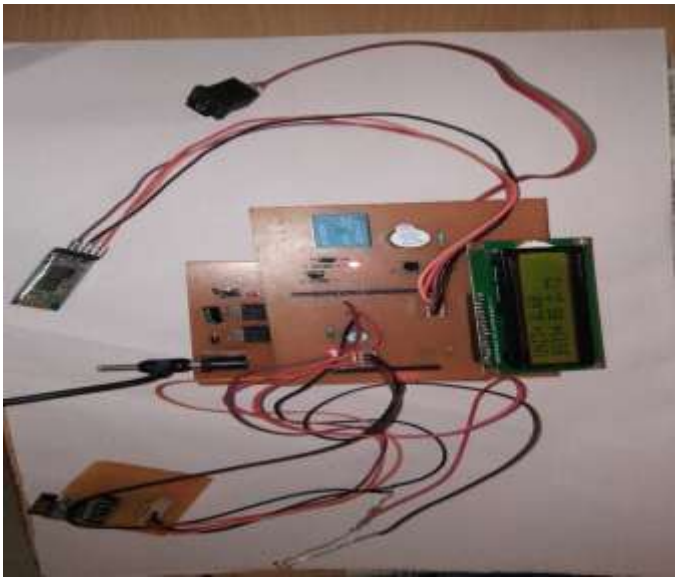
ThingSpeak allows you to aggregate, visualize and analyze live data streams in the cloud. Some of the key capabilities of ThingSpeak include the ability to:

- Easily configure devices to send data to ThingSpeak using popular IoT protocols.
- Visualize your sensor data in real-time.
- Run your IoT analytics automatically based on schedules or events.



2. Bluetooth:

V.I System Design:



VI.I. Block Diagram:

The smart electricity meter using Wi-Fi module can be easily described in two parts. The first part being the physical part and second one being the Webpage. It consists of the ATMEGA 328, ESP 8266 Wi-Fi module,16*2 LCD display, power supply.

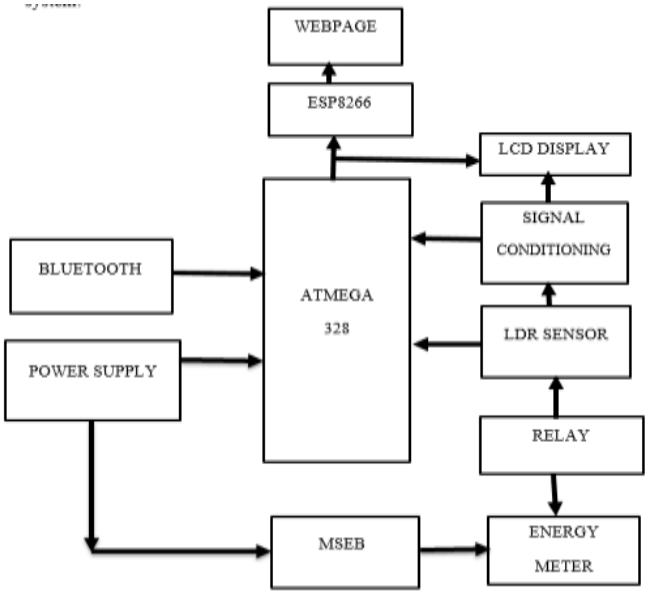


Fig. block diagram

Microcontroller will count that pulses and this system displaying the information about the energy consumed in terms of units, about the bill and if any theft occurs that will be displayed in the website. Hence every user can

check the information anywhere globally. Thing speak web page is used for displaying the information of the system.

VI.II. FLOW CHART

Fig -3.2 shows the system flow chart of proposed system which will indicates the actual flow of proposed system to gain the appropriate result.

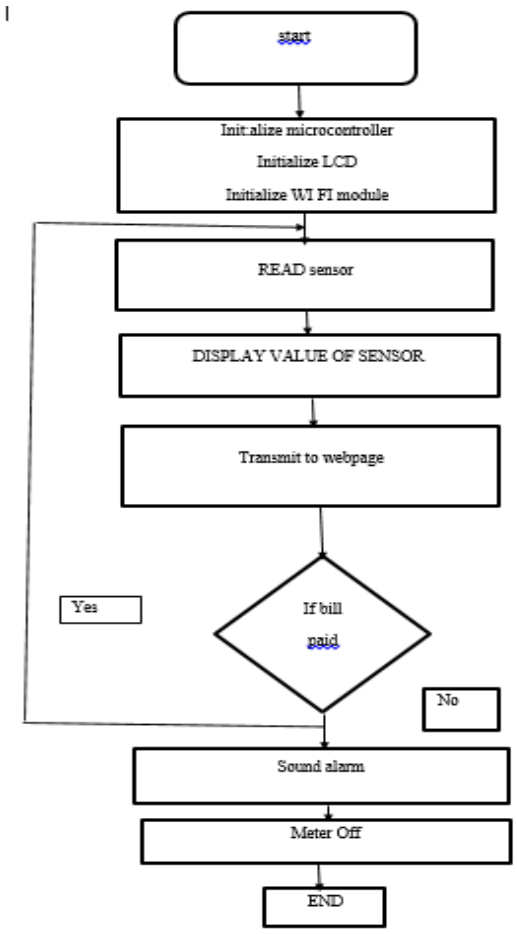


Fig. Flow Chart

VII. APPLICATIONS

- This device is useful for Smart home system.
- Useful in industry automation where high electricity bill issue.
- Residential and commercial building in a public energy supply system
- Public power sources.
- Goverment Energy plant.

VIII. ADVANTAGES

- Real time access and calculating.
- Wide Range of information exchange.
- Use as portable system for any device.
- Updates the user about the energy uses of connected device anywhere in the world.
- Helps to verify the electricity bill according to their uses.

IX. ACKNOWLEDGMENT

We are really delighted to submit this paper on "IOT based energy meter and monitoring system ".We would like to thank sincerely to our guide Ms.M.U.Ghewari for his valuable guidance, constant assistance, support, endurance and constructive suggestions for the betterment of this project work. We would like to express our deep sense of gratitude to our principal Prof. Dr. A. M. Mulla for encouraging throughout this course. We would like to convey our heartfelt thanks to our HOD Prof. P. J. Chorage for giving us the opportunity to embark upon this topic. We would like to that all our faculties and friends for their help and constructive criticism during this technical paper.

X. CONCLUSION

Proposed system consist of an android application that will contain the thinkspeak which will helps the user to show electricity uses with accordingly their bill. Hardware part consists of arduiono uno board that can perform according to the coding part for detecting and calculating. ESP8266 module able for the world wide connectivity for sending updates about system through SMS service.

In the present work wireless meter reading system is designed to monitor the meter reading. It avoids the human intervention, provides efficient meter reading, avoid the billing error and reduce the maintenance cost. It displays the corresponding information on LCD for user notification.

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