

IOT Based Smart Controller

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Abstract: *This project deals with the study of energy meter recordings and app billing system. This enables easy wireless access to existing energy meter by the user and aims to maneuver faraway from the routine method of manual reading of electricity meters during which a meter reader visit the all meter location sporadically and skim the meter value manually. We will use current sensor to measure the parameters and will use NodeMCU ESP8266 to post the data to an HTML Webpages. In this system we can keep a watch on the meter readings regularly and send message to the user about energy consumption and billing. In this project energy meter is interfaced to the microcontroller. The energy consumption is constantly monitored by the energy meter. Depending upon the energy consumption units, billing is done by the microcontroller according to the code written in it. The energy consumption units and billing is displayed on the mobile and we can also send SMS to the user mobile about energy consumption and billing details using IoT. In this project we connected two bulbs. Using BLYNK app we can turn OFF or ON the bulbs. In case we are using large amount of electricity we can turn OFF the load using relay.*

Keywords— *Energy meter, monitoring, mobile billing, manual reading, NodeMCU ESP8266, microcontroller, LCD, SMS, IoT.*

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I. Introduction

Electricity, which is the most utilizable forms of energy, is utilized throughout the entire world. So, the advancement of latest technology, the usage of electricity is surging gradually. But coming to the production of electricity, it's inadequate due to the deficiency of natural resources. Therefore, the power must be utilized in a limited way. In numerous number of countries current is measured by the energy meters which are inspected constantly by an electrician. According to the observations, they conclude that the electrical bills are prepared and generally these are prepared based on their own assumptions which might be inaccurate at times, costly, time consuming and moreover wrong. So there's no regular system to monitor the readings, sometimes the consumer uses current every month without even paying any bills. The current meter monitoring and digital app billing system is a kind of system which can avoid and reduce the regular traditional meter readings and billings, save the human resources to improve the precession to stop the power wastage. This project is all about monitoring of the energy meter and digital app billing system using a remote which is launched using IoT.

The IoT smart energy meter with two grid stations and a consumer load which is directly-coupled with a 230V AC supply in series connection.

IoT: It's well known as Internet of Things, which will connect the everyday physical objects over internet-from every household thing like fans, lights etc. And also health care things like medical devices; smart things, some are wearable, and also some of smart cities and smart villages. IoT means in word we can call it as smart. Because, Nowadays we are receiving location data from our car (smart car) while we are commuting. So, these type of connected devices can be adjust in our home temperature before we arrive to our house. So, depending on the kind of technology the IoT, that can be analyze the data either by human beings or AI and machine learning (AI/ML) in a real-time. Coming to the applications of IoT devices are: there are extensive set of IoT devices are there, which are divided into home applications, customer applications, industrial applications, and also in infrastructure regions. Customer applications are created mainly for customers like vehicles, smart watches, smart televisions and also connected to health .Applications for health care are IoMT(which means Internet of medical things).And also smartphones , smartphones wakeup us and also our day starts with smartphone and end with our smartphone. On an average we are using more than 4hrs per a day, it's a big number.Because, smartphone looks very small and everyone can easily handle it and use it, it has versatile number of features.

1.1. Node MCU:

The firmware uses the Lua scripting language.

MCU stands for microcontroller unit which really means it is a computer on a single chip Node MCU is an open source chipset and the development kit which helps to build IOT products.It contains firmware that runs mainly on the ESP8266wi-fi SoC fromEspressif inc systems, and hardware components which are supportedby the ESP-12 module.And also, It containssixteen(16) input and output pins.1-analog pin is used to measure the analog voltage at the range of 0–3.3V. It's a Small size module to fit smartly inside your IoT projects.

1.1.1. To do a project using node MCU, we need to know how to use it, how to download it, how to write and develop it. We will get node MCU as per our requirements.

The main advantage of using this node MCU is:

Node MCU is cost wise it is very low. It is mainly used for wifi network by integrated support. And board is small in size. And also main advantage of node MCU is consumption of energy is low. And also it contains some disadvantages like, need to learn new type of language and also integrated development environment. Pinout be reduced. Documentation is scarce.



2.1Relay Module 2CH:

This is a low- level 5V, 2-channel relay interface board, and each channel requires a 15-20mA driver current.



2.1.1. Relay Module 2CH is used to control the various appliances and equipment with a large amount of current.It has a standard interface that can be controlled by the microcontroller such as ARM, AVR, and Arduino etc. And also it is used as a low level triggered controller signal which is used to control the relay. While we triggering the relay and relay operatethem open normally and also closed normally.

And coming to the features of relay module 2CH are,

2.1.2. It is good for control of higher circuits. And also it is safe. Mainly in power systems, lower current will control the higher current. It is high quality product and it is brand new. And the standard interface that can be controlled by microcontroller directly. It has wide range of controllable voltages. It controls the high load of current which can reach 250v, 15A etc. It is around the board with containing 4 mounting holes, and easily installation and also fixing. It contains common end, beginning and also closed end. And also it has a package include 1 X 2 channel 5V relay module.

3.1 SMPS :(Switch-Mode Power Supply)

Switch-Mode Power Supply(SMPS),is a technology which may allude to number of similar terms. While all of them look at the same old basic technology, but they keep referring to different elements of general technology.

Switch-Mode Power Supply (SMPS) : This term SMPS is generally used to designate an item that could be connected to the main, or any other external supply. The source is generated using a SMPS, which is a complete power supply.

The SMPS is mainly used for switching the voltage is not a big deal and efficiency of system matters. The main operations of smps circuit take place in switching and also voltage is varying continuously. The operation of switching devices in saturation or in cut off region. The switching time is used to control the output voltage of the feedback circuitry. The adjusting of duty cycle is adjusted by switching time. High efficiency in SMPS,

3.1.1. Switch-Mode Regulator: Switch Mode Regulator refers to an electronic-circuit that provides the required regulation. A switch-mode regulator also comes under the overall switch-mode power supply.

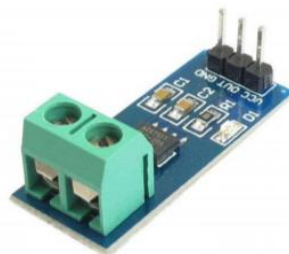
3.1.2. Switch Mode Regulator Controller :

Most of the integrated circuits in the switch-mode regulators do not contain the series-switching component. This comes to knowledge when the current or the voltage levels go up, because if there is an external series switching component then it would handle the higher voltage and current levels as well as the resultant power dissipated.



4.1. Current Sensor(ACS712):

A voltage drop is caused between them due to the Current flowing through a conductor. Ohms law states the relationship between voltage and current. In electronic devices, if there is an abnormal large amount of current supplied above its requirement which leads to the overload state which can't tamper the device. The task of a proper working of device is to measure the current and the measurement of voltage is a pliable task and it does not have any affect on of the system. But the measurement of current is a meddling task which cannot be identified directly as simple as voltage.



A sensor is required if we want to measure the current flowing in a circuit. ACS712 is a current sensor which can be utilized to estimate and calculate how much current is put in to the conductor and it won't affect the functioning of the system. It is a fully integrated, Half-effect based linear sensor IC. This IC contains a 2.1kilo Volts Root Mean Square voltage isolation in company with a small amount of resistance offered by current conductor.

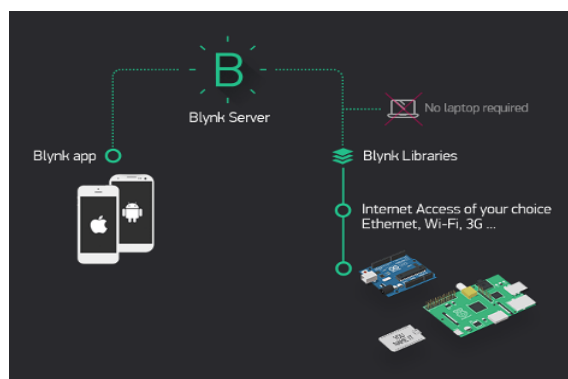
5.1. BLYNK:

BLYNK is an IoT platform which is available in iOS and Android apps used to control the devices programmed with Arduino, Raspberry Pi etc.

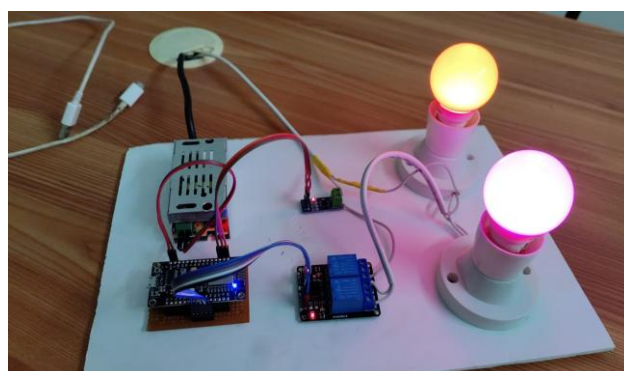
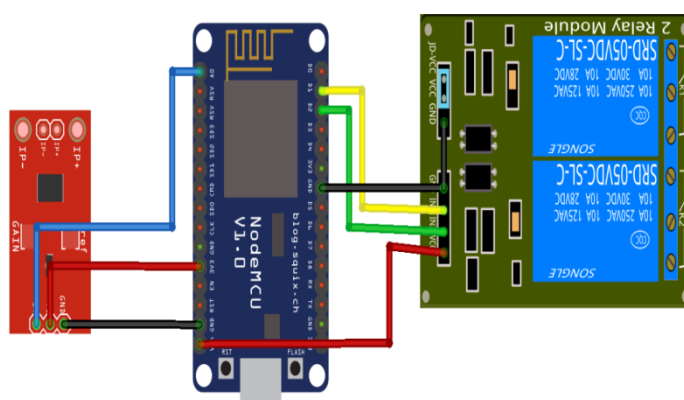
BLYNK is a digital console, in which you can simply construct graphic interface for the projects by adding widgets without any hesitation.

We can use it in simple way to set the circuit up and you can start using it in less than 5 mins.

BLYNK is not designated onlyfor some specific setup or board. Instead, it supports hardware of our very ownwish,weather you like to use Arduino or Raspberry Pi which is linked to the internet supply over Wi-Fi ,LAN ,or this new ESP8266 wifi module, which youcan find online..



II.Circuit Diagram:

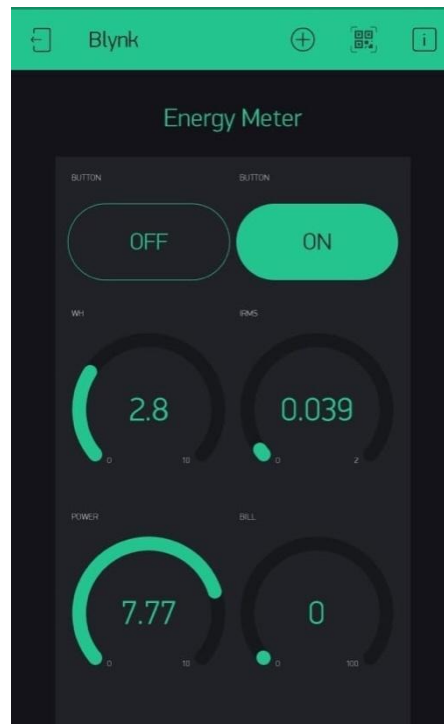


III. Working:

We have to connect the Node MCU to the relay 2CH. So, that it can control the equipment. Two bulbs are connected to the relay 2CH. Current sensor is then connected to the analog pins of the given Node MCU. SMPS is also connected to the Node MCU. We have to upload the arduino code to the Node MCU. In Blynk app grab the gadgets like button, switch. Connect the Blynk app to the ESP8266. In Blynk we can ON and OFF the

bulb which we connected to the Node MCU. So that we can see how much energy is consumed. We can OFF the bulb if more energy is consumed. Like that we can control the load

ENERGY METER OUTPUT:



IV. Advantages:

1. This IoT smart energy meter can be installed in Industrial buildings, residential areas and commercial buildings to supply power supply consecutively to the connected load.
2. By using this smart meter device we can control the consumer load easily by not going anywhere by just switching it ON or OFF anytime.
3. This IoT smart energy meter is cost efficient, accurate and more reliable as compared to the different other types of energy meters in the market.

V. Conclusion:

According to this project we can implement an app based wireless automatic meter reading and instant billing system based on the concept of IoT.

And designed meter is able to the usage value at predefined time and status is displayed in Blynk App. We can observe how much energy is consumed. We can control the load.

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