

IOT Based Smart Grid Monitoring Using ArduinoController

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Abstract: *This undertaking depicts the digitization of burden energy utilization readings over the web. The proposed framework configuration dispenses with the association of human in power support. The client can screen energy utilization in watts from a page by giving a channel id to the heap. The Webpage uses the THINGSPEAK analytics to dissect the energy use to give more definite depiction and representation of the energy use measurements. Wi-Fi unit performs IOT activity by sending energy information of the heap to the page which can be gotten to through the channel id of the gadget. In the proposed framework, customer can do drive the executives by knowing energy use time to time. This proposed framework uses an Arduino microcontroller. The unit which is created can be shown on the site page through the Wi-Fi module.*

Keywords—Currentsensor,16*2LCDDisplay,ArduinoNanoBoard,ESP8266Wi-Fi Module, Buzzer.

1. INTRODUCTION

The Internet of things (IOT) idea empowers us to interface the ordinary everyday gadgets with one another over the web. The gadgets associated through IOT idea can be dissected from a distance. The IOT idea gives the essential framework and chances to shape an association between the actual world and PC based frameworks. The idea has been acquiring significance with an ever increasing number of remote gadgets that are expanding quickly on the lookout. Equipment gadgets are associated with one another over the web. The ESP 8266 Wi-Fi module utilized in the framework furnishes the network with the web in the framework [1].

Presently a-days the interest for power is expanding at a consistent rate in the populace and is being used for different purposes viz, horticulture, businesses, family purposes, emergency clinics and so on., Thus, it is turning out to be increasingly more convoluted to deal with the power upkeep and prerequisites. In this manner there is a quick necessity to save however much power as could reasonably be expected. As the interest from the more current ages of populace for power is expanding so in alongside it the innovation improvement is required. The proposed framework gives a specialized turn to the typical energy meters utilizing the IOT innovation. Additionally, there are different issues that we need to address, for example, power burglary which thus create monetary misfortune to the country. Checking, Optimized power utilization and decrease of force wastage are the significant targets that lie ahead for a superior framework [3].

This Wi-Fi based framework is planned in light of three significant goals. They are:-

1. To give computerized load energy perusing a quick premise.
2. To utilize the power in an advanced way.
3. Reduce the power wastage.

The framework essentially can be ordered

based on assistance closes in two ways:-

1. Consumer end
2. Service end.

The information from the framework is shown on a site page which can be gotten to by the shopper.

The framework is planned on an Arduino micro controller [2]. It tends to be basically separated into three sections viz., regulator, burglary discovery circuit and a Wi-Fi unit. The regulator plays out the essential computations and cycles the data. Burglary identification circuit gives data about any extra or robbery load energy perusing and the main job is played by the Wi-Fi unit to send the data from the regulator over the Internet. The Arduino regulator is modified on the Arduino programming IDE (Integrated Development Environment which is a pre-imperative to work on the Arduino board. Its code is subsidiary of the C language [4].

This paper portrays Arduino Microcontroller based plan and execution of energy meter utilizing IoT idea. The proposed framework configuration wipes out the human association in Electricity support. The Buyer needs to pay for the use of power on time, on the off chance that that he was unable to pay, the power transmission can be switched off independently from the far off server. The client can screen the energy utilization in units from a website page by giving gadget IP address. Wi-Fi unit plays out the IoT activity by sending energy meter information to site page which can be obtained to through IP address.

2. BLOCKDETAILS

The intelligent power meter utilizing Wi-Fi module can be handily depicted in two sections. The initial segment being the actual part and second one being the Webpage, it comprises of the Arduino Nano Board, ESP 8266 Wi-Fi module (Node MCU), 16*2 LCD show, ringer and power supply.

3. BLOCKDIAGRAM

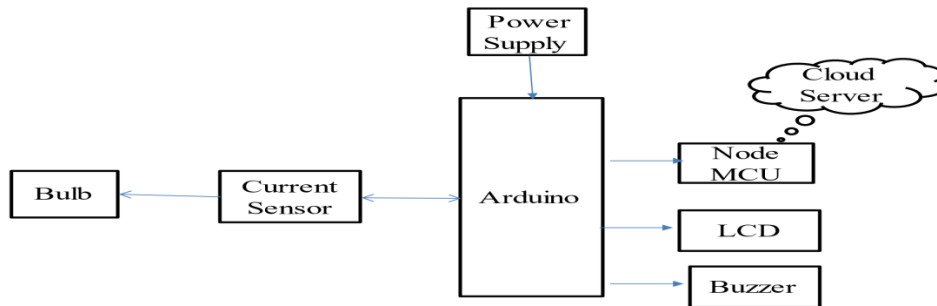


Fig -1:BlockDiagramofthesystem

4. HARDWAREIMPLEMENTATIONS

A total IoT based detecting framework is proposed for Substation robotization application in Smart Grid climate. Different pieces of the framework are talked about exhaustively alongside their chance of use close by the current substation computerization frameworks. A general execution of the framework including network geographies, remote correspondence organizations and secure correspondence with different pieces of the power lattice is additionally talked about. The MQTT convention recommended in the proposed framework is pertinent to the substation climate and gives a dependable and secure method for conveying sensor information to a huge crowd. The framework configuration is practical and simple to carry out and arrange. It gives another way to deal with screen, store, picture and impart the sensor information involving IoT in the substation climate. The proposed framework is right now under execution and an Arduino sensor hub model has been tried as a piece of it.

4.1 CurrentSensor

The Allegro® ACS712 gives prudent and exact answers for AC or DC current detecting in modern, business, and correspondences frameworks. The gadget bundle takes into consideration simple execution by the client. The gadget isn't planned for auto applications.

The gadget comprises of an exact, low-offset, straight Hall circuit with a copper conduction way situated close to the outer layer of the kick the bucket. Applied current moving through this copper conduction way produces an attractive field which the Hall IC proselytes into a corresponding voltage. Gadget precision is enhanced through the nearness of the attractive sign to the Hall transducer. An exact, corresponding voltage is given by the low-counterbalanced, chopper-settled BiCMOS Hall IC, which is modified for precision in the wake of bundling.

The result of the gadget has a positive incline ($>VI_{OUT}(Q)$) while a rising current moves through the essential copper conduction way (from pins 1 and 2, to pins 3 and 4), which is the way utilized for current examining. The interior opposition of this conductive way is 1.2 mΩ regular, providing low powerlosses.

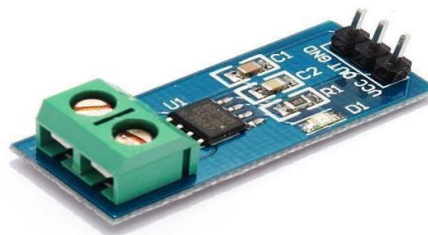


Fig-2:CurrentSensor

4.2 ArduinoNanoBoard

Arduino is a microcontroller board and it depends on the AT mega 328P. It comprises of 14 computerized I/O pins and 6 simple info pins and a gem oscillator of 16 MHz recurrence, a power supply jack and a USB port to dump the code, ICSP header and a reset button. It very well may be controlled with the power jack toward the beginning and later can be controlled with AC to DC connector or with a battery.

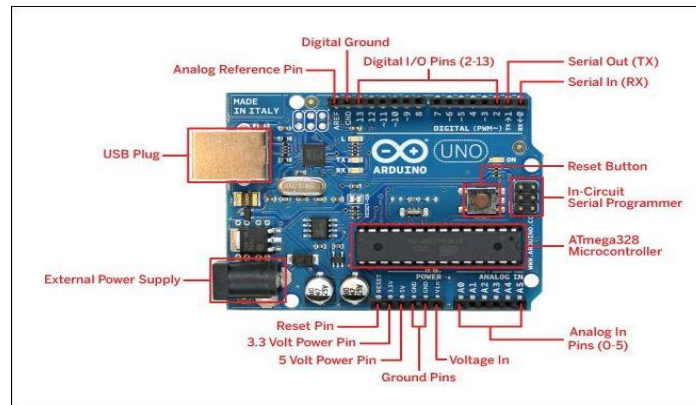


Fig-3:ArduinoNanoboard

4.3 ESP8266 Wi-FiModule(NodeMCU)

The ESP 8266 Wi-Fi module is a minimal expense part with which producers are making remotelynetworkable microcontroller module. ESP 8266 Wi-Fi module is a framework on-a-chip with capacities for 2.4GHz territory. Itutilizes a 32 digit RISC CPU running at 80 MHz. It depends on the TCP/IP (Transfer control convention) [3]. It is the most significant part in the framework as it plays out the IOT activity. It has 64 kb boot ROM, 64 kb guidance RAM, 96 kb information RAM.Wi-Fi unit performs IOT activity by sending energy meter information to site page which can be gotten to through IP address. The TX, RX pins are associated with the 7 and 8 pins of the Arduino microcontroller.



Fig-4:ESP8266Wi-Fimodule(NodeMCU)

4.4 16*2LCDDisplay

LCD (Liquid crystal display) screen is an electronic showcase module and tracks down a great many applications. 16*2 presentation implies it can show 16 characters for every line and there are 2 such lines. In LCD each character is shown in 5*7pixel lattice. The 11, 12, 13 and 14 pins of the showcase are utilized as information pins for Arduino interacting. Showing the wattage is utilized.

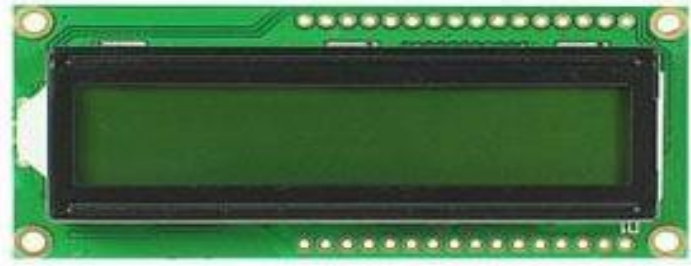


Fig-5:16*2 LCDdisplay

5. CIRCUITDIAGRAM

Twocircuitdiagramshavebeenused intheproject.Thecircuitdiagramsareasfollows:-

5.1 PowerSupplyUnitCircuitDiagram:

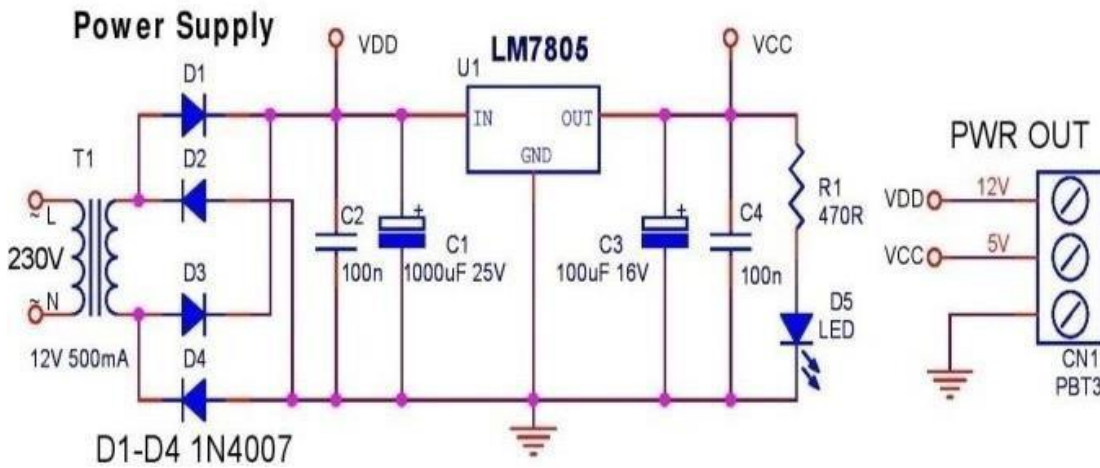


Fig-6:PowerSupplyUnitCircuitDiagram

5.2 SchematicDiagram:

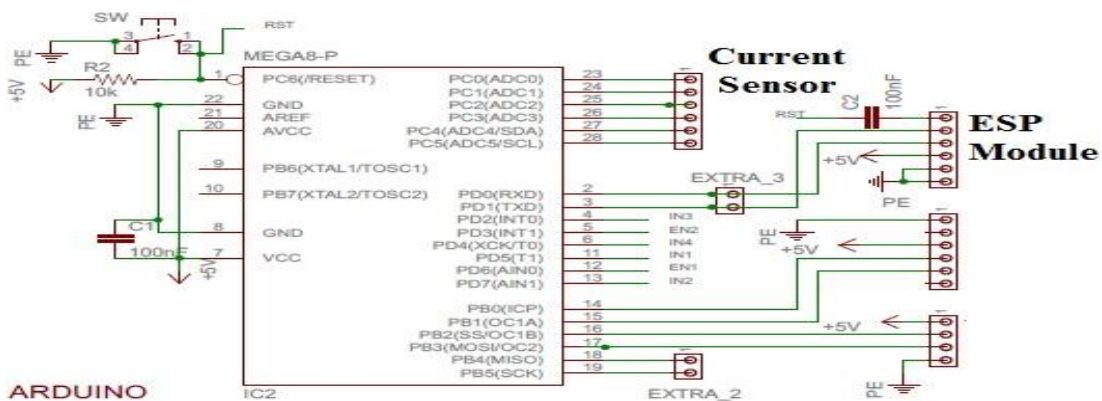


Fig-7:SchematicDiagram

6. FLOW CHART

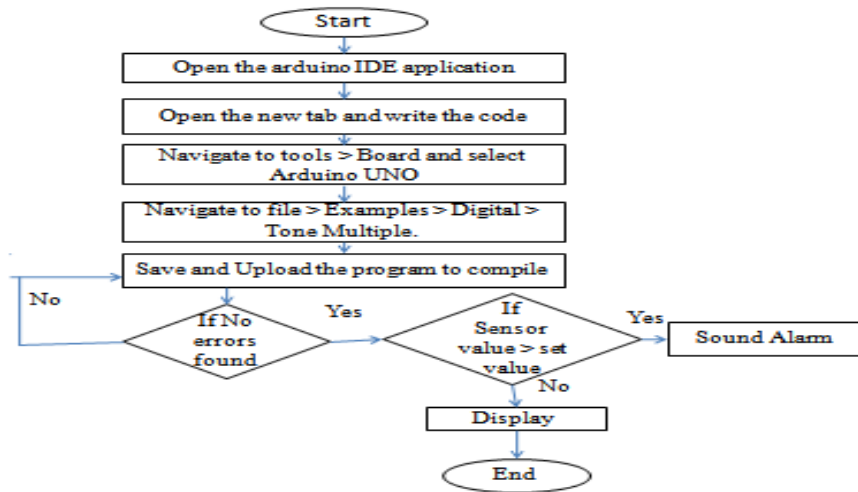


Fig8- Flow chart representation

7. WEBPAGE

The proposed framework can be utilized to show load energy use perusing with regards to Watthours. Each client would have the option to get to the data from anyplace on the earth. Thingspeak.com is one such site page which takes the assistance of the Math Works MATLAB examination to introduce the gadget data in a more itemized examination in both depiction and perception. Thingspeak.com gives the client the capacity to add quite a few channels to one record and in each record data can be taken care of into 8 fields [7]. A record can be relegated to one division of an area and n channels can be made to a set-up of n meters in the region. The data can be monitored by both the purchaser and specialist co-op.

8. THINGSPEAK GRAPHICINTERFACE

The Internet of Things gives admittance to a wide scope of installed gadgets and web administrations. ThingSpeak is an open information stage and API for the IoT that empowers you to gather, store, examine, imagine, and follow up on information from sensors or actuators, like Arduino, BeagleBone Black, and other equipment. For instance, with ThingSpeak you can make sensor-logging applications, area following applications, and an interpersonal organization of things with notices, so you could have your home indoor regulator control itself in view of your on-going area. The essential component of ThingSpeak movement is the channel, which contains information fields, area fields, and a status field. After ThingSpeak channel is made, you can compose information to the channel, interaction and view the information with MATLAB® code, and respond to the information with tweets and different cautions. The average ThingSpeak work process lets you:

1. Create a Channel and gather information.
2. Analyze and picture the information.

9. RESULT

Firstly, We need to turn on the mains. Current sensor detects the power used by the heap. Which gives yield in simple structure. The result of the sensor is provided as contribution to the simple information part in the Arduino Nano Board. Arduino board has inbuilt simple to computerized convertor which switches simple contribution of control over completely to advanced yield. This advanced result is shown on LCD show in type of Watts is displayed (fig 9.1). There is a set point esteem; when the power used by the heap surpasses the set point esteem LCD shows "power increased to maximum" is shown on the LCD display (fig 9.2).The Node MCU is utilized to interface web with the observing equipment framework. The power used by the heap is shown in the cloud viz, ThingSpeak cloud in graphical organization as displayed in the Chart – 1(fig 9.3). It shows time to time power usage of the heap/loads associated with the framework.

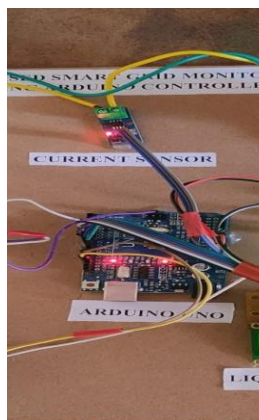


Fig9.ProposedsystemHardwareview

Fig 9.1. reading less than set value

Fig 9.2. reading higher than set value

Fig 9.3. graphical representation of readings

10. CONCLUSIONS

Energy Monitoring using IOT is an innovative application of internet of things developed to control home appliances remotely over the cloud from anywhere in the world. In the proposed project, current sensor is used to sense the current and display it on internet using IoT. The system updates the information in every 1 to 2 seconds on the internet using public cloud THINGSPEAK.

In the present system, energy load consumption is accessed using Wi-Fi and it will help consumers to avoid unwanted use of electricity. IoT system where a user can monitor energy consumption and pay the bill Online can be made. Also, a system where a user can be alerted when the energy consumption exceeds, when

he/she crosses threshold of electricity usage slab can be equipped. Also using cloud analytics we can predict future energy consumptions.

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