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IOT BASED POWER MONITORING SYSTEM

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Abstract: IOT has become a part of the modern world; the significance and utilization are increasing with each passing day. This approach is to design an efficient and real-time wireless networks to monitor power consumption of electrical appliances. A sensor is set at the heap to ascertain current, a circuit is utilized to figure voltage and with these two, power can be computed. This project permit to get the power values and control gadgets from any place on the planet this project describes the digitization of load energy usage readings over the internet. The proposed system design eliminates the involvement of human in electricity maintenance. The user can monitor energy consumption in watts from a webpage by providing a channel id for the load. The Webpage utilizes the THINGSPEAK analytics to analyze the energy usage to give more detailed description and visualization of the energy usage statistics. Wi-Fi unit performs IOT operation by sending energy data of the load to the webpage which can be accessed through the channel id of the device. In the proposed system, consumer can do power management by knowing energy usage time to time. This proposed system utilizes an Arduino microcontroller. The unit which is generated can be displayed on the webpage through Wi-Fi module.

Keywords: *IOT, Arduino, Wi-Fi module, LDR circuit, current sensor, voltage sensor.*

I INTRODUCTION

Internet is an interconnection of computers all over the world. Internet links billion of devices worldwide, and is used to send, receive data all over the world. Internet has vast uses and applications in many fields and domain. One of the important applications of the internet is IoT. IoT is interconnection of physical objects, vehicles etc. mixed with various other fields like embedded systems, sensors, software which helps to collect, transfer and exchange information. IOT has many applications in many fields. This includes Wearables, Smart City, Smart grid, Industrial Internet, Connected car, Connected health, Smart retail, Smart supply chain, Smart farming. One of the main applications of IOT and the one this paper deals with is monitoring information from remote location.

The heart of the system is a Microcontroller. A microcontroller is a small computer on a single integrated circuit. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. There are different microcontrollers like Altera, Fujitsu, Holtek, Infineon etc., Atmel ATmega328P based Arduino is used in this paper because Arduino is made to help to use the microcontroller easily.

OBJECTIVES OF PROJECT:-

- •Measurement of voltage and current of the system.
- •Measurement of Frequency of the power supply.
- •Measurement of power factor.
- •To monitor continuous power consumption of load.
- •To detect metering abnormalities, theft, and network faults.
- •To make the system automated and smart.
- •To avoid unnecessary waste of light.

Need of project:-

- •To make lamps automatically ON and OFF.
- •To make the system wireless and smart.

Benčat, J. Technical Report, Monitoring Test Results of the D–201–HMO Highway Bridge – Lafranconi,.

II. PROPOSED SYSTEM:

BLOCK DIAGRAM:

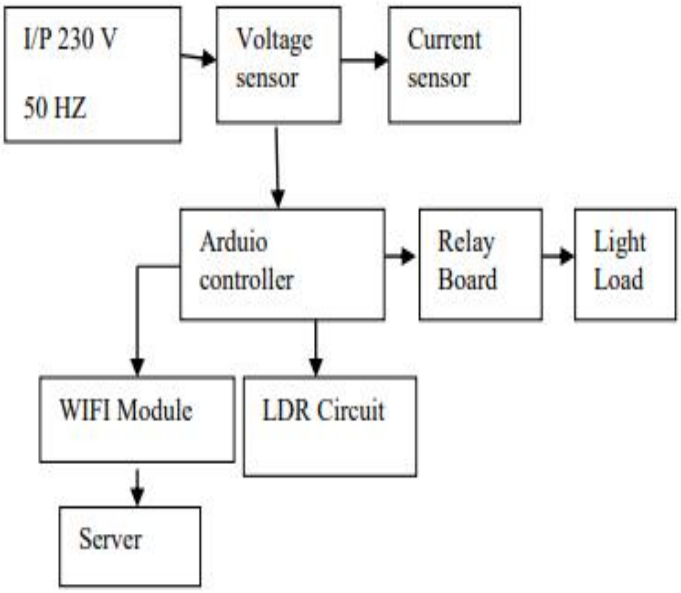

Fig .1 block diagram

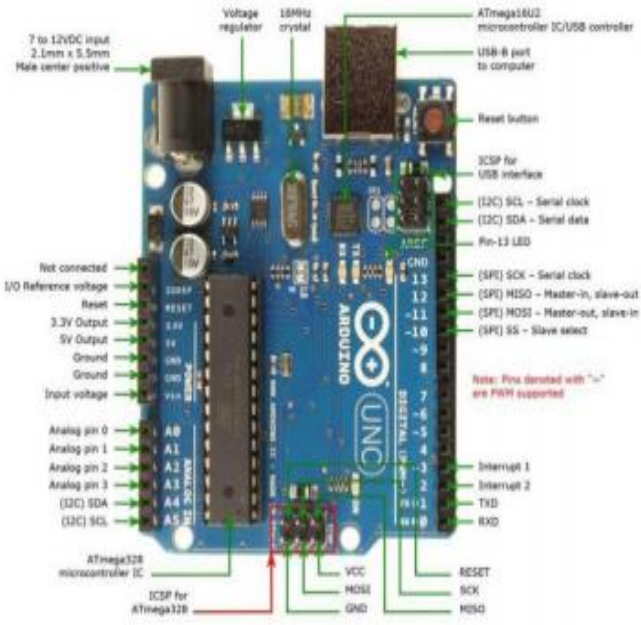

Fig.2 arduino UNO

III.HARDWARE:

A.ARUDINO UNO

Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, a reset button and it is shown in Fig.2. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with anAC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDIUSB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial convertor. “Uno" means one in Italian and was chosen to mark the release of Arduino Software 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform.

PZEM004T METER:

A.FUNCTION:

1. Electrical parameter measurement function (voltage,current,power,energy).
2. The reset function of energy key.
3. Store data when power off (store accumulated energy before power off).
4. Bright red digital display function (display voltage, current, active power, energy).
5. Serial communication function (with TTL, Serial interface itself, can communicate with a variety of terminal through the pin board, read andset the parameter).

Figure 3:PZEM-004T-10A

C.ESP8266EX WIFI MODULE : 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.

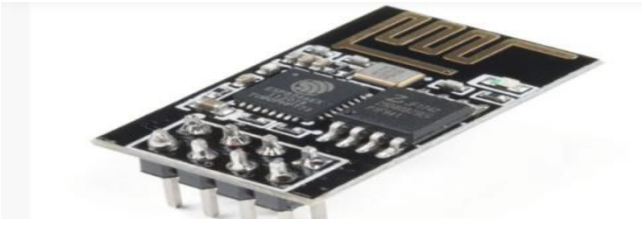

Fig.4 Wi-Fi Module

The ESP8266 is capable of either hosting application or offloading all Wi-Fi networking functions from another application processor.

D.LDR:

A photoresistor, also called a photocell or light-dependent resistor(LDR), is a semiconductor

thatchanges its electrical resistance when exposed to light. Figure 5 . shows a photoresistor as one leg ofa voltage divider circuit. The analog input pin provides the signal that will be averaged.

The resistance of a photoresistor decreases as the light incident on the face of the photoresistor increases. By placing the photoresistor in the upper leg of a voltage divider, as in Figure 5,

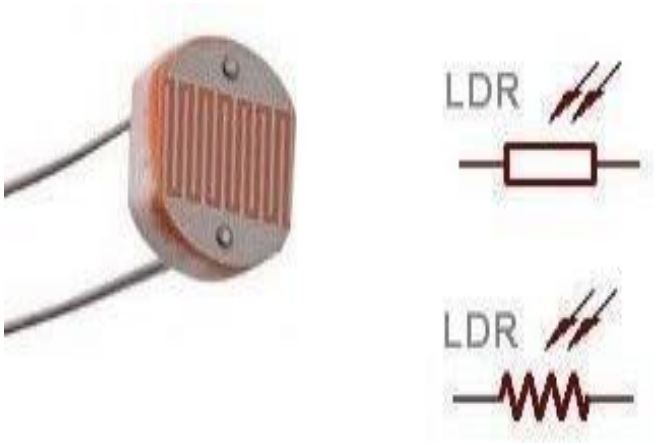

Fig.5. LDR

The output of the voltage divider increases when the light intensityincreases.

CURRENT SENSOR

In this project current sensor ACS712 is used to measure the current, voltage and it is shown in Fig.4. It gives accurate current measurement for both AC and DC signals. These are good sensors for metering and measuring overall power consumption of systems. This sensor produces an output voltage which is directly proportional to sensed current. It works on the principle of Hall Effect. 5V should be supplied to Vcc of ACS712 breakout board and the GND should be the negative of 0v of supply. Once itis powered, the Vout should produce output voltage which represent current going through the sensing pads. When the load is in OFF state then the sensor produces Vcc/2 voltage (no load voltage).ACS712 is able to measure current in two directions.

Output voltage more than 2.5V (VCC/2) indicates current in one direction and voltage less than 2.5V indicates current in another direction.

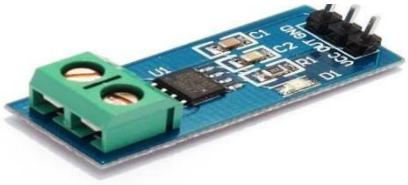

Fig.6 ACS712 Hall Effect sensor

AC voltage measurement can be carried out by converting AC voltage into proportional DC Voltage using rectifier and filter circuits. For low AC voltage (mili volts) measurement precision rectifier is used as diode knee voltage is 0.7 Volt. Similar to DC voltage measurement Voltage divider is constructed using 47K Ohm variable resistor R1. 5v zener diode is used to protect Arduino from accidental excess voltages. Adjust the resistor R1 (47K) to calibrate the voltage. Here the AC voltage that we can giveto transformer is from 50V to 230V depending on its ratings.

Rectified DC is fed to the voltage divider circuit. Connect Arduino as per circuit shown in Fig.5 make ground common for Arduino and circuit shown in figure. Adjust the resistor R1 to get proper reading. When AC Voltage is 250V we get 5V output.

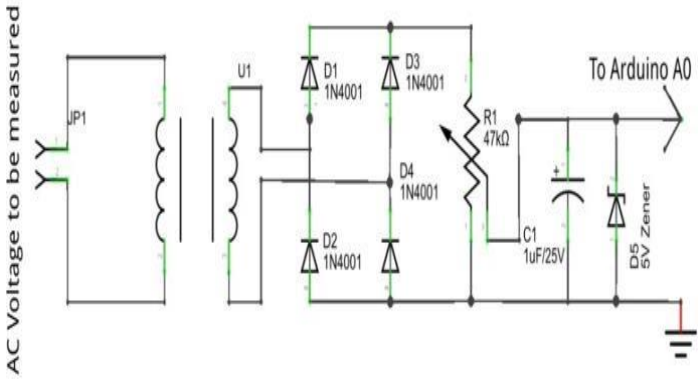

Fig.7 Voltage Sensor

III. SYSTEM PERFORMANCE

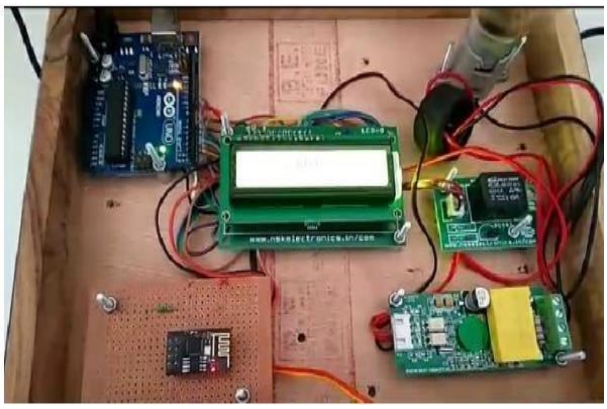

Fig 8 System kit

IV. RESULT ANALYSIS:

1. The results showed an efficiency of the automated lamp OFF and ON system over the manual one and smart one.

2. All the parameters sensed by the sensors such as voltage, current, frequency, energy, power, power factor is very accurate and monitored.

3. All the values sensed by the sensors are continuously measured and they are very much accurate when compared with standard values.

V CONCLUSION: -

We can operate night lamps automatically by using LDR circuit. Lamps will be glow only when darkness is present. It's economic one, and electricity will be saved. In the present system, energy load consumption is accessed using Wi-Fi and it will help consumers to avoid unwanted use of electricity We can make a system which can send SMS to the concerned meter reading man of that area when theft is detected at consumer end. Also using cloud analytics we can predict future energy consumptions.

VII.REFERENCES:-

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