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IOT based Smart Energy Monitoring System

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Abstract: Energy-saving measures play an important role, as they exist you have a huge demand for electricity in this current situation due to population growth, urbanization and industrial development. Therefore, energy monitoring methods are becoming more and more prominent. In this project we will monitor, measure, and control the energy consumption of a variety of materials separately and continuously through sensors and arduino. This paper discusses the calculation of load capacity. Here, we have planned a low-cost energy monitoring method, which is recycled to save a large volume of energy by detecting high-power devices and devices that can be turned off using the Relay Module. Wi-Fi is powered by an ESP8266 downloadable circuit linked to the download, estimates the power consumption and the consumer can see the actual amounts of power used constantly by means of the Wi-Fi module on ESP8266 on the user's side on a mobile phone or PC using the Blink server. The problematic with conventional power observing is these methods not only to estimate power consumption but, by using the projected method the operator can turn off the device, using too much power.

IndexTerms - ***Arduino, ESP 8266, IoT, cloud***

I. INTRODUCTION

The day to day life devices can be connected by using IOT. Devices connected to the IoT concept can be monitored and remotely controlled using a variety of programs. The IoT concept offers basic organization and chances to build connections between the physical world and computer-based systems. The thought is very important for many wireless devices that are rapidly growing in the market. It connects hardware devices to each other via the Internet

The ESP 8266 Wi-Fi unit provides the connectivity with the internet in the system. The demand for electricity is increasing in the very high rate as the population and its lifestyle is changing very fast. Electricity is also consumed for various platforms wiz, agriculture, industry, home appliances, hospitals etc.

The handling the measurement and monitoring the usage is being very complicated due to large network and use of bad practices like electricity theft. To ensure efficient use of electricity there is an immediate requisite to monitor and control the misuse of the energy as possible. As the demand from the new generation of people for electricity grows, so does the need for technological improvements.

The proposed system provides technical assistance to standard power meters using IoT tools. And there are other matters that we need to look at such as the misuse of electricity which ultimately leads to economic losses. Monitoring, Optimized Energy Consumption and Reduction of Energy Consumption are the main goals that lie ahead for a better system. Smart energy meter using a Wi-Fi system is built based on three main objectives.

To provide continuous monitoring of 2electricity consumption.

To control energy consuming device which is excessing power limit.

To provide monitored data to ensure efficient electricity usage.

Similarly the system should also be useful for remote monitoring of the electricity consumption.

In the proposed methodology, the IOT based circuit integrates the controller ESP8266 with the voltage regulator circuit and transformer. The Wi-Fi enabled ESP8266 makes the designed architecture as internet-enabled by using the Wi-Fi module incorporated in it and it integrated with cloud from where the user can retrieve the energy consumed values of the load. On mobile using blink Embedded C software design is used for calculating the energy values from the sensed digital GPIO pins of the ESP8266. Whenever the load using extreme power the equipment will be turned off using arduino and transmission module. It can be closed by setting the amount of storage capacity to a specific load depending on the power score of the device associated to the region. Information from the app is displayed on the display and in the Android app which can also be accessed by anyone from anywhere.

The system is built on a small Arduino controller. It can be divided into a three-component sensor, a controller and a Wi-Fi unit. The controller performs basic statistics and information processes. The regional sensor provides details of any power consumption and the most important role is played by Wi-Fi to drive unit info from the Internet controller. The buyer is reminded of the proper use. The Arduino controller is configured with the Arduino IDE software which is required to operate the Arduino board. Figure 1 made up of of an Arduino UNO board, an ESP 8266 Wi-Fi element and a LCD. The Wi-Fi module is a key feature used for IoT functionality. The Arduino board unit provides links between the various components of the proposed system. Arduino is the backbone of the system needed for the performance of tasks that need to be done such as automatic calculation and automatic power consumption. The load represents devices that require electricity to operate. The ac supply is joined to the system to enable the system. Power meter readings are processed and updated Wi-Fi via the ESP 8266 Wi-Fi Module and can be shown to the smart phone user and laptop using the cloud at any time.

Exiting System:

The present days digital meters are installed to monitor the usage of electricity. The digital meter measures the total electricity consumption all together. Few of them have GSM based monitoring system which give next level user interface to inform about electricity usage [2]. The existing energy meters don't have facility to monitor immediate energy consumption of all devices separately and continuously. Also existing system uses GSM module to display data at user mobile which is high cost effective and requires more maintenance. This proposed work addresses this problem and made reliable for displaying data using cloud at user mobile as well as laptop anytime, anywhere. It is resulted into highly secured and less maintenance.

II. SYSTEM OVERVIEW

The purpose of this method is to monitor energy. Continued use of loads should also be noted for the energy consumption of affected people with the ESP8266 microcontroller and data connection

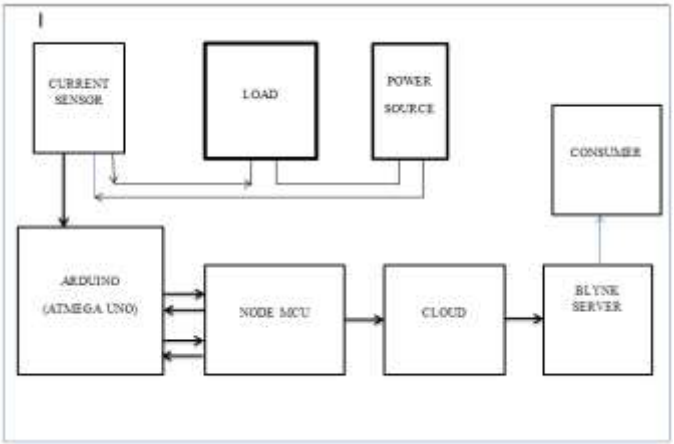

Figure 1: Proposed System Architecture

As shown in Figure 1 a power monitoring system containing a current transformer, linked to a series and a load. The transformer used in the system is of the ground type. The transformer is followed by a DC power supply for translating AC power into a DC power supply on an ESP8266 microcontroller for measuring power. The ESP8266 controller is used to determine the power applied to the associated load using GPIO digital anchors, which are provided with DC power from Regulated Power Supply.

The embedded system C is used in the development of a system for calculating the amount of energy used. Wi-Fi module embedded with ESP8266 used Display the actual amounts of energy used on the user side.

In construction technology, the controller determines the power consumption every 1msec. The controller is connected to the GPIO connectors of the ESP8266 microcontroller. The controller determines the power consumption based on the amount of power received from the GPIO pins from the controller output.

This result is displayed at user smartphone or laptop also using cloud storage. User can deliver the real values of energy through cloud storage using blink as shown in figure 1.

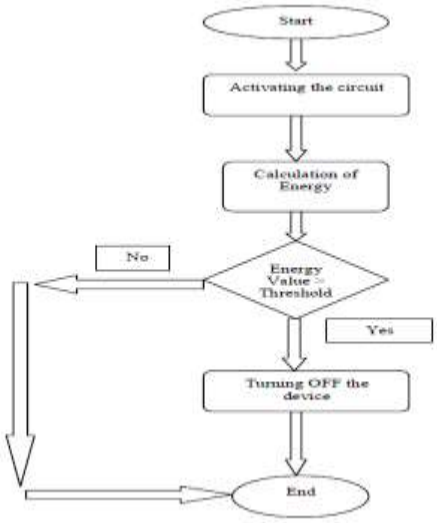

Figure 2: Flow diagram of the Proposed Method

III. IMPLEMENTATION METHODOLOGY

Suggested startup method system is shown in the flow chart shown in figure 2. First the built structure estimates the energy loaded. The amount of energy used is compared to the limit value which is a different value for a certain associated device. If the amount of power used exceeds the limit, it indicates that the device should be turned off. Therefore, the system shuts down the device with the help of the transmission module. Whenever the calculated value used are fewer than the limit value the performance of the circuit will continue.

IV. SOFTWARE DESCRIPTION

A. *Embeded C language*

The processor used in ESP8266 is connected with embedded software, which is why the embedded system is used to generate results. The embedded language of C Programming plays an important role in accomplishing a work using a processor. In the power monitoring number circuit used by the embedded input code of the load is used.

B. Arduino IDE

Arduino IDE is open source software used by typing programs on Arduino friendly devices such as ESP8266. Arduino natural rendering of both C and C ++ languages.

V. HARDWARE DESCRIPTION

A. 16×2 LCD Display

B. ESP8266

The ESP8266 controller is designed for extremely low power expertise and reaches a clock speed of 160 MHz
Low power ESP8266 operates in three modes with active mode, sleep mode and deep sleep

Table 1. Specifications of ESP8266

Sr. No.	**Description of ESP8266**	
1	Category	Single Board Microcontroller
2	Current	3.0-3.3
3	RAM	<36Kb
4	Clock Rate	80MHz/160MHz
5	Power	USB

VI. RESULT ANALYSIS

The performance of the planned measurement is compared to the tabular form shown in table 2. Compared to existing power monitoring structures the projected method is much safer and the system strategy is simpler. The user can always monitor power consumption using cloud storage on any smart devices.

Table 2. Benefits of the proposed program in addition to the existing plan

Sr. No.	**Parameter**	**Planned Method**	**Current System**
1	Design	Modest	Difficult
2	Security	More	Less
3	Maintenance of the System	Simple	Difficult
4	Competence	High	Low
5	Device Control	Probable	Not Probable

VII. EXPERIMENTAL RESULTS

The model of the energy monitoring system is shown in figure 3. In the example of the planned system the assumed load is a bulb. In the design process, the transformer is linked to the series and load. When a load is associated to a circuit it will consume a large volume of energy, the amount of energy used in the circuit observed by the load when it is opened by 1000 watts and the power evaluation is shown on figure. 4. Threshold value is determined to be 800 watts. Therefore, load consumption is above the limit value and the load is automatically shut off by the system as shown in figure 5.

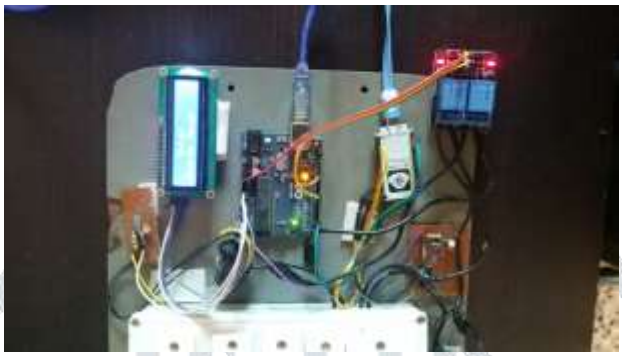

Figure 3: Hardware Prototype

Figure 4: Power reading when Load is connected

Figure 5: Reading when Load exceeds the power limit

VIII. CONCLUSION

The projected energy monitoring structure provides accurate energy consumption rates and energy calculation regular use for 1msec. So, it takes a lot a little time to identify the power limit excessive load and the user can load control. Therefore, a large quantity of energy savings can be achieved through a tailored program. If this system is used in hostels or offices where the use of electricity is only permitted for certain applications, we may be able to control the misuse of the infrastructure through this system.

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