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Power monitoring with time controlling & data logging

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Abstract - *Now days it is very necessary to save electrical energy, for that the power consumption of that device should be very low therefore, we are making a device, which is connectable to any electrical appliances. This device calculate the power consumption of those appliances continuously and continuously creates the database. This device is wirelessly controllable means we can ON or OFF that device wirelessly. We can also set timing wirelessly on this device. After particular timing, the device (home appliance) will be automatically switched off. We can used this device to save energy e.g. we can set timing for mobile charging so that after particular time charging will be switched off.*

Key Words: **Current Sensor, Arduino Uno, Database.**

1. INTRODUCTION

In order to save the energy and to ensure the safety of electric equipment the power consumption of electric device needs to be monitor in real time we present a design of a low cost system for real time monitoring of the power which is consumed by the device using thingspeak (in the graphical format). It is also useful for energy management to increase the efficiency of instrument. It Is Useful where alternating current supply is used and used In Costly Home Appliances.We are calculating and monitoring Power Consumption through Micro Controller (Arduino) and stores its data for the later analysis. We also set timer for any device using our smartphone and after times up of that device, the device get automatically turns off.

2. Objective

1. This system removes need of manual handling.
2. Circuit used in device for time counting (timer) provides safety to that electric device and respective device prevented from heating effect.
3. Test results are recorded on thingspeak so that any previous data of testing can be fetched.
4. Monitoring of power is done wirelessly and its analysis can be done in seconds.
5. It reduces power consumed and also manual handling involved in the process.
6. Results are sent to the thingspeak database so that required action can be taken.

3. Literature Survey

[1] The Five Characteristics of Cloud Manufacturing Things "paper presented by M.Spinola. This paper is about the essential things on cloud computing we need to be aware of before using cloud computing. From the above paper we learnt that using cloud would be better than using the local server as the storage space in could is vast and data could be fetched from cloud whenever necessary From the above paper we learnt that the sensors and physical elements like water could be combined with internet for its testing.

[2] What is the Internet of Things: An Economics Perspective, Auto ID Labs White paper presented by E.Fleisch. This paper is targeted towards students, practitioners and researchers who are interested in understanding and contributing to the ongoing merge of the physical world of things and the Internet. From the above paper we learnt that the sensors and physical elements like water could be combined with internet for its testing. This reduces a lot of manual work involved in traditional system of water testing.

[3] paper presented by Harsha khandel, suchitra pandey, and D. Raynolds. This paper is all about power consumption and data monitoring. From the above paper we learnt about how to crate a database and hoe to process it to increase cost efficiency and productivity of time.

4. METHODOLOGY

4.1 Block Diagram

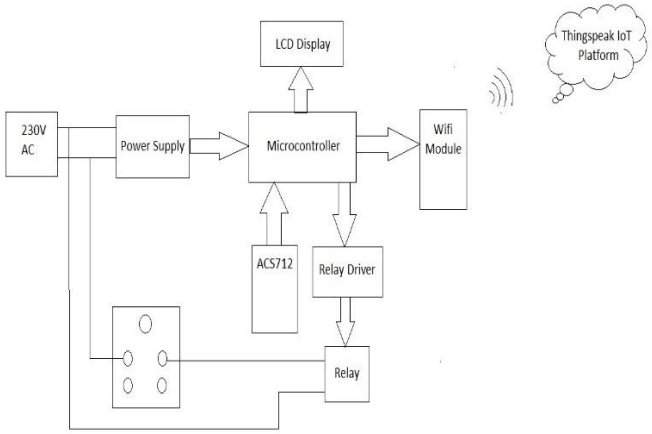

Fig -1: Block Diagram of Circuit

The AC load is given to the main system. This system contains the meter, which receives the signal in continuous form. The controller is the heart or the brain of the system; it coordinates the functionality of other parts of the system. It can be any of the microcontrollers; for this research an Arduino microcontroller was used for easy prototyping, implementation and emulation of embedded systems. Fig.2- Block Diagram of the Circuit. The power fluctuations are monitored using the current sensor, which is fed to the microcontroller. Relay is an electromagnetic switch, which operates on small electric current that turn on or off a much larger electric current. The live reading of meter is displayed on LCD. For transferring the data wirelessly, ESP8266 Wi-Fi module is used. The authorized person continuously receives the notification regarding consumption of power on the smart app that power is in the limit. For observation the

Power consumption data will be given to the thingspeak using Wi-Fi module. Here the calculation of total power supplied will be monitored and the permanent record will be stored in database.

5. TOOLS

[1]. Current sensor

ACS712 current sensor is used in power monitoring system. It provides precise solutions for AC or DC current sensing which is suitable in industrial, commercial, and communications systems.

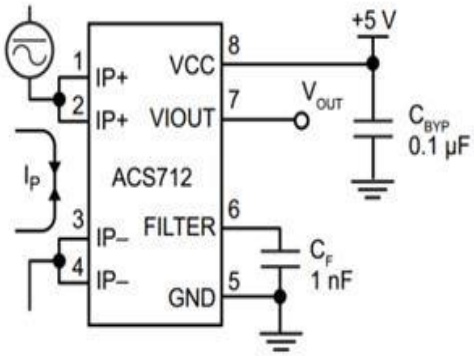

Fig -2: current sensor

The device consists of a precise, low-offset, linear Hall circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which the Hall IC converts into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic signal to the Hall transducer.

The output of the device has a positive slope (>VIOUT (Q) when an increasing current flows through the primary copper conduction path (from pins 1 and 2, to pins 3 and 4), which is the path used for current sampling. The internal resistance of this conductive path is 1.2-mΩ typical, providing low power loss. The thickness of the copper conductor allows survival of the device at up to 5× over current conditions. The terminals of the conductive path are electrically isolated from the signal leads (pins 5 through 8). This allows the ACS712 to be used in applications requiring electrical isolation without the use of opto-isolators or other costly isolation techniques. The ACS712 outputs an analog signal.

[2]. Arduino for communication

Arduino is a series of credit card-sized single board computers. We have used Arduino for communication as it is efficient in cloud computing. It supports full edged operating system. It has several pins which facilities us to connect sensors and other devices to make computation easy. Arduino Allows embedding with hardware device. Arduino is low cost. Arduino quad core with 1GB RAM. An Arduino is a microcontroller motherboard. A microcontroller is a simple computer that can run one program at a time, repeatedly. It is very easy to use. A Raspberry Pi is a general-purpose computer,

usually with a Linux operating system, and the ability to run multiple programs. It is more complicated to use than an Arduino an Arduino board is best used for simple repetitive tasks: opening and closing a garage door, reading the outside parameters (sensors) and reporting it to database with the help of Wi-Fi module (ESP8266). Raspberry Pi is best used when you need a full-fledged computer: driving a more complicated robot, performing multiple tasks, doing intense calculations (as for Bitcoin or encryption). Anywhere in the document, if referred as Arduino/ Raspberry Pi refers to IOT environment, which can be replaced by other based on the users requirements and performance.

Fig -3: Arduino

6. RESULT AND DISSCUSSION

4.1 Hardware Developed

The figure.4 shows developed system for monitoring power system.

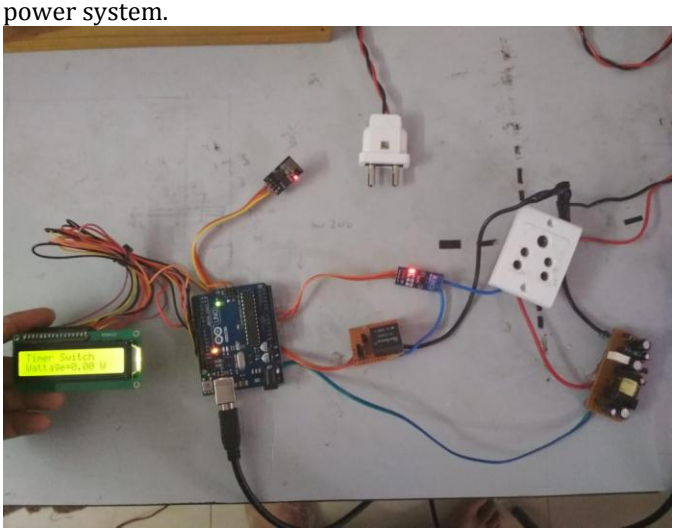

Fig -4: Developed Experimental Setup

4.2 System Integration with Application

The above figure shows way for information is received and display on LCD, TCP Client application and on the front panel of the Thingspeak.

Current sensor is connected to plug via Arduino. LCD display takes data from Arduino and display the data. AC to DC circuitry is used to convert 230v AC to 12v DC for Arduino compatibility. In this condition load is not there.

Case 1:

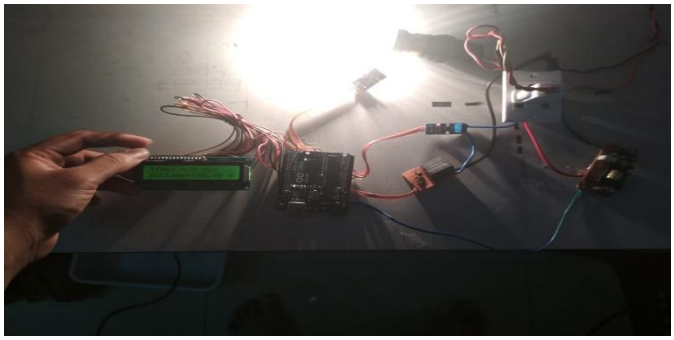

Fig -4: Load is connected to plug

In above figure the load is connected to the device the power consumption of that load is displayed on Thingspeak using Wi-Fi module and on LCD through Arduino. The current is measured by ACS712 which is used to calculate power consumption.

3. Recorded data and graphical information

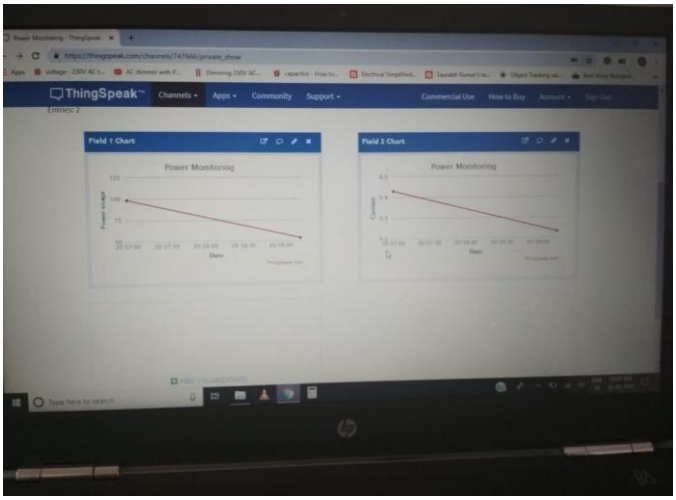

Fig -4: Graph obtain as per power consumed

The whole process is based on the Ohm's law which states that," the electric power in watts associated with a complete electric circuit or a circuit component

represents the rate at which energy is converted from the electrical energy of the moving charges to some other form, e.g., heat, mechanical energy, or energy stored in electric fields or magnetic fields".

P = V I
POWER= VOLTAGE X CURRENT

Here taking a voltage as a predefined data and on the calibration of current, the power will be calculated.

3. CONCLUSIONS

The above presented project was successful in what it had to achieve. Our main objective was to monitor power consumption of electrical equipment's and to maintain history of that data on database. When the time given by user ends up, the power supply will cut off automatically. The major point is we have been able to record all the details obtained in our monitoring on database. The results can be viewed and fetched whenever required. The monitoring of power can be done wirelessly using this system. Hence, we have tried to achieve all our objectives.

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