Data Analysis of Electricity Consumption and Optimization

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Abstract: *This paper is about data analysis of consumption of electricity and optimization of electricity too.It is totally based on energy management. We know the things become more convenient by the use of internet and better result in machinery have been achieved after development of IOT. Like so many things home appliance can also be controlled through IOT and in home management system IOT played a crucial role to measurement and optimization of energy. As per the user comfort android application take over so many things and it have given good result in energy management system too. To control the every appliance and machinery Raspberry pi is used which have inbuilt Wi-Fifacility to communicate with Android application. For communication purpose GSM is used. As per the power optimization concern temperature sensors, light sensor, ultrasonic sensor are used. And to remove ripples in current by the use of capacitors so many good result can be achieved in power optimization.*

Keywords: Home energy management system; IOT; android app;Raspberry pi; GSM; power optimization

1. Introduction

As per today's time electric appliances are required everywhere and by the technical development use of these appliances have become more convenientas well as the expenditure of these appliances also high so consumer also want to save energy to reduce the expenditure. This paper is focusing to improve the existing technologies to minimize the energy consumption that goes to waste due to defect or fault in product or appliances [7].

This research shows that energy saving can be done by the help of some sensors by attaching them with appliances to save the energy another advantage of this research is that a person can control the appliances from anywhere and also can know the consumed unit of a particular appliances at any time by the help of an android application.

This paper focus the three field of technologies and those are IOT, App development and embedded system. By using the app person will be able to control the appliances and also will be able to reduce the wastage of power.in this App all the available device will be listed on the screen along with control adequacy.

Figure 1.1: Home Energy management system

Most significant aspect of this App is that it is a single app being able to control many devices and it can perform many task like on-off and calculation of unit consumed and alarm facility for appliance too by which if user want to take any information about more unit consumption then user can set an alarm of maximum unit consumption and if device energy consumption over take this pre saved data then alarm will intimate the user about overflow of consumed units.

2. Related Work

We have reviewed the previous research work on App and power optimization. we also studied some method of energy saving like use led bulb instead of bulb .this paper mainly focus on reduction of energy consumption by the help of some sensors and also by controlling the appliances through mobile application . It also focus on monitoring of each appliances activity and calculation of energy consumption in real time and alert the user about wastage of energy.

3. Aim

Our objective is to redeem the energy which get wasted as there is increment in consumption by the appliances at home level and machineries at industry level due to fault in appliances.

4. Hardware

a) Raspberry pi
Raspberry pi is based on ARM (advanced reduced instruction set computing machine technology) which reduce the cost, heat and power consumption [6]. Raspberry pi is based on Linux operating system and it has inbuilt Wi-Fi facility. For controlling purpose microcontroller can be used but on microcontroller we cannot use multiple appliance at a time this problem can be overcome by using computer and raspberry pi is a mini computer and it gives better result [6].

b) Relay
Relay is used as a switch. Relay connection is needed to operate multiple device on a same controller.

c) ACS712 CURRENT SENSOR

The line current can be measured by this sensor. The DC offset of the sensor output is 2.5V, so no separate circuit for offset is needed. This sensor gives output in voltage form which is converted into current through the code [2]. This sensor is connected in series with the load and the proportional signal by the load is given by

*Vout= K*Iin*(1)

K can be taken through the data sheet of ACS712.

5. Methodology

Our main objective is to show the data of energy consumption on the screen for that we used Raspberry pi 3-B. we could use the Microcontroller and Arduino too.

In this device is controlled by the raspberry pi. The Data of voltage and current is transferred to cloud server by using Wi-Fi module for more rooms we used relays.
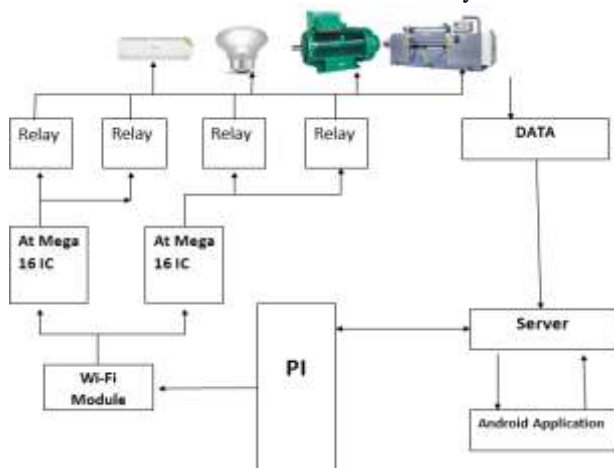
Figure 5.1: System architecture

As we know that the voltage of every appliance is fixed and that is 220V and variation in power comes only by the current so to measure the power, current 2measurement is needed for that a current sensor can be used and in this particular project hall current sensor have been used.

The data is then manipulated in android application that would show the data of electricity consumption as per the user interest and this android application also will show the details of appliances.

6. Calculation

For calculate the consumed unit of per appliance we used this formula

Voltage= 220v

$$\text{Power} = v*I \tag{2}$$
$$\text{Consumed units} = P*T/1000 \tag{3}$$

7. Discussion

It is found that many users didn't care about the maintenance of the appliances and the wastage of energy at small level due to their busy schedule. But when it comes to android application the users are willing to get upgrade with. And

the govt. and large public sector are focusing on the smart technologies .this paper not only focus the home automation system but also wastage energy reduction at smallest possible level. The energy saving is not only constitute of effort of govt. and scientist or experimenter but also the effort of user.

8. Conclusion

It should be properly recommended that user take necessary action regarding wastage of energy by improving their place with smart device. This work focus on smart energy management system to reduce the wastage of energy. Smart home automation system is promising technology for future and it is mainly based on the principal of having less human involvement as possible while maintaining the optimum comfort level .this work is extending the feature of smart automation system and make the technology even more robust in terms of cost efficiency.

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