Low Power Fully Automated Smart Energy Conservation Switching Box

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***Abstract*:- Energy is a major input students and faculties. A simple action of sector for economic development of any country. In this paper, it is proposed to develop a Smart Energy Conservation System that will help various organizations to play an effective role in saving electrical energy. The major sector which consumes maximum amount of electricity is observed to be the educational institutions. Electricity is observed to be consumed nearly 70% of the total available time by switching OFF the electric consumables when not in use will save a lot of energy. In order to conserve energy, automated lighting system using Raspberry Pi that monitors the electrical lighting and the running of fans is proposed. The experimental results show that we can reduce our bill to the extent of 50% and also conserve energy, if the electrical appliances are switched OFF promptly when not in use.**

Keywords:- Raspberry PI, Electrical Consumables, Energy Conservation, Automated Lighting, Smart System

INTRODUCTION

Energy conservation will be one of the buzzwords in near future. To deliver a sustained economic growth rate, of 8% to 9% before 2031-32, and to meet life time energy needs of all citizens, India needs to increase its primary energy supply by 3 to 4 times and electricity generation capacity by about 6 times. As a result, growth rates for energy service demand will keep on increasing because of accelerated industrialization, urbanization, and an emerging consumer society. The cost of generating electricity will only go up in order to keep up with the costs of inflation. In such a scenario, it is very clear that consumers will be paying more prices per unit of electricity consumed, in the years to come. The simplest technique to save power and consequently the costs is to switch off the lights and fans as soon as we leave the room. However, this is not a second nature to many of us. The idea is to

LITERATURE SURVEY

An extensive literature survey has been carried out on different techniques that have been implemented for the lighting system. In [3], the authors describe about automated lighting system with visitor counters. This System needs no manual operation for switching ON / OFF, as a person enters or exits from a room. The PIR Sensors coupled with IR transmitter and receiver is placed at the entrance of the room doors in such a way that the sensor senses a person entering / exiting the room. This can also be done by using a laser. When a person enters into the room, the lights in the room will be switched ON automate, by creating a device that monitors "changes" in the environment and respond automatically to the situation. By switching off lights and fans in a timely manner, we stand to save costs on electricity bill by at least 30% to 40% even by conservative estimates. The proposed method is implemented using Raspberry Pi.

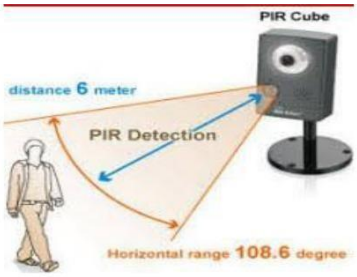
and when a person leaves the room then the lights in the room will be switched off. The lights will only be switched OFF when all the persons in the room go out and the room is unoccupied. Sensor Technology [4] is also used for the same objective of conserving energy. For instance, vacancy Sensor allows direct replacement of standard wall switches. Using passive infrared technology (PIR), these sensors combine occupancy detection and voltage switching in a single package. These units automatically turn off lights after a room or an area is vacant. They have a 108.6 degree horizontal range field of view and can cover up to 6 meter of distance.

METHODOLOGY

BLOCK DIAGRAM:

The proposed System needs no manual operation for switching ON / OFF when a person enters or exits from a room. The PIR Sensors is placed at the entrance of the room doors in such a way that the sensor senses a person entering / exiting the room. A Microcontroller is a circuit which helps in controlling the lights and fans in a room and keeps track of number of persons / visitors entered or exit from the room. In addition to this, intensity level is fixed in an LDR, when a person enters into the room. If the intensity of the room is less than the fixed value, the PIR sensor should be turned on and hence the light. The lights will only be switched OFF when all the persons in the room go out and the room is unoccupied.

Fig 2 Raspberry Pi module



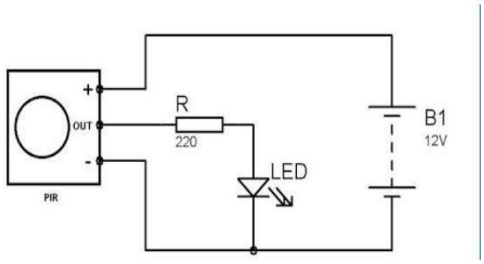


Fig 3 Internal circuit diagram of PIR sensor

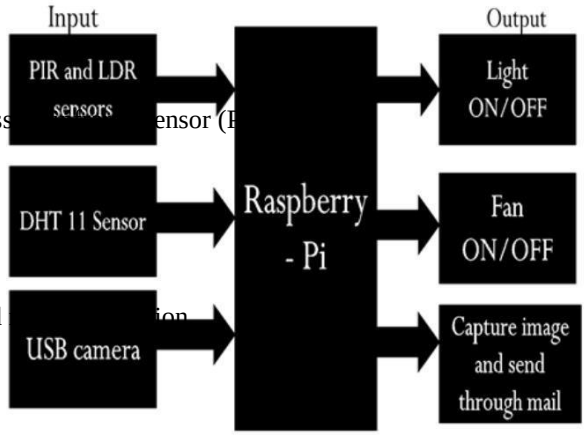


Fig 1 Block diagram of switch box

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electronic sensor that measures infrared (IR) light radiating from object in its field of view. They are most often used in PIR

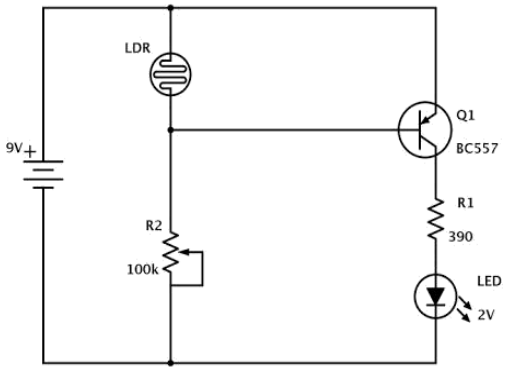

Fig 4 Internal circuit diagram of LDR sensor

A photo resistor or light dependent resistor is a component that is sensitive to light. When light falls upon it, its resistance changes. Values of the resistance of the LDR may change over many orders of magnitude as value of the resistance keeps on falling as the level of light increases.

This System needs no manual operation for switching ON / OFF when a person enters or exits from a room. The fan is switched on/off by the use of a DHT 11 sensor. Body temperature is the important measure here.

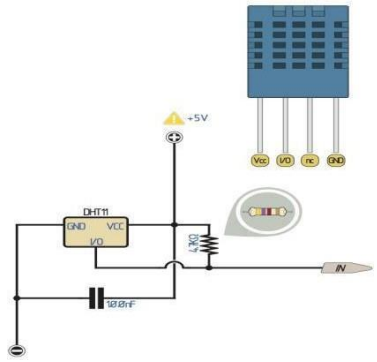

Fig 5 Internal circuit diagram of DHT11 sensor

The DHT11 is a basic, ultra low-cost, digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin. It requires careful timing to grab data. A USB webcam is a camera that connects to a computer, usually through plugging it in to a USB port on the machine. The video is fed to the computer where a software application lets us view the pictures and also transfer them to the Internet. This module may be used to monitor the students in a classroom during regular classes, internal tests, external examinations, etc. This is done by using a USB camera to capture the image.

PROPOSED WORK:

Automated lighting system uses Raspberry Pi, a flexible system which reduces electricity bills. This system can be used in residential, institutional, commercial and other industries to conserve energy and to reduce the cost of consumables on yearly basis.

A Micro SD card is inserted into the slot on the board which acts as the hard drive for the Raspberry Pi. It is powered by USB and the image output. This gives us all of the basic abilities of a normal computer. It also has an extremely low power consumption of about 2 watts (approximately equivalent to a mobile charger). The Raspbian operating system is a lightweight version of Linux that is optimized for this low powered device. With the help of Raspberry Pi, we can program the circuit board as per our requirements in Python language. By using a USB camera we can capture the images of a person entering the room. There is no need for any sensors to be installed for this proposed system.

RESULT

The system was tested to determine the energy consumed before and after the installation of the system. the units consumed on a day-to-day basis for a sequence of 8 days. It can be inferred from the graph that there is significant amount of energy conserved. the difference in the percentage of energy consumption before and after implementation of the automated lighting system using Raspberry PI. It can be inferred from the pie chart that there is a drastic reduction of consumption of power. The results show that almost 50% of the power consumption can be saved.

CONCLUSION

The automatic lighting system turns OFF lights and fans in the room when unoccupied. The test classroom was consuming 64% of electricity before deploying the system and after the deployment of the system we found that the consumption was reduced to 36%. It can be inferred from this that 50% of energy is conserved. This project, a Low Power Fully Automated Smart Energy Conservation Switching Box is a real time application.

REFERENCES:

[1] Raspberry Pi Foundation, UK registered charity 1129409 - http://www.raspberrypi.org/help/
[2] Cellan Jones, Rory (5th May 2011), Peter (3rd June 2011), Bush, Steve (25th May 2011), “Dongle computer solve the programming on a TV” - http://en.wikipedia.org/wiki/Raspberry_Pi#/media/File:Raspberry_Pi_B%2B_top.jpg
[3] http://www.projectsof8051.com/automatic- room-light-controller-with-visitor-counter/
[4] Womack Electric Supply, 2011 - http://www.womackelectric.com/wp- content/uploads/2011/05/P-S-Occupancy-and- Vacancy-Sensors-Catalog.pdf
[5] Akula Rahul, K.Haripriya, E.Sneha, “Smart Energy Management System Based on Zigbee Technology”, 11th March 2015.
[6] Dr. D.V.Pushpa Latha, Dr. K.R.Sudha, Swati Devabhaktuni, *“PLC based Smart Street Lighting Control”*, I.J.Intelligent System and Applications, 2014, 01, 64-72.
[7] Tutorialspoint - http://www.tutorialspoint.com/python/python_overview.html
[8] OpenCV (Open Source Computer Vision) - http://opencv.org/
[9] EEVblog electronics community forum - https://www.google.co.in/webhp?sourceid=chromeinstant&ion=1&espv=2&ie=UT