ISSN: 2277-9655
Impact Factor: 4.116

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

DESIGN AND DEVELOPMENT OF INTELLIGENT LIGHTING SYSTEM FOR SMART HOUSES

Miss. Ashwini Deshmukh*, Dr. K.B.Khanchandani
*(E&tc, SSGMCE, Shegaon/ SGBAU, India)
(E&tc, SSGMCE, Shegaon/ SGBAU, India)

DOI: 10.5281/zenodo.59639

ABSTRACT

Energy conservation is the most important factor in recent human life, more wastage of energy is caused by the inefficient use of the consumer electronics. Energy saving in buildings not only saves money and also helps protect the natural resources and environment .The sensor which detects the day light is used to switch outdoor lighting and the PIR sensor which detects the entering person into room are used here to regulate the indoor lighting intensity. Saving the electricity is not difficult. Just by turn off the light when leaving the room. We have tried to make a LED lighting system which may operate intelligently considering energy efficiency and user satisfaction.

KEYWORDS:LEDPanel,PIRSensor,PWM,IlluminationSensor.

INTRODUCTION

Energy-saving solutions are very essential in recent years because of environmental issues such as climate change and global warming. According to conservation of energy, energy can neither be created (produced) nor destroyed by itself. It can only be transformed. Environmental problems are very important issues and these problems are largely caused by the excessive use of energy. Taking care of the environment is a responsibility that everyone should feel accountable for. Most of us are already aware of environmentally friendly processes such as recycling to minimize the amount of waste we produce and reduce our carbon footprint. However, a lot of people are unaware of new and upcoming technologies that we can use to help reduce carbon emissions. A good example of this is led lightning which provides many environmental advantages. Daily more and more home appliances and consumer electronics are installed in homes. Residential energy consumption tends to grow rapidly. Around 10 % of a total household power is consumed during standby power mode, the reduction of standby power is greatly necessary to reduce the electricity cost in home. LED lights are up to 80% more efficient than traditional lighting such as fluorescent and incandescent lights. 95% of the energy in LEDs is converted into light and only 5% is wasted as heat. This is compared to fluorescent lights which convert 95% of energy to heat and only 5% into light! LED lights also draw much less power than traditional lighting; a typical 84 watt fluorescent can be replaced by a 36 watt LED to give the same level of light. Less energy use reduces the demand from power plants and decreases greenhouse gas emissions.

Recently, an intelligent lighting control system are developed to reduce energy consumption as automatically controlling the intensity of illumination through situation awareness, such as awareness of user movement or brightness of surroundings.

WORKING PRINCIPLE

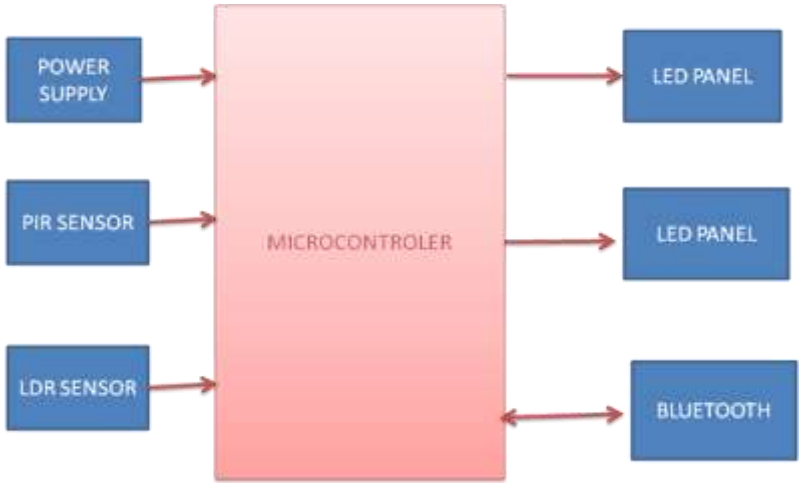
Intelligent Energy Saving System, the aim of the project is to save the energy. In this project we are using various sensors, controlling and display.

In this project work the basic signal processing of various parameters which are , LDR, motion sensor. For measuring various parameters values, various sensors are used and the output of these sensors are converted to control the parameters. The control circuit is designed using micro-controller. The outputs of all the three parameters

are fed to micro-controller. The output of the micro-controller is used to drive the led light as shown in "Fig." 1.1. Bluetooth is used to control intensity of led light. The proposed LED system can autonomously adjust the light intensity value to enhance both energy efficiency and user satisfaction.

The proposed system provides intelligent mechanism for effective energy management using multi sensors and wireless communication technology to control LED light according to user's state and surroundings. We use environmental sensors like illumination sensors (LDR), motion sensor (PIR), which allows the system to vary brightness of illumination. The system using PIR sensor decides whether a user is in a room or not and control the brightness of lights connected with microcontroller. The microcontroller continuously monitors the sensors. In LED lights, it is possible to adjust the brightness of the lights by using PWM. i.e. if the illumination of surrounding is sensed, uses can be provided the regular brightness through brightening or darkening the lights freely. Also it varies the illumination according to the insulation of the season or the time of day. When the movements are rarely detected, system autonomously turns the LED lights off or adjusts the weaker brightness to save power consumption.

Block Diagram:



Block Diagram of Led Lighting system

COMPONENTS

PIR Sensor

A PIR detector is a motion detector that senses the heat emitted by a living body. These are often fitted to security lights so that they will switch on automatically if approached. They are very effective in enhancing home security systems. The sensor is passive because, instead of emitting a beam of light or microwave energy that must be interrupted by a passing person in order to "sense" that person, the PIR is simply sensitive to the infrared energy emitted by every living thing. When an intruder walks into the detector's field of vision, the detector "sees" a sharp increase in infrared energy.

Ldr Sensor

LDR's or Light Dependent Resistors are very useful especially in light/dark sensor circuits. These help in automatically switching ON /OFF the street lights and etc., normally the resistance of an LDR is very high, sometimes as very high as 1000000 ohms, but when they are illuminated with light, resistance drop dramatically. Electronic opto sensors are the devices that alter their electrical characteristics, in the presence of visible or invisible light. The best-known devices of these types are the light dependent resistor (LDR), the photo diode and the phototransistors.

Bluetooth serial interface module

Bluetooth serial module is used for converting serial port to Bluetooth. These modules have two modes: master and slaver device. The device named after even number is defined to be master or slaver when out of factory and can't be changed to the other mode. But for the device named after odd number, users can set the work mode (master or slaver) of the device by AT commands. During the pairing, the current is fluctuant in the range of 30-40 m. The mean current is about 25mA. After paring, no matter processing communication or not, the current is 8mA. There is no sleep mode. This parameter is same for all the Bluetooth modules.

Arduino

The 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 crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

Design and Development

LED Panel

LED panel requires 12V.But Arduino gives 5V supply. For boosting voltage MOSFET is used.LED panel is of 42w having 84 LED'S connected in series.That means each led requires half watt energy to glow.

LED Panel

LDR Sensor

Input voltage to LDR is 5v.output voltage changes as light falls on sensor. Output voltage when light is full on is 0.19V .And when light goes on decreasing output voltage changes up to 3.20V.By voltage divider rule output voltage is given by,

Output voltage=VIN *(R2/R2+R1)
VO=5*(10K/10K+10K)
VO=2.5V

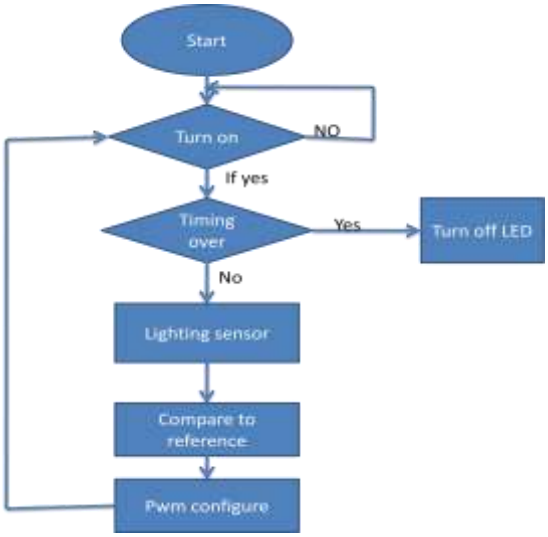
PIR Sensor

Input voltage to PIR is 5V.Output voltage changes as motion is detected. Output voltage when there is no motion is 3.27V .And output voltage when there is motion is 4.85V.

Bluetooth

To connect Bluetooth with Arduino, it is necessary to set baud rate. Baud rate is the rate at which information is transferred in a communication channel. In the serial port context, "9600 baud" means that the serial port is capable of transferring a maximum of 9600 bits per second.

MOSFET based controller unit



Flowchart of PWM

RESULTS

Table1.Power consumption of the system

Days	On time of the Appliances (hrs)		Energy Consumption (W/hrs)		Total Energy Saved (W/hrs)
	With Developed Hardware	Without Developed Hardware	With Developed Hardware	Without Developed Hardware	
Sun	7.92	11.00	950.4	1320.0	369.6
Mon	6.55	10.00	786.0	1200.0	414.0
Tues	7.15	10.25	858.0	1230.0	372.0
Wed	7.40	9.22	888.0	1106.4	218.4
Thurs	6.33	9.70	759.0	11.64.0	404.6
Fri	12.40	16.62	1488.0	1994.0	506.4
Sat	10.15	12.38	1218.0	1485.6	267.6

CONCLUSION

The proposed system utilizes multi sensors and wireless communication technology in order to control an LED light according to the user's state and the surroundings. The proposed system can autonomously adjust the minimum light intensity value to enhance both energy efficiency and user satisfaction. With the increasing cost of conventional energy, this system is an efficient means of saving energy. The power supply used, is from renewable source which

helps in reducing dependence on conventional electricity. Intelligent Energy Saving System is not limited for any particular application, it can be used anywhere in a process industries with little modifications in software coding according to the requirements.

REFERENCES

[1] Andreas Foglar, Halid Hrasnica, Maurice Draaijer, Nikolaos Mouratidis, Spyridon Tompros , "Enabling Applicability of Energy Saving Applications on the Appliances of the Home Environment", November/December 2009 , pg no.8-16

[2] Haesik Kim, Honggang Zhang, Kari Horneman, Tao Chen, Yang Yang," Network Energy Saving technologies for Green Wireless Access Networks", October 2011, pg no. 30-38.

[3] Jinsung Byun, Sehyun Park," Development of a Self-adapting Intelligent System for Building Energy Saving and Context-aware Smart Services", Vol. 57, no.1,February 2011, pg no.90-98.

[4] Jinsoo Han, Chang-Sic Choi, and Ilwoo Lee, "More Efficient Home Energy Management System Based on ZigBee Communication and Infrared Remote Controls",Vol.57, no.1, February 2011,pg. no. 85-89.

[5] Cagdas Atici, Tanir ozcelebi and Johan J. Lukkien, "Exploring User-Centered Intelligent Road Lighting Design A Road Map and Future Research Directions", Vol.57, no.2, February 2011, pg. no. 788-793.

[6] Fabio Leccese, "Remote-Control System of High Efficiency and Intelligent Street Lighting Using a ZigBee Network of Devices and Sensors", Vol.28, no.1, January 2013,pg. no.21-28.

[7] Meng-Shiuan Pan, Lun-Wu Yeh, Yen-Ann Chen, Yu-Hsuan Lin, and Yu-Chee Tseng, "A WSN-based Intelligent Light Control System Considering User Activities and Profiles", pg. no.1-12.

[8] Byoungjoo Lee, Gwanyeon Kim, Insung Hong, Sehyun Park, Yoonsik Uhm, " Design and Implementation of Power-aware LED Light Enabler with Location-aware Adaptive Middleware and Context-aware User Pattern", January 2010,pg no.231-239.

[9] Seung-Ho Hong, Tae-Jin Park,"Experimental Case Study of a BACnet-Based Lighting Control System", Vol. 6, no. 2, April 2009, pg no. 322-333.

[10] Aurora Gil-de-Castro and Antonio Moreno-Munoz, Francisco Domingo-Perez, Francisco Jose Bellido-Outeirino, Jose Maria Flores-Arias,"Building Lighting Automation through the Integration of DALI with Wireless Sensor Networks", 2012, pg no.47-52.

[11] Author Name: A. Schoofs, A. Guerrieri, A.G. Ruzzelli, G.M.P. O'Hare ," ANNOT: Automated Electricity Data Annotation Using Wireless Sensor Networks ", June, 2010.

[12] Ying-Wen Bai and Yi-Te Ku, "Automatic Room Light Intensity Detection and Control Using a Microprocessor and Light Sensors", Vol. 54, No. 3, August 2008, pg. no. 1173- 1176.

[13] R.A.Ramlee, M.H.Leong, R.S.S.Singh, M.M.Ismail, M.A.Othman, H.A.Sulaiman, M.H.Misran, M.A.Meor Said, "Bluetooth Remote Home Automation System Using Android Application", The International Journal of Engineering And Science,Vol. 2,no.1, 2013, pg. no. 149-153.

[14] Hayoung Oh, Hyokyung Bahn, and Ki-Joon Chae, "An Energy-Efficient Sensor Routing Scheme for Home Automation Networks", Vol. 51, No. 3, August 2005, pg. no.836- 839.

[15] Jinsoo Han, Haeryong Lee, and Kwang-Roh Park, "Remote-Controllable and Energy Saving Room Architecture based on ZigBee Communication", Vol. 55, No. 1, February 2009, pg. no.264-268.