International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 06, June-2019

Intensity Control of Electrical Load for Marathwada Institute of Technology

Aakansha Shankhala, Shweta Soni
I. G.. D. T. U. W. New Delhi

***Abstract*:- Now days, renewable energy sources are most widely used because they are present in abundance in the environment. As the nonrenewable energies are limited therefore we are using renewable energy which is widely preferred in the present scenario. For reducing energy consumption, automatic lights are used. The initial cost is high for installation but they give us more profit in future run. The objective of this paper is how we reduce the cost and energy utilization in MIT. For this objective we are switching from nonrenewable energy to the renewable energy source and also controlling intensity of the light so that it can be automated and will be used whenever required. For this we have to control the intensity of the light by controlling the voltage supplied to the light used in MIT which decrease the consumption of the light and in future it will help to reduce energy utilization. So, for this purpose we made a working model in which we showed that we can control light intensity of light used in the corridors. For this purpose we made the light intensity zero during day time and at night if there is any person detected then the light intensity will be full that is 100% and if not then the light intensity will decrease accordingly and after sometime it will turn off and in-between this process if any one crosses again from the corridors than again the light intensity will become full and the process will go on.**

Keywords: Arduino, light emitting diode, PIR Sensor, Solar Energy

INTRODUCTION

Sun is the most important source of the renewable energy present today. The sun has provided energy for all the living creatures on earth and it also provides a greater scope for growth and development. Solar energy is produced by the sun. Solar energy is free and does not compromise the environment[1].Two main types of solar energy systems are in use today: photovoltaic and thermal systems. There is a great deal of opportunity for using these systems in the present world, and ongoing works is seeking to improve the available technology and increase the utilization of solar energy systems in the world [2].Recent technological innovations have paved the way to the rebirth of lights through solar powered ones. Many users are switching to lights whose intensity can be control and can work on main supply as well as by using renewable sources of energy i.e., solar nowadays due to a number of reasons[3].After seeing that there is a lot of wastage of electricity in MIT at night due to the continues on of the light in corridors, we have experience that there is a need of system which will save electricity. We need to save or conserve energy because most of the energy sources we depend on, like coal and natural gas can't be replaced. Saving is very important, instead of using the power in unnecessary times it should be switched off. Most of the time we see light are on even after sunrise thus wasting lot of energy even the whole day lights are on in the corridors of our building when it is not required. Over here we are avoiding the problem by having an automatic system which turns on, off and controlling the intensity of light of the light when the ambient light falls below a specific intensity [2].The use of electric energy for lighting the lamps proved to be more costly and it utilized more amount of energy and hence our project deals with the same application with the use of solar energy which is the important renewable energy and is available in abundance in the world [3].We will use PIR sensor as the switch for the LED, the PIR sensor will go to high condition when detects infrared or motion from the environment. We are going to use relay also in our project for the adjustment of intensity of the light.The lights used in the MIT campus has a wattage of 40 watt per hour so if we consider at least 8 to 10 hours at night then the power consumption by per light will be 320 to 400 watt because it will be continuously ON for that much of time and if the one light is taking this much of consumption then we are having almost 23 light in the corridor of the ground floor of our campus then the power consumption will become 7360 to 9200 watt per day which is the total wastage of the power. Thus if we are switching to the lights whose light intensity can be control will be reduce the consumption of the power as compared to that as given above.If we are switching to the light whose intensity we are controlling then the power consumption will depend upon the person moving in the corridor. It the people moving in the corridor are more the people moving in the corridor then the power consumption is less. Thus that will become automatic on and off and the intensity will be also controlled.

In first section we wrote the introduction to our paper, in section 2 we tell about the components used in our project, working principle, block diagram, flow chart and software details. In section 3 we show the performance analysis and at last conclusion and the future scope.

SYSTEM MODELING

Components Used

The components used in our project are as given below:-

1.Passive Infrared Sensor:- HC-SR501 is based on infrared technology,automatic control module,high sensitivity,high reliability, ultra-low voltage operating mode, widely used in various auto-sensing electrical equipment's, especially for battery powered automatic controlled product.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 06, June-2019

Fig.1 Circuit of PIR Sensor

Automatically sensing light for floor, bathroom, basement, etc. where these can be used. It is having in built comparator so there is no requirement of connecting external comparators to the circuit.

Fig.2 PIR Sensor

It is having features like automatic detecting in which output will be high when object enters the sensing range, and automatically turns to low when object leave. Photosensitive control can be set.

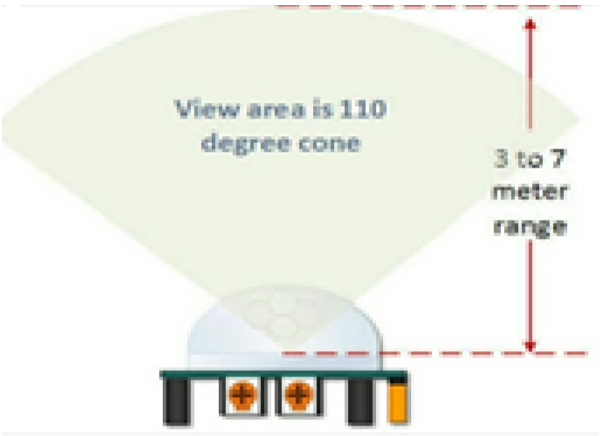

Fig.3 Area covered by PIR Sensor

Temperature compensation in the summer when the ambient temperature rises to 30 to 32 degree Celsius the detection distance is slightly shorter, temperature compensation can be used for performance compensation.

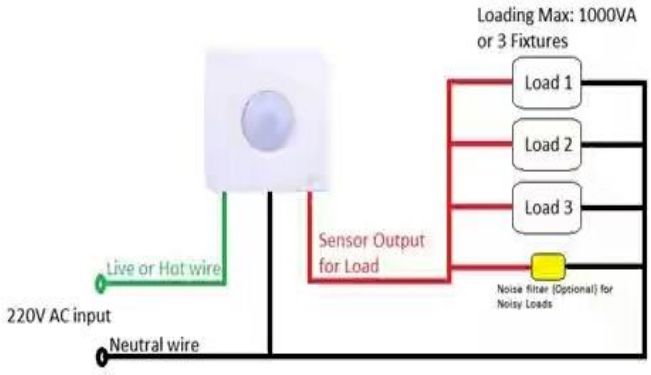

Fig.4 PIR Sensor Working

It is having two working mode that is, non-repeatabletrigger/delay mode(set to low): the sensor will turn to low after the delay, even the sensing object is still in range.

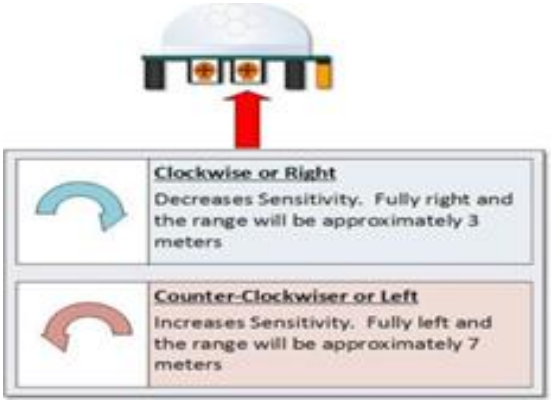

Fig.5 Non Repeatable trigger of PIR Sensor

Repeatable trigger (sett to high): the sensor will not turn to low if the objects still stay in sensing range in the delay time. It is having wide operating voltage range.

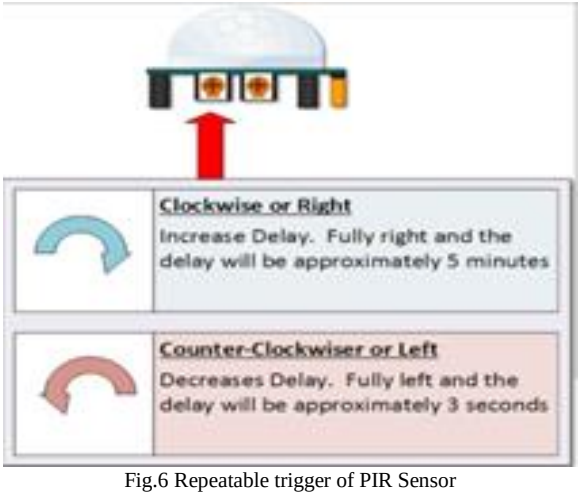

Fig.6 Repeatable trigger of PIR Sensor

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 06, June-2019

Working Principle of PIR sensor is that it is having element made of crystalline material that generates an electric charge when exposed to infrared radiation. The changes in the amount of infrared striking the element changes the voltage generated which are measured by an on-board amplifier. The device contains a special filter called Fresnel lenses, which focuses the infrared signals onto the elements. As the ambient infrared signals changes rapidly the on-board amplifier trips the output to indicate motion.
It has a range of approximately 20 feet;this can vary with environmental conditions. It requires a warm up time in order to function properly. This can be possible because there is a learning environment present around. This could be anywhere from 10-60 seconds. During this time there should be as little motion as possible in the sensor field of view.

2.Arduino: Arduinohas 14 digital input/output pins, 6 analog input pins, 19 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller, connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

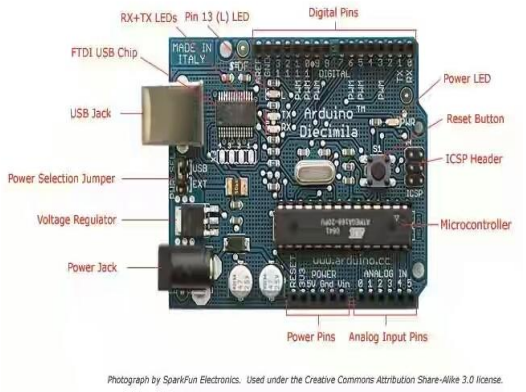

Fig.7Arduino

It is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a 16 megahertz quartz crystal, A USB connection, A power jack, and ICSP header and a reset button.

3.Light Dependent Resistor: A light dependent resistor(LDR) or a photo resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive device. They are also called as photoconductors. Its working principle depends on photo conductivity.

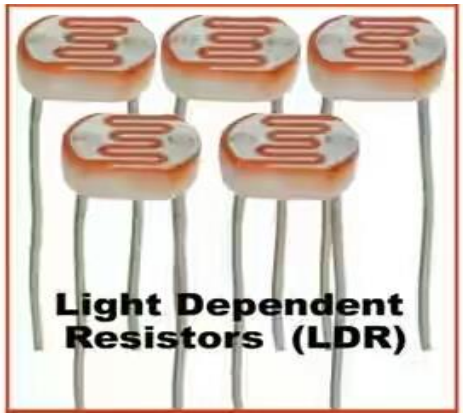

Fig.8 LDR

4.Relay Driver:-Relays are components that permit a low-power circuit to control signal or to switch high current ON and OFF which should be electrically isolated from controlling circuit.Driven circuit is used to boost or amplify signals from microcontroller to control power switches in semiconductor devices.

Fig.9 Relay Driver

The ULN2003 series are high-voltage, high-current Darlington drivers comprised of seven NPN Darlington pairs. All unit features integral clamp diodes for switching inductive loads. It is having application in relay, lamp and display drivers.Darlington pair is a compound structure consisting of two bipolar transistor connected in such a way that the current amplified by the first transistor is amplified further by second one. This configuration gives much higher current gain then each transistor taken separately.

5.Light Emitting Diode:-A light emitting diode is a two lead semiconductor light source. It is a p-n junction diode, which emit light when activated. Here, in our project we are using LEDs for the lighting because of the following reason. Although most people think of LEDs as indicator lighting, there are types of LEDs specifically designed for general illumination applications.
As the technology has become more robust, reliable and efficient, LED lighting has become more commonplace in everyday life. When LEDs are properly integrated into a light fixture, or luminaire, the illumination should achieve over 80 lumens per watt of efficiency (7x more efficient

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 06, June-2019

than a light bulb) and a life of over 60,000 hours (> 12 years).
The reason for using LED lies in the basic physics of the device. LEDs:
Emit light in a controlled directional way,
Emit light efficiently and
Have extremely long life when properly engineered into a luminaire
Although LEDs are not right for every lighting challenge, in solar lighting LEDs provide excellent efficacy (light efficiency measured in lumens/Watt) and allow the use of precision optics to direct light in precise, repeatable patterns to maximize pole spacing.

Working Principle
The Working Principle of Solar Light is very simple. Photo voltaic solar cells convert the radiation of sun light into electrical energy. This process of energy conversion is generally called the "Photo voltaic effect". It is also known as solar cells, or "photo voltaic cells." With the help of photo voltaic solar cells made of the principle effect of solar panels during the day. The received electrical energy stored in batteries. At night when the illumination reduced then Solar cells board open the circuit voltage. To know the value of voltages charge and discharge method is used.Charge and discharge controllers are generally used to protect the battery[8]
We are using the principle of light intensity control in our project if there is someone present in the corridor of MIT then the light intensity will become 100% and if there is no one then the intensity will reduce 20-20% after sometime and then it will be turn off that is the intensity will become 0% and if any one between this process again comes in the area of PIR sensor then the intensity will be again 100%. So by this we can reduce the consumption of the power in MIT. This is basically we are going to do for night when there are not many peoples but still for some peoples we have to switch ON the light whole night which increases the consumption of the power therefore mainly to reduce the power consumption during night we are making this project.

The Advantages of Solar Lights are:
Solar lights are independent of the utility grid resulting to lessened operation costs. These means that these are wireless lights and are not connected to electricity provider. The lights are dependent of the heat energy given off by the sun, storing as much of it throughout the day.
Solar lights require lesser maintenance than conventional lights. These have lower chances of overheating.
Since solar wires do not have external wires, the risk of accidents is minimized. A lot of times, accidents happen to the personnel who fixes the light.
Solar lights are environment-friendly because its panels are solely dependent to the sun hence eliminating your carbon footprints contribution.
Some parts of solar lighting systems can beeasily carried to remote areas making these more efficient and handy solutions tolighting problems.

The disadvantages of Solar Lights are:
1. Solar lights require higher initial investment compared to conventional lights. This is actually the main reason why most people are having second thoughts about switching to solar lights. They consider the money they are required to spend without realizing the long-term benefits and the longer life cycle of solar street lights. Because these are non-wired, these can easily be stolen[14].
2. The risk for theft is relatively higher because it has higher monetary value compared to regular street lights.
3. Snow or dust, and moisture can accumulate on horizontal PV-panels. This leads to reduced or full stoppage of energy production[13].
4. Rechargeable batteries must be replaced a few times within the lifetime of the fixtures. Just like other components, rechargeable batteries also get exhausted that is why you must include replacing them as part of your maintenance cost [12].

PERFORMANCE ANALYSIS

Comparison between Conventional Method and Light Intensity Control Method
The ground floor of the MIT building there are 23 lights used in the corridor and each light consumes 40 watt per hour. Basically we are doing this project to give the working model of our idea to MIT so that they can implement it in future to consume less power as compared to the present scenario.
If there is some work in MIT or some function at night then we have to switch ON all the lights whether there may be someone or not. Which will affects the power consumption as well as the electricity bill too. In our project we are controlling the intensity of the light so that it will be in use whenever there is the requirement of the light or otherwise it will be off thus saving the power consumption too.
In our project the main aim is to control the intensity if there is someone present then the intensity will become 100% and after that it will decrease 20-20% as given in the program and after sometime it will be off and if some other person will come between this process then the intensity of the light will again become 100%. As this will compared to conventional one if there is someone present in the corridor or not we have to make the lights on continuously. Thus, which is increasing the power consumption of the electricity but if we imply our project in MIT then the consumption might be decrease in future.
We are using LDR also for sensing the day and night because it is not required to turn on the lights in day but still many times by mistake this happens that even there is no requirement of the lights at day time but the lights are on consuming the electricity. Thus by this we can also control this power consumption also so that the wastage of electricity can be decrease. Even this intensity control we can implement in classes also but the problem in the class is that we have to increase the time of intensity control there and it will also sense the light present in the environment.
Lighting is a vital part of any building. Proper lighting enhances the beauty of the room, interior spaces and

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 06, June-2019

provides illumination for tasks and activities .at the same time electricity is becoming more expensive while its consumption is getting higher. In order to reduce electric consumption in commercial building, an effective lighting system is necessary. Smart lighting contributes major of electrical energy consumption worldwide. People often forget to turn off the light in their house when they go out so the room is lit even when there is no need for it. Sometimes the lights continue to be on until the room is already illuminated by natural light. Consumer often unnoticed the energy that is wasted by letting this happen. Besides, this act also leads to increase in electrical bill. There is also a problem of the use of excessive amounts of light. So there is need of smart lighting system, that uses the day lighting of the room and an automatic occupancy system to shut-off when nobody in the room. In this paper, it is proposed to provide comprehensive survey on technologies for smart lighting system to reduce energy consumption.

Advantages and Applications of This Project over Conventional System

Human Motion Tracking: Smart lighting controls the system based on human motion tracking. Proper illumination and color temperature depend on human activities. indoorThe activity modes such as study mode and watching TV mode were estimated and the illumination and color temperature of the LED lighting system were controlled in real time according to the estimated activity.

Smart City: There is a growing demand for energy efficient solutions in different areas. The improvement of the quality of service and the reduction of resource waste is the goal of new solutions. Smart city needs technologies like street lighting system which reduces the consumption of energy and supports the economic growth of city leads to economic growth of country.

Enhancing Sleep Quality With The Blue Spectrum Light: Using smart lighting system color of light can be controlled. Studies of human circadian rhythm imply that the blue spectrum of visible light is good for human.

Energy Efficiency: Saving energy using need-based lighting management in homes and offices: By collecting and identifying real time data about occupants, incident sunlight and light-field sensing, Smart lighting system can optimize the required light output in both day and night. By maximizing light usage in the appropriate places expected energy savings are between 40-70% higher than simply adopting CFL bulbs.

Smart Grid Control: The smart grid is a modernized electrical grid that uses information and communications technology to gather and act on information, such as the behaviors of suppliers and consumers, in an automated fashion to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity.

CONCLUSION

By using this project we are controlling intensity of light. We are using renewable energywhich is ecofriendly and pollution free. As this project has initial cost high but it gives long term profit. Aswe are using solar energy that is present in abundance and economical. Now days, Renewable energy sources are most widely used because they are present in abundance in the environment. As the non-renewable energy are limited therefore, we are using renewable energy which is widely preferred in the present scenario. For reducing energy consumption, automatic street lights are used. The initial cost is high for installation but they give us more profit in future run. The objective of this project is to reduce the cost and energy utilization. For that objective we are switching from non-renewable energy to renewable energy sources. For this we have to control the intensity of the light by controlling the voltage supplied to light which will decrease the consumption of light and in future it will help to reduce energy utilization.

In this project we are controlling intensity of light in MIT corridors which will reduce the power consumption in our building and which will be helpful to us in long run. It will be helpful to reduce the consumption of electricity during night where the people are not that much present compared to day time. Thus for that reason this project will be helpful. As we are also concentrating on solar thus it is renewable as well as ecofriendly as there is the provision of solar already in our campus it will be beneficial to that also and the electricity bill will be reduced if we are changing the conventional lights with this intensity control one. We will provide a working model for this light intensity control which we will submit to MIT and after that if they will like that idea then they will approve that idea which will be implemented after that in MIT.

FUTURE SCOPE

As non-renewable sources are limited and we know that they are demising at a faster rate so now at present we are switching to renewable sources. We are using Arduinouno in our project which is cheap and reprogrammable we can easily change our burn program according to our need. We are using PIR Sensors instead of IR Sensors because PIR Sensors have so many advantages like It is good source of saving energy.It responds aptly to human motion and can get adjusted to body temperature.We can also adjust it according to the outside changing temperature.Spotlight of IR light is possible because of lenses present in PIR sensor.Evaluation of moving object becomes easy due to intensity of infrared lights.We can make use of these detectors in equipment as well as appliances. The main advantage of PIR sensor is that it saves our energy bill.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 06, June-2019

REFERENCES

[1] Mr. AmeyJ.Manekar, Dr. Dr. R .V. Kshirsagar"Design and Implementation of Automatic Street Light Controller for Energy using FPGA" International Journal of Advanced Research in Computer and Communication Engineering-2011.

[2] Shilpashree R N, Shruthi H O, Smitha S, Veenashree C N, Arpitha Shankar S I " GSM BASED AUTOMATION OF STREET LIGHT" IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 1 Issue 3, May 2014.

[3] Dr.D.V.PushpaLatha "PLC based smart street light controlling using LDR" International Journal of Latest Trends in Engineering and Technology (IJLTET)2010

[4] Brinda.N, Thamaraimanalan.T, Nivethitha.T " Designing An Intelligent Street Lighting system using a Zigbee Network" International Journal of Emerging Technologies in Computational and Applied Sciences (IJETCAS)2011

[5] Alzubaidi, S.; Soori, P.K., "Study on energy efficient street lighting system design," Power Engineering and Optimization Conference(PEDCO) Melaka, Malaysia, 2012 Ieee International , vol., no.,pp.291,295, 6-7 June 2012.

[6] Denardin, G.W.; Barriquello, C.H.; Campos, A.; Pinto, R.A.;Dalla Costa, M.A.; do Prado, R.N.; , "Control network for modern street lighting systems," Industrial Electronics (ISIE), 2011 IEEE International Symposium on , vol., no., pp.1282-1289, 27-30 June 2011.

[7] Chunguo Jing; LiangchaoRen; DeyingGu; , "Geographical routing for WSN of street lighting monitoring and control system," Computer Design and Applications (ICCDA), 2010 International Conference on, vol.3, no., pp.V3-235-V3-238, 25-27 June 2010.

[8] Long, X.; Liao, R.; Zhou, J. , "Development of street lighting system-based novel high-brightness LED modules," Optoelectronics, IET , vol.3, no.1, pp.40-46, February 2009.

[9] Xingming Long; Jing Zhou; , "An intelligent driver for Light Emitting Diode Street Lighting," Automation Congress, 2008. WAC 2008.World , vol., no., pp.1-5, Sept. 28 2008-Oct. 2 2008

[10] MihirRanjanAcharya, MadhusmitaPriyardahni, S K Sabir , Udaya Kumar Sahoo "Automatic street light control using solar energy" IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 10, Issue 2, Ver. III -Mar - Apr.2015.

[11] "Energy Saving Using LED Automatic Street Light Control System" ,Mitsu Shah1, Charmi Shah2, Hardik Shah3, Riddhi Shah4,J. M. Rathod5 T. D. Pawar6, V. N. Kamat7 .IJREAT International Journal of Research in Engineering & Advanced Technology, Volume 2, Issue 2, Apr-May, 2014

[12] "Street Light Glow On Detecting Vechile Movement Using Sensor" ,S. Suganya1, R. Sinduja2, T. Sowmiya3 & S. Senthilkumar4, International Journal For Advance Research In Engineering And Technology, ISSN 2320-6802, ICIRET-2014

[13] "Electronic Devices and Circuit Theory", Robert Boylestad& Louis Nashelsky.10th Edition. Publication prentice hall in 2005

[14] "Solar at a Glance",Secondary Energy Infobook, Page:40-43 - 2008