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SOLAR POWERED LED LAMP WITH AUTO-INTENSITY CONTROL

Authors Name- Ms. Vanashree Khapre[1], Ms. Shivani Ganer[2], Ms. Priyanka Sadmake[3], Mr. Sagar Khade[4], Mr. Shubham Dhengre[5], Prof. S. K. Mude[6]

[1,2,3,4,5,6]*Department of Electrical Engineering, K. D. K. College of Engineering, Nagpur, India*

Abstract - *The project is based on LED Lamp with auto intensity control using solar power from photovoltaic solar module. Photovoltaic panel is used for charging the battery by converting the sunlight into electricity. A charge controller circuit is used to control the charging and preventing the battery from being overcharged or undercharged. The electricity generated from the sunlight is stored in a rechargeable Battery during the day time. This stored electricity is used after the dusk to light up the LED based Solar Lamp. The Light intensity of the Lamp is controlled by processing the state of charge of the battery. This project can be implemented in the rural area , household , Office Premises , Buildings for Outdoor security purpose. Taking the current energy crises into consideration, this project can be useful for a sustainable future.*

***Key Words*: Solar Energy, Smart system, LED, Battery, Sensors.**

1. INTRODUCTION

This paper proposes the energy efficient and Auto-intensity control of a smart solar lamp. This smart solar lamp is a lamp which is used in our day to day life efficiently utilizing both the power sources A.C. and Solar energy on the basis of requirement. It contains a photovoltaic solar panel, an A.C source, LED lights, a PIR motion detector, an LDR light detector and a rechargeable battery.

This system is smart enough to charge the battery either by solar energy or by ac mains. If the solar energy is adequate then it will charge from there otherwise if the weather is cloudy or solar energy is not properly available then it will charge through ac mains.

Solar lamps are used for generally illumination where centrally generated power is not conveniently or economically available. In this research we choose solar energy which is photovoltaic cell system, an ideal for providing electrical power.

It is also provided with sensors. They are there for the smart action of the lamp. It has a PIR sensor that will detect the motion in its vicinity and an LDR sensor to check the light intensity of the surrounding. Also, another add-on feature is of burglar alarm which is provided for safety purpose. The main purpose behind it is to provide security in the form such that if the conductors are touched then the speaker will produce sound.

Comfort and safety are one of the biggest requirements in our life. But many systems fail to provide such and making it is a big challenge because of need to make many controlling systems which can run in same time. We have tried to create automation in lighting for this purpose. One of the biggest advantages of solar energy is non-polluting. Other various advantages are noise free and ecofriendly. It does not harm the natural resources and very cheap for long term usage. The main aim of this research is how we can get maximum usage and storage of this energy for further usage.

2. OBJECTIVES

1. Improve the quality of life and off grid areas by providing the light, entertainment, and communication through affordable and reliable source of energy-Solar.

2. To design automatically operated lamp which doesn't require any manual help.
3. Increase productivity, promote use of Portable and inexpensive lamp.
4. Apply solar energy technology as the enabling technology for sustainable development.

3. HARDWARE IMPLEMENTATON

The following figure shows the flowchart of the algorithm which we designed for the lamp to follow. There are various conditions given in the algorithm which when fulfilled will result in turning ON of the lamp.

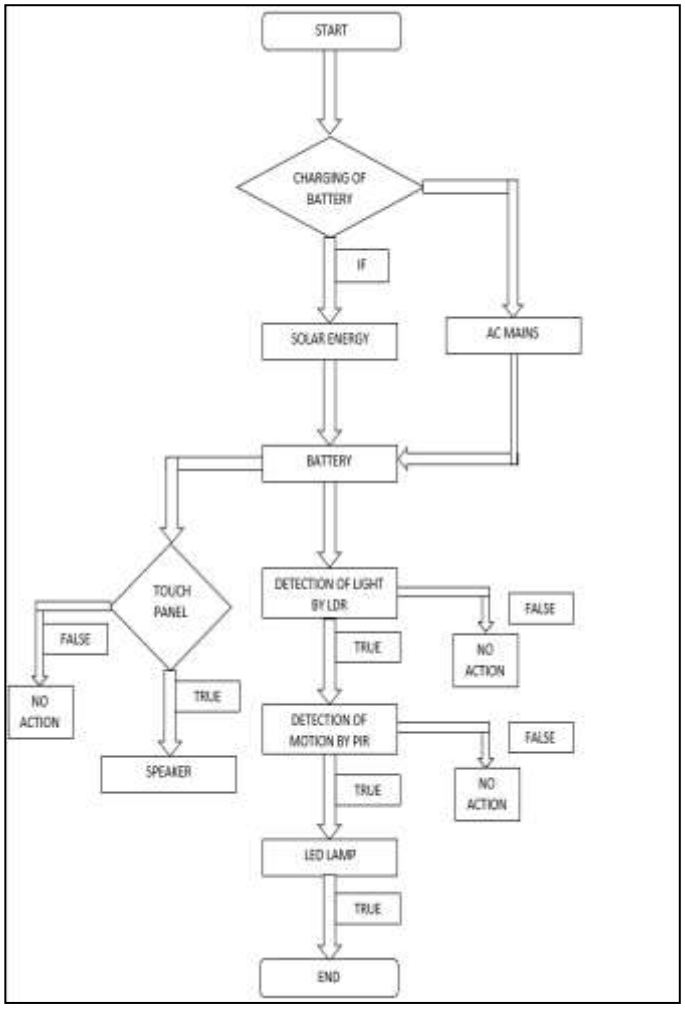

Fig -1: Flow Chart

Starting with the charging process, the battery is to be charged mainly by the solar energy only. In case if adequate solar power isn't available then only it will switch to ac supply.

Now the next step to follow is the main circuitry of the lamp. First the light sensor will come in action and check light intensity. If the light intensity is low then it will give a high signal to the motion sensor to detect any of the motion taking place in the surrounding. On successful detection of motion then further a high signal is given to LED lamp to turn ON.

Also, the circuitry of burglar alarm is also charged by the same battery. The conductors are left open, however when somebody touches it then circuit will be closed and a high signal is sent to speaker to blow the sound.

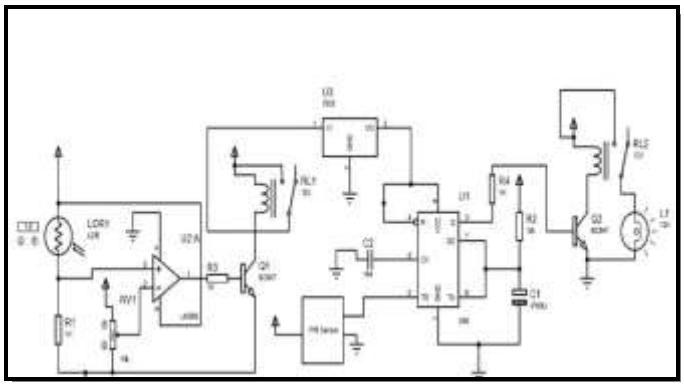

Fig -2: Circuit Diagram to Turn-On Solar Lamp

The above circuit diagram is mounted on PCB. In above diagram, LM 358 IC is used as a comparator. The LDR is connected in series with resistance R1. The LDR and R1 used as voltage divider. When the light intensity decreases, the voltage drop across LDR also decreases. The non-inverting pin of Op-Amp is connected to LDR. The inverting pin of Op-Amp is connected to potentiometer. The potentiometer is used to set the voltage of comparator. When the intensity of light decreases, the output of the Op-Amp is set to high and accordingly the relay is set on and connect the next stage for performance. The next stage is performance of human sensor detection system. In this system, PIR sensor is used to detect the human presence, if the human presence is detected, then at that time the mono-stable multivibrator will set the relay ON for some time. When the humanbeing is present then at that time the LED light will turn ON, and when there is no human in the area then light will automatically turn OFF. Relay is driven through transistor BC547, the relay is used for connecting LED lamp on battery.

3.1 WORKING PRINCIPLE

The working principle of solar lamp is it has a panel mounted in a particular arrangement at an in such a way that it can receive solar radiation with high intensity easily from the sun. The solar panel turns solar energy into electrical energy. This electrical energy is stored in batteries by using a solar charging circuit. The main function of solar charger is to increase the current from the panel while batteries are charging, It also disconnects the solar panel from the batteries when they are fully charged and also connect to the panel when the charging in batteries is low.

From battery the supply (12V) is passed to the LDR (Light Dependent Resistor) which will sense the intensity of the surrounding light. As we want that the light should turn ON only when the intensity of light is too low i.e. dark. Thus, the LDR will sense the intensity of light and pass the signal to the PIR (Passive Infrared Sensor) when there is darkness. The PIR sensor will sense the motion within its range and thus turn ON the lights for a while (10-20 sec) and gets turn OFF, if there is presence of any motion in its range it turns ON again and if not then it will remain OFF.

Also supply from the battery given to the burglar alarm circuit. From the burglar alarm circuit two wires are drawn which is to be joint to the ends of the any conductor separated apart from each other. As soon as someone touches both the conductor the circuit gets completed, and alarm starts.

ADVANTAGES

1. Intelligent control and maintenance-
   Solar lighting system are controlled by built-in intelligence which requires no manual operation, making them safe and economical. The whole construction process is simple and time-saving, while maintenance is infrequent and easy.
2. Reduced Electricity Bill-
   As this works on solar the cost of electricity is reduce, this completely removes the cocern of cable connection, while there is no cable to steal.
3. Easy installation-
   Outdoor lamps are easy to install, it is popular home uses wall mounted lamp, in courtyard, garden and security lights.

APPLICATIONS

1. Outdoor security purpose-
   Solar powered security lights are illuminated by solar energy which is converted into electric energy. As a result, these are a practical choice for security purpose, as without electricity they can operate at night because sun provided needed energy during the day. These light automatically turn-on when it senses any motion.
2. Industrial and Commercial premises-
   Industrial areas are bigger in size therefore they take large amount of electricity for outdoor lighting. While installing these solar lamp, the cost will reduce and also works for security purpose by motion sensing during night.
3. For Garden or park-
   This lamps are independent of grid so they can be installed anywhere in the park, these provide safety for officials in order to secure the area during night.

CONCLUSION

This paper is intended to design a simple and low-cost multitasking hybrid solar lamp with a motion and light detector. This solar lamp is having an additional feature of charging by AC mains supply if proper solar energy is not available are main aim is to design a system such that it provides better lightning in night and provide safety to nearby area. The design has more scope for future research and development. Though it is a paper, we hope some modification will lead to wide variety of usage.

REFERENCES

[1] Prabhat Ranjan, Shubham Kumar, Sujit Kumar, Prof. P. R. Naregalkar, "Smart Solar Emergency Lamp with Motion Detector", 5th May 2016.

[2] Burhanuddin Bharmal, Aniruddha Shahapurkar, Akshay Aswalkar, "Automatic Home Lightning solutions using Human detection, Sunlight Intensity and Room Temperature", 6th June 2017.

[3] G. D. Rai, "Non-Conventional Energy Sources"

[4] Vismita Kolvekar, Valerie Vaz, Fatima Shaikh, Jyoti Kumari, Michelle Araujo E. Viegas, "IJSR-International Journal for Scientific Research & Development|Vol. 4, Issue 11, 2017| ISSN (online): 2321-0613

[5] Suhil Kiwan, Anwar Abo Mosali, Adnan Al-Ghasem, "Smart Solar-Powered LED Outdoor Lightning System Based on the Energy Storage Level in Batteries", 31st August 2018.

[6] Mahesh kumar Bhairi, Manohar Edake, Shubhangi Kangle, Bhaskar Madgundi, V. B. Bhosale, "Design & Implementation of Smart Solar LED street light.

[7] Shivani Ganer, Priyanka Sadmake, Vanashree Khapre,"Smart Solar Lamp with Auto Turn-ON Mechanism", IJSREM volume:4 Issue:03 March 2020 |ISSN:2582-3930.