

Solar Highway Lighting System with Auto Turn Off On Day Time with LCD Display

Divya pujar, Jyothika.P, Anupama Naik, Mahant.G.Kattimani

Abstract— This paper is based on the idea of maintaining maximum utilization and minimum loss of available energy. Sun is the source of all energy on the earth. It is most abundant, inexhaustible and universal source of energy. All other sources of energy draw their strength from the sun. India is blessed with plenty of solar energy because most parts of the country receive bright sunshine throughout the year except a brief monsoon period so this paper is based on solar highway light system. If any of the light is fault message sent to authorized person as well non working solar. To avoid accident intelligent system is implemented high beam and low beam. Power saving is the essential now a days, so to avoid wastage of power intelligent lighting system is implemented, when vehicle is present it will work with 100% intensity rest of the time 50%. Solar energy is used for this application so solar tracking is implemented to track sun and store energy during day time.

Index Terms— PV module, LM317, intelligent Street light, LDR (Light depending Resistor), IR Sensor (Infra red Sensor)

I. INTRODUCTION

Energy is vital input for sustainable development and economic growth for any country. Electrical energy is considered a most convenient form of energy sources in rural and urban areas. The main sources of power generation today are fossil fuels and nuclear reactors. These are depletable, non-renewable and pollute the environment. Moreover, the exploration of these resources is expensive. Hydro energy is also used, but it does not produce adequate and consistent power for the nation's consumption (Adu and Bolaji, 2004). In many parts of the world there is growing awareness that renewable energy has an important role to play in the provision of social amenities such as potable water and electricity. Among the various types of renewable energy, special attention has been given to solar energy because it is freely available. The gradually growing requirement of energy and the limited resource of traditional energy sources has become a challenge for both developed and developing countries. For this reason, in policy makers' agenda, energy efficiency and sustainability are given the first priority for any project to be installed. Solar street lighting system is an effective way to reduce power consumption and CO₂ impact on the environment with the maintenance of the safety standards of the road. Electric street lighting consumes 114 TW h annually, leading to the emission of 69 million tones of CO₂ [1]. By PV (Photovoltaic) effect the solar radiation can

be directly converted into electrical energy. This energy is stored in a rechargeable battery and supplied to the luminary when it is required to glow. The system is designed to provide an automatic control facility. This control may be of three types. First one is optical control method, by using light/dark sensor the street lights can be automatically turn "ON" in the evening after dark, turn "OFF" automatically after dawn in the morning, but the night street lighting is too bright and also a wastage of energy [2]. Second one is time control method, in which the light will be glow time to time automatically as per the adjustment [3] and the third one is time-optical control, in The solar street light has been designed after too much research work. Its uniqueness and best features can make it the most preferable choice in rural area. With gradual development in this research, new features are being added to increase the efficiency. The proposed model may be considered as the third generation of street light which is also known as intelligent street light. The intelligent street light control system uses the latest international intelligent street light energy-saving control technology [5]. The main aim behind the research of designing the system is to find a way for maximum utilization of available energy with minimum wastage or loss.

A clear visibility of the road ahead is significant concern for safe night time driving. However, high beams are utilized less than sufficient on the roads since drivers are afraid of dazzling others. Subsequently, the smart programmed control of vehicles front lamp is of incredible significance. According to road accident surveys, majority of the accidents occur in dark. Visibility in dark is significant issue for safe driving. Therefore careless drivers continue using a high beam even though approaching vehicle is observed. These high beams create glare for approaching drivers which then causes temporary blindness. To solve this problem, night time vehicle detection has a great importance. This project reviews various attempts made to solve the problem, Conventional street lighting systems in areas with a low frequency of passersby are online most of the night without purpose. The consequence is that a large amount of power is wasted meaninglessly. With the broad availability of flexible-lighting technology like light-emitting diode lamps and everywhere available wireless internet connection, fast reacting, reliably operating, and power-conserving street lighting systems become reality. The purpose of this work is to describe the Intelligent Street Lighting (ISL) system, a first approach to accomplish the demand for flexible public lighting systems.

II. METHODOLOGY

Solar based charging

SOLAR PANEL

Solar panels are devices that convert light into electricity.. Some scientists call them photovoltaic which means, basically, "light-electricity."

Manuscript received August 14, 2020

Divya pujar, EEE Dept, TCE Gadag, Karnataka, India

Jyothika.P, EEE Dept, TCE Gadag, Karnataka, India

Anupama Naik, EEE Dept, TCE Gadag, Karnataka, India

Mahant.G.Kattimani, Prof, EEE Dept, TCE Gadag, Karnataka, India

Solar Highway Lighting System with Auto Turn Off On Day Time with LCD Display

A solar panel is a collection of solar cells Lots of small solar cells spread over a large area can work together to provide enough power to be useful. The more light that hits a cell, the more electricity it produces

SOLAR CONTROL CIRCUIT

solar control circuit controls the variation(fluctuation) in the voltage level and it will give constant voltage to charger and lights & fan.

REGULATOR

Regulator is an electronic circuit whose function is to keep output always constant though the input is varied. The o/p of regulator IC is fed to the USB female pin in order to charge the battery with the help of data cable.

CHARGE CONTROLLER

A solar charge controller regulates the voltage and current coming from your solar panels which is placed between a solar panel and a battery .It is used to maintain the proper charging voltage on the batteries. As the input voltage from the solar panel rises, the charge controller regulates the charge to the batteries preventing any over charging.

BATTERY

In a solar system, batteries are required energy storage medium. The solar insolation not available during the night or cloudy skies hence PV power not possible. Lead-acid batteries which is most popular in the PV system on account of low cost and simple charging process.

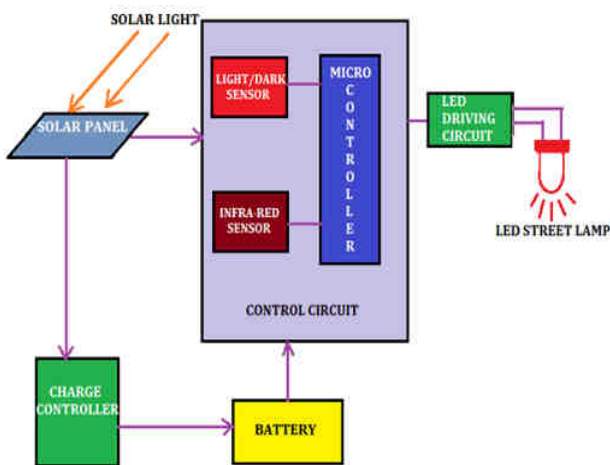


Fig 1. Block Diagram of Auto intensity and control Solar highway.

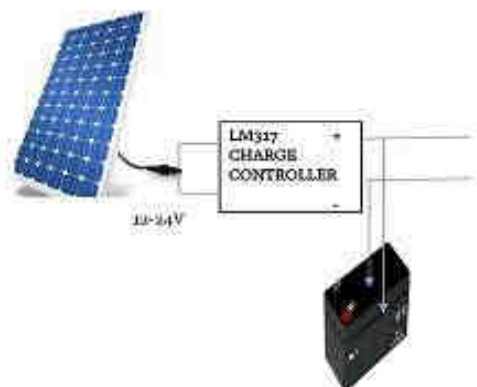


Fig 2: Block diagram of solar based charging.

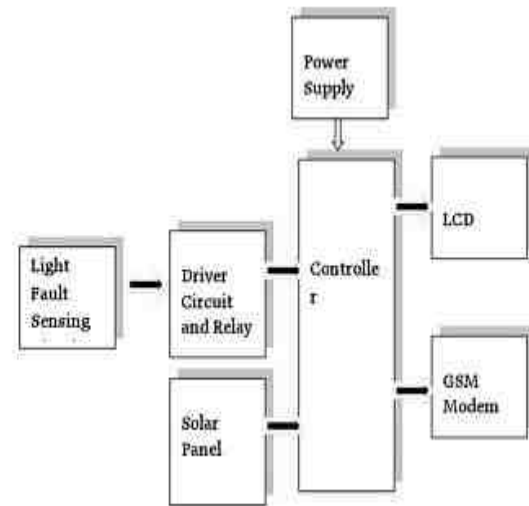


Fig 3: Block Diagram Solar & Light Fault Detection

Light sensing used to detect light fault, using LDR circuit is used for light fault detection, during night time lights will on , light will fall on LDR circuit, if light is of during night LDR circuit sense it and send signal to controller to send message to concern person using GSM modem.

DRIVER CIRCUIT:

As we know the output of microcontroller circuit is 5V, which cannot drive the relay or loads .So the driver circuit is used to increase the signal. A driver circuit comprises of Darlington amplifier or signal transistor, which increases the DC level to a required value say 9V/12V. This 9V/12V is much more enough to operate the different loads connected to the circuit.

RELAY:

Relay is one of the most important electro-mechanical devices highly used in industrial applications specifically in automation. A relay is used for electronic to electrical interfacing i.e. it is used to switch on or off electrical circuits operating at high AC voltage using a low DC control voltage. A relay generally has two parts, a coil which operates at the rated DC voltage and a mechanically movable switch. The electronic and electrical circuits are electrically isolated but magnetically connected to each other, hence the appliance controlled depend on user message.

The 230 volt AC supply is given to the step down transformer because Atmel 89c51 microcontroller support to 5 volt only. After that AC voltage is converted in to DC voltage by using rectifier. Then fixed DC voltage

MICROCONTROLLER UNIT

Microcontroller is the heart of this project it controls the working according to the program that means microcontroller sends appropriate pulses /signals to driver circuit.

LCD

(Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable;

have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

GSM MODULE

For sending message, a GSM Module named SIMCOM_300 with RS232, power supply, buzzer and audio interface are used. This can be connected to PC by using a USB to Serial Adaptor. Terminal programs such as Real term are used to send & receive data. The interface between GSM

Module and microcontroller can also be done directly with the help of wires.

GSM Module works with AT COMMANDS where AT stands for Application Terminal.

Some useful AT Commands are:

1. AT
2. AT+CMGS
3. AT+CMGR
4. AT+CMGD
5. AT+CSQ?

And so on.

With help of GSM modem the sms is transmitted. For sending message, a GSM Module named SIMCOM_300 with RS232, power supply, buzzer and audio interface are used. This can be connected to PC by using a USB to Serial Adaptor. Terminal programs such as Real term are used to send & receive data. The interface between GSM .Module and microcontroller can also be done directly with the help of wires

APPLICATIONS

1. It can used in industries,
2. It can be used in Domestic purpose,
3. It can be used in agriculture
4. It can be used for street lights
5. Rural vacation homes
6. Solar energy based battery charge.
7. Light fault monitoring and message sending.
8. Power saver using 50 & 100% intensity.
9. Solar Tracking.

ADVANTAGES

1. Solar panel life span is more
2. solar power reduces pollution and global warming
3. Solar is of free source available every where
4. Affordable and Efficient
5. It saves the man power.
6. Saves life.
7. Power saver.
8. efficiency

DISADVANTAGES

1. Night time it won't work

CONCLUSION

This paper 'SOLAR POWERED LCD LIGHT WITH AUTO INTENSITY CONTROL' is a cost effective, practical, eco-friendly and the safest way to save energy. It clearly tackles the two problems that world is facing today, saving of energy and also disposal of incandescent lamps, very efficiently. According to statistical data we can save more that 40 % of electrical energy that is now consumed by the highways In developing counties the major part of the geographical area is to be explored in terms of road connectivity. So instead of implementing the higher targets roads to be developed per day such countries can reduce the target and develop solar road so they could improve economy with infrastructure. Generally the Solar Highways will:-

1. Create an intelligent, secure highway infrastructure that pays for itself.
2. Create an intelligent, secure, decentralized, self-healing power grid.
3. Eliminate the need for coal-fired or nuclear power plants.
4. End our dependency on oil and other fossil fuels (oil, coal and natural gas).
5. Cut our nation's greenhouse gas emissions by over 50%.
6. Provide safer driving conditions.
7. Snow & ice management
8. Traffic management
9. Wild life protection
10. National security
11. Usage of recycled material "Let's make things to happen rather than waiting things to happen" "It's better late than never" "Let's go greener"

ACKNOWLEDGMENT

The satisfaction of the successful completion of any task would be incomplete without the expression of gratitude to the people who have made it possible. We acknowledge and would like to take this opportunity to thank beloved Guide M. G.Kattimani, Assistant professor Department of Electrical and Electronics Engineering, TCE Gadag, Karnataka, India.

REFERENCES

- [1] Abhishek Jivrag, 2Vinayak Chawre, 3Aditya Bhagwat, Solar Operated Multiple Granulated Pesticide Duster WCE 2011, July 6 - 8, 2011, London, U.K, Vol. III. ISBN: 978-988-19251-5-2.
- [2] R.JOSHUA, V.VASU & P.VINCENT, Solar Sprayer-An Agriculture Implement, International Journal of Sustainable Agriculture2 (1): 16-19,2010ISSN 2079-2107
- [3] Solar photovoltaics for sustainable agriculture and rural development, by B. van Campen, D. Guidi and G. Best, Environment and Natural Resources Working Paper No. 2 FAO, Rome, 2000
- [4] Adu, M.R. and Bolaji, B.O. (2004). Possibility of rural electrification through solar energy in Nigeria. Proceedings of 5th Annual Engineering Conference of School of Engineering and Engineering Technology, Federal University of Technology Minna, Nigeria: 105-111.
- [5] Albrecht, J. (2007). The future role of photovoltaics: a learning curve versus portfolio perspective. Energy Policy, 35: 2296-2304.

- [6] Aziz, A., Kassmi, K., Olivie, F. and Martinez, A. (2006). Symbolization of the electric diagram of the marketed solar panels. Moroccan Journal of Condensed Matter, 7(1): 38-41.
- [7]. Ashish Kushwaha, Gaurav Katiyar, & Harshita Katiyar, Hemant Yadav, Saxena 'GPS And GSM Based Accident Alarm System' ;National Student Conference On "Advances in Electrical & Information Communication Technology" AEICT-2014 .
- [8]. Hu Jian-ming; Li Jie; Li Guang-Hui, "Automobile Anti-theft System Based on GSM and GPS Module," Intelligent Networks and Intelligent Systems (ICINIS), 2012 Fifth International Conference on , vol., no., pp.199,201, 1-3 Nov. 2012
- [9]. C.Prabha , R.Sunitha , R.Anitha ;Automatic Vehicle Accident Detection and Messaging System Using GSM and GPS Modem;International Journal of Advanced Research in Electrical,Electronics and Instrumentation Engineering.
- [10]. T. Krishna Kishore, T. Sasi Vardhan, N. Lakshmi Narayana "Vehicle Tracking using A Reliable Embedded Data Acquisition System with GPS and GSM" International Journal of Computer Science and Network Security, February 2010.

AUTHORS DETAILS



Divya Pujar is born on Nov 22, 1998 at Mundargi, Karnataka state, India. Degree in department of Electrical and Electronics Engineering, Tontadarya College of Engineering, Gadag district, Karnataka State, India. Her area of interest are control system, Transmission and Distribution .



Jyothika.P is born on Jan 17,1999 at Harapanahalli Karnataka state, India. Degree in department of Electrical and Electronics Engineering, Tontadarya College of Engineering, Gadag district, Karnataka State, India. Her area of interest are Power Generation and Renewable Energy Resources.



Anupama Naik is born on June 1, 1996 at Gangavathi, Karnataka state, India. Degree in department of Electrical and Electronics Engineering, Tontadarya College of Engineering, Gadag district, Karnataka State, India. Her area of interest are Electrical Circuits, Transmission and Distribution and Control systems



Mahant G Kattimani is born on June 5,1983 at Gadag, Karnataka state, India. He received B.E degree in Electrical & Electronics from KLE College of Engineering and Technology, Belgaum. He completed M.Tech. (VLSI Design and Embedded Systems) from VTU Extension center, Bangalore. Presently he is Working as Assistant Professor in Tontadarya College of Engineering, Gadag from August 2019. His area of interests are VSLI design, Power System ,Renewable Energy etc.