Study and Implementation of Automatic Dimming Control of LED Street Light

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Abstract

In present day, the maintenance of streetlight is one among the foremost downside for electricity boards in India. Also, there's scope for saving power throughout off peak time i.e. in from around midnight 12AM to 04AM within the morning. The way that are presently accustomed maintain and management the street light is a lot of advanced and uneconomical. During this paper a replacement technique is planned to regulate the intensity of LED Street lights using LDR, and to automate street lights using PIR sensors, and LDRs, leading to power saving. Implementation is done using PIC controller. This paper presents a sensible smart street lighting system that provides a secure already dark surroundings for all road users and pedestrian. The most objectives are to make associate degree automation system of street lighting using a cheap microcontroller that is PIC and to attain energy-saving. Light Emitting Diode (LED) is represented because the light module. This method is controlled consistent with the particular mode. These modes are controlled by two sensors which are Light Dependent Resistor (LDR) and Passive Infrared (PIR) sensor. This method can automatically turn on and off the lights according to traffic flow. This system operates throughout the night and therefore the focus is only for the unidirectional road at a junction. Street light will be on when only there is road user otherwise, it will turn off. This design can save a great amount of electricity or energy consumption compared to conventional street lights that keep alight throughout nights. Moreover, the upkeep value will be reduced and life of the system can increase. As the result, the system has been with success designed and enforced as a model system

Key Words: PIR, LDR, Streetlights, Power supply, microcontroller

I. INTRODUCTION

In a city street light is one of the major power consuming factor. Even in day time when there is no requirement of street light it is frequently seen that these light remain on violating the energy conservation rule. This continuous lighting pollutes the environment as well as increase the tariff of the electricity. The vital use of street light is in public transportation during night time or when the day light is very feeble. Therefore the design an controlling of street lighting is an important area of work for maintaining safe transformation in or daily life. A number of researches have concentrated on the work to reduce the energy consumption an also to reduce environment pollution. A report was made to present an efficient street lighting system with reduce power consumption in comparison to classical lighting testing system.by study various street lighting lamps, as incandescent, CFL, High-intensity discharge and Light-Emitting diode showing that the LEDs are more efficient than other lighting system.

Nowadays, street lighting is essential for all areas whether urban or rural since people know that street light is an alternative during the day night in order to keep the safety of the road users. Street lights management control is quite simple, yet as the urbanization, the number of streets increased rapidly. The traditional lighting street lamp on-off control is based on chronological time, which may inefficient and inflexible. The existing street lighting control system used timer and photocell.

This Street Lighting Automation System is an intelligent system which provides the flexible and efficient system in order to control the street lighting autonomously. This system is controlled by two sensors which are PIR sensor and LDR sensor. LDR sensor is used in order to detect darkness to activate ON/OFF switch. Also new technique to automate their system using both sensors. With the presence of these sensors that detect the intensity of light and used to detect the presence of humans or cars then, it turned on the system automatically. The main controller for this project is using an PIC. The main reason LED was chosen is to reduce the energy consumption as it were very effective in lighting and low light decay in the lifetime. The LEDs have about 110° light emission angle. Meanwhile, the conventional lamps usually have 360° and need a reflector to direct the light beam to the target street lighting.

II.DESIGN OF AUTOMATIC DIMMING CONTROL WITH MOTION SENSING LED STREET LIGHT.

A. Design of the system

Now a day, automation system are preferred because they reduce the use of energy. In modern society it is necessary to use the energy as efficiency as possible. These automation system play an essential role in making our daily life more comfortable. Among all exciting application, street light play a vital role in our environment and also a critical role in providing light for safety during night-time travel. Inefficient lighting wastes significant financial resources every year, and poor lighting creates unsafe conditions. Energy efficient technologies and design mechanism can reduce cost of the street lighting drastically.

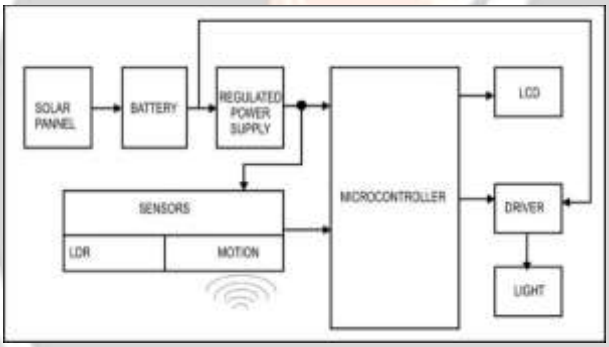

Fig:- The block diagram of proposed system

1. *Solar Panel:-*

- Solar panel is used to control intensity of street light for power consumption. The solar panel is the device which is used to convert the light energy into the electrical energy
- Panel watt=40W.
- Maximum current out = 40 /12=3.3Amps.
- Maximum current from panel = 3.3Amp =3300mA
- Current require to run the circuit 15 mA
- 3150mA current is available to charge battery.
- So, 12v/7Ah battery will charge in 7Ah/3.150A=2.2 and for 30 Ah battery will charge in 30/3.150A=@10hrs.

2. *Battery:-*

- An electric battery is a device consisting of one or more electrochemical cells with external connection provides to power electrical devices such as flashlights and smartphones. When a battery is supplying electric power, its positive terminal is the cathode and it's negative terminal is the anode.
- Run control circuit and LED strip light for 1 hour battery required of 2.56Ah.
- Therefore to operating same for 12 hours battery capacity requires of 30.3Ah.

3. *LDR :-*

- A Light Dependent Resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells. They are made up of semiconductor material having high resistance.

4. *Regulator IC7805*

- A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It is 5V positive voltage regulator. Minimum input voltage is 7V. Maximum input voltage is 25 V. The output current of this IC can go up to 1.5A
- If the input voltage is12V and you are consuming 1A, then (12.5)*1= 7W. This 7 Watt will be dissipated as heat.

5. *Microcontroller :-*

- PIC16F886 Microcontroller from 'PIC16F' family and is made by MICROCHIP TECHNOLOGY. It is an 8-Bit Microcontroller with Nana-Watt Technology.
- Along with 24 programmable Input/output pins which are developed to handle 20mA current.

6. *LCD:-*

- LCD module are very commonly used in most embedded projects, the reason being it's cheap price, availability and programmer friendly. Most of us would have come across these display in our day to day life, either at POC's or calculators. The appearance and the pin outs have already been visualized above now let us get a bit technical.
- 16*2LCD is named so because it has 16 columns and Rows. There are a lot of combination available like, 8*1, 8*2, 10*2, 16*1, etc. but the most used one is the 16*2 LCD. So, it will have (16*2=32) 32 characters in total and each characters will be made of 5*2 Pixel Dots. A single character with all it's Pixel.

  Operation voltage is 4.7 to 5.3V.

  Current consumption is 1mA without backlight.

7. *MOSFET :-*

- The IRFZ44N is a N-channel MOSFET with a high drain current of 49A and low Rds value of 17.5mohm. It also has a low threshold voltage of 4V at which the MOSFET will start conducting. Hence it is commonly used with microcontrollers to drive with 5V. However a driver circuit is needed if the MOSFET has to be switched in completely.
  Small signal N-channel MOSFET

  Continuous drain current (ID) is 49A at 25 degree.

  Pulsed drain current (ID-peak) is 160A

  Minimum Gate threshold voltage (VGS-th) is 2V

  Max gate threshold voltage (VGS-th) is 4V

  Gate source voltage is VGS is $\pm$ 20V (max)

8. *PIR MOTION Sensor*

- The PIR sensor stands for Passive Infrared sensor. It is a low cost sensor which can detect the presence of Human beings. This sensor has three output pins Vcc, output and Ground. Since the output pins is 3.3V TTL logic it can be used with any platforms

- The module can be powered from voltage 4.5V to 20V but, typically 5V is used. Once the module is powered allow the module to calibrate itself for few minutes, 2 minutes is a well settled time. Then observe the output on the output pin.

9. *LED :-*
   - A light-emitting diode is a two lead semiconductor light source. It a p-n junction diode that emits lights when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons.
     Total power consumption=30.75W.

     Total current drain =30.75/12V=2.56Amp.

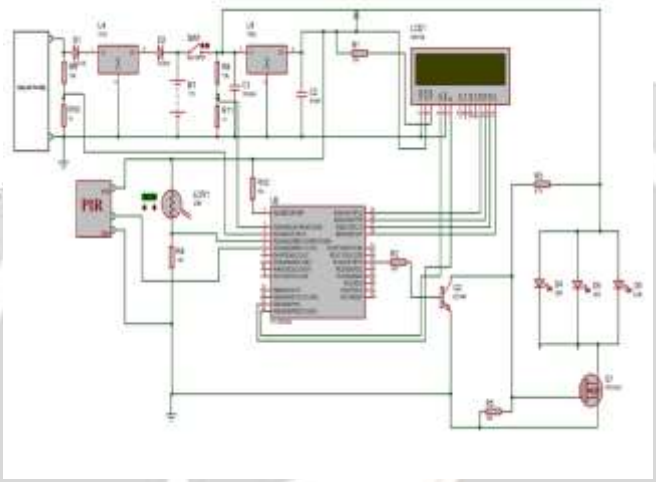

Fig :- 2 Circuit Diagram

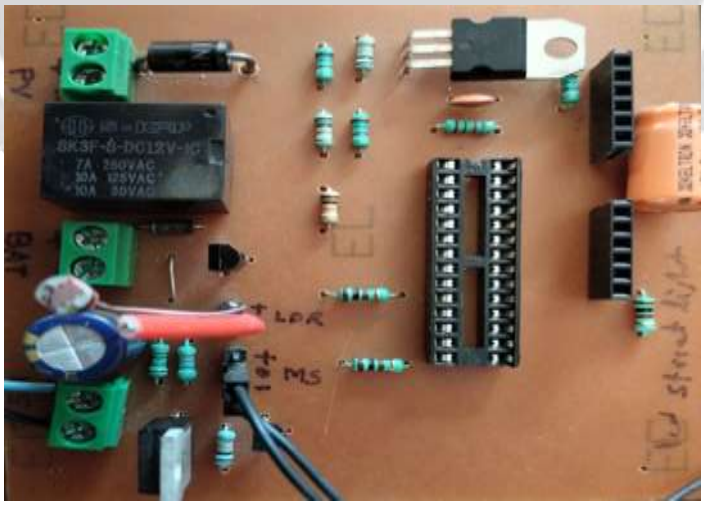

Fig.3.3.2. PRINTED CIRCUIT BOARD ASSMEBLY

III. RESULT

Physical testing of the dimming of the circuit has been check for different light condition for the brighter, dimmer and darker light and the circuit has been working satisfactory

IV. CONCLUSIONS

The system is design to improve the management of street lighting in populated areas. The system has been designed and the following parameter have been calculated. Through this system generation electricity in dc from take place without help of grid system and so that generated energy is not wasted, with the help of PWM Technology, dimming has been installed the system.

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