Design and Construction of Automatic Lamp Post with Parallel Connected Solar

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Abstract- ***The main aim of this paper is "design and construction of automatic lamp post with parallel connected solar". This project includes a circuit of lamp post with automatic on/off state during day and night. The main aims to develop a system which will lead to energy conservation and by doing and to automatically switch the lamp post to an on/off state utilizing the Light Depended Resistor. The module used for lighting is the LED. This project has designed the delay time because the light of surroundings suddenly. The beauty of the proposed research paper is that the wastage of unused electricity can be reduced, lifetime of the lamplights gets enhance because the lights do not stay ON during the whole time, and also helps to increase safety measurements.***

Indexed Terms- ***LDR sensor, Switching Transistor, Resistor, DC Relay, Battery, LEDs, Preset, and Capacitor.***

I. INTRODUCTION

Advanced technology, Electrical appliances are easy to use for human. We are difficult to switch on or off the light on high way road, so to assist us in such situations, I have explained a simple circuit that will automatically lamp post on the high way road consisting of LEDs coupled with relay. It is lit well enough to see the objects nearby. Automatic lamp posts are the major requirement in today's life of transportation for safety purposes and avoiding accidents during night. By using this simple circuit, the light will "automatically switch on" in night and "automatically switch off" in morning.

It senses the light intensity from surroundings. And it automatically switches ON when the surrounding is dark and it switches OFF when it receives light from surroundings. A sensor called LDR is used to detect the light intensity. This control system is a simple yet powerful concept, which uses transistor as a switch. By using this system manual works are 100% removed. This circuit is very easy to work around and also it is battery operated. By using this system energy consumption is also reduced.

The traditional lighting system has been limited to two options ON and OFF only, and it is not efficient because this kind of operations meant power loss due to continuing working on maximum voltage. Hence, wastage of power from lights is one of the noticeable power loss, but with the use of automation, it leads to many new methods of energy and money saving. In this regard, controlling lighting system using Light Dependent Resistor (LDR) [4], IR obstacle detector sensor [5] and Arduino [6] together is proposed in the past [7-10]. In the meanwhile, the importance of smart light system has motivated a lot of studies. Sun tracking sensors are also utilized to power OFF the lamp post by the detection of the sunlight luminance.

Furthermore, lamp post control with the use of solar energy. Lamp Post is distinguished from turning ON/OFF the electricity.

The power consumed by the circuit is very low because of the very few components used in the circuit. Initial cost and maintenance can be the draw backs of this designed circuit. With the advances in technology and good resource planning the cost of the circuit can be cut down and also with the use of good equipment the maintenance can also be reduced in

terms of periodic checks. The LEDs have long life, emit cool light. For these reasons that circuit presents for more advantages which can over shadow the present limitations. Keeping in view the long term benefits and the initial cost would never be a problem.

II. METHODOLOGY AND OVERVIEW

The Lamplights of dipped lights will let you see for about 30 meters. A brief methodology has been discussed in Fig.1.

For avoiding all this type of problems, this research project in which the lamplights are controlled automatically on/off system use sensor for sending signal to the control unit in which controls the power supply to the lamplights. The sunlight delivers rays of photons (solar energy) which hit the solar panel (Photovoltaic module) shown in Figure 2.

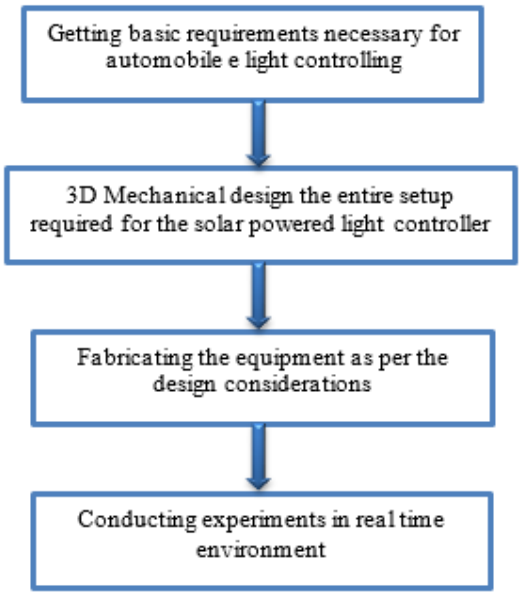

Fig.1. the Flow Chart of the Project

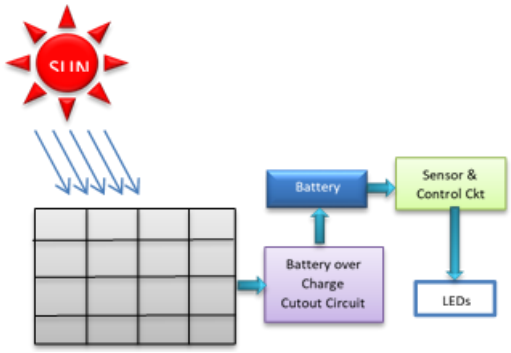

Fig.2 Over view of Solar Lamp Controller

a. Light Dependent Resistor (LDR)

LDR is a Light Dependent Resistor (Fig. 3a) whose resistance is dependent on the light impinging on it. The resistance offered by the sensor decreases with the increase in light strength and increases with the decrease in light strength. This device is used for detection of day-time and night-time because when sunlight falls on it, it will consider as day-time, and when there is no sunlight falls on it, it will be regarded as a night, as shown in Fig. 3b. These are very beneficial, especially in light/dark sensor circuits and help in automatically switching ON /OFF the street lights.

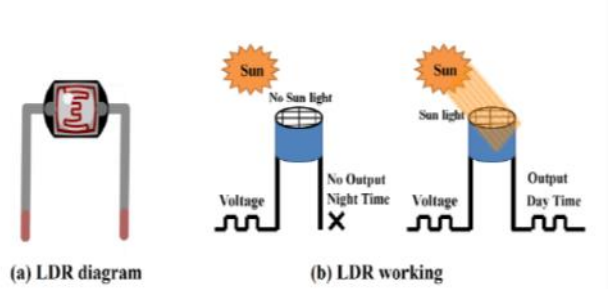

Fig.3. LDR symbol and its working phenomenon [4].

b. LEDs

A LED (light-emitting diode) is a PN junction diode which is used for emitting visible light when it is activated, as presented in Fig. 4. When the voltage is applied over its elements, electrons regroup with holes within the LED, releasing energy in the form of photons which gives the visible light. LEDs may have the Dim/full capability.

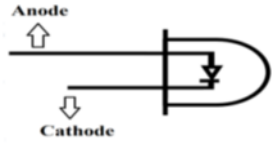

Fig.3. LED circuit diagram [7].

c. Battery over Charge Cutout Circuit

Battery over charge cut-out circuit is shown in figure 5. UA741 IC is used as comparator. This circuit can be used in any battery charger.

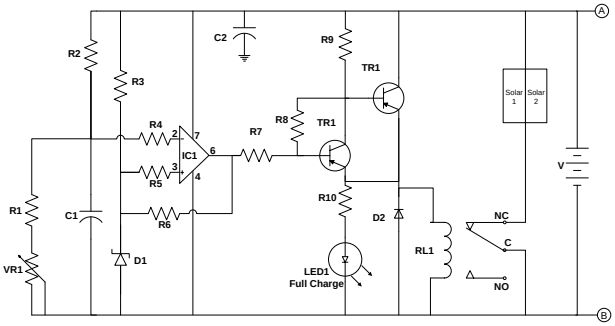

Fig.5. Battery over Charge Cut-out Circuit

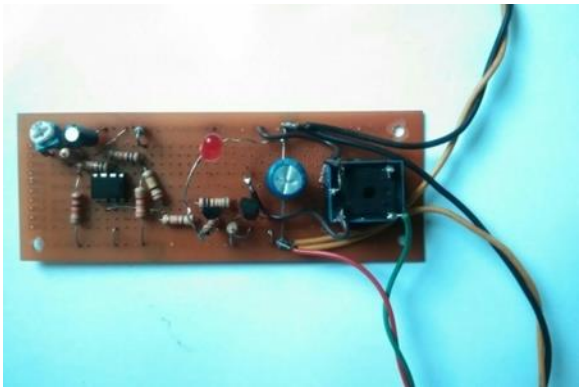

Fig.6. Design Model of Battery over Charge Cut-out Circuit

d. LDR Sensor and Control Circuit

In figure 7, the dark knowing circuit will automatically switch on when the dark is being. When the time is getting the sunlight, the resistance of LDR is very less, so the voltage of the preset's pin 2 is very high. So, the transistor is saturating and the collector volt of TR_1 is zero voltage may be absolutely. So, the base bias voltage of transistor TR_2 is also absolutely zero volt, TR_2 is cut-off. Then, at TR_2 the collector cannot electricity and relay breaks down, the relay point Common pin cannot connect normally open pin, so turned off.

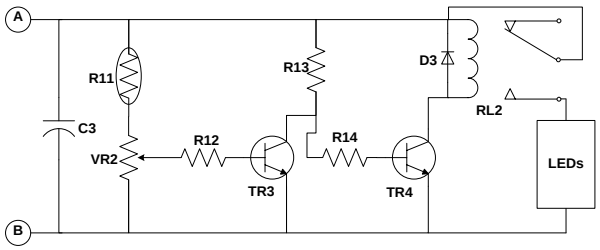

Fig.7. LDR Sensor and Control Circuit

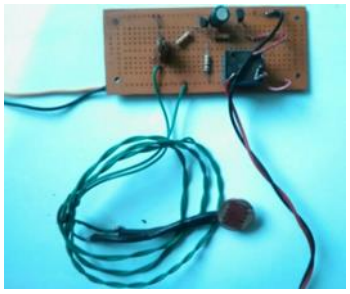

Fig.8. Design Model of LDR Sensor and Control Circuit

e. Design and Result of Automatic Lamp Post System

After sunset is being, the less the light, the more the resistance and the voltage drop of LDR. So, the voltage of the preset's pin 2 is proportionally low. At prepaid light, the preset's pin 2 voltage is reached under 0.6V. So, the base bias voltage of transistor TR1 is too reached under 0.6V and it is cut-off. Then, the electric current flow over the resistor R2 and capacitor are charged electricity. After a few second (R1 and C2 prepared time), TR2 is saturated and relay is operated. By connecting relay's common pin and normally open pin, the light switches on.

When the light of surroundings (such as cloudy during raining season or the bird flies cross on the surface of LDR) suddenly light and dark, the relay chattering is became. So to prevent these conditions it is designed by capacitor C2.

Delay time can calculate by the following equation:

$$T=0.7\ R_2\ C_2$$
$$=0.7\ (10K\Omega)\ (470\Omega F)$$
$$=3.3s$$

By the valve of C2 changing, delay time can change as like.

Table 1. Specification and Result Data of Elements

Symbols	Description	Value
R1	Resistor	4.7kΩ
R2	Resistor	22kΩ
R3	Resistor	3.3kΩ
R4,R5,R8	Resistor	10kΩ
R6	Resistor	200kΩ
Symbols	Description	Value
R7,R12,R14	Resistor	47kΩ
R9	Resistor	2.4kΩ
R10	Resistor	2.2kΩ
R11	Resistor	LDR
R13	Resistor	15kΩ
VR1,VR2	Preset (Variable Resistor)	10KΩ
C_1,C_2	Capacitor	470μF(25V)
TR1	Transistor	A564
TR2	Transistor	C684
TR3	Transistor	C945
TR4	Transistor	C1384
RL1,RL2	Relay	12V DC
V	Battery	12V 4A
Solar1,Solar2	Solar	12V,20watts

III. CONCLUSION

The circuit works automatically by switching the lamp post to an ON/OFF state. LDR sensor, transistor module, relay module, solar, IC 741, A564 transistor, A684 transistor and battery are the main modules required for the perfect working of the circuit. This paper solves the problem of automation with the use of LDR. By employing this circuit, energy consumption can be reduced considerably as the light switches ON or OFF automatically in appropriate time. Errors which occur due to manual operation can be eliminated completely. The construction of the circuit is very simple circuit and inexpensive. So, this circuit should be used the countries very well getting sunshine. The proposed lamp post automation system is a cost effective and the safest way to reduce power consumption.

Fig.9. Model Design Assembly of Automatic Lamp Post

It helps us to get rid of today's world problems of manual switching and most importantly, primary cost and maintenance can be decreased easily. The LED consumes less energy with cool-white light emission and has a better life than high energy consuming lamps. Moving to the new & renewable energy sources, this system can be upgraded by replacing conventional LED modules with the solar-based LED modules. With these efficient reasons, this presented work has more advantages which can overcome the present limitations. Keep in mind that these long-term benefits; the starting cost would never be a problem because the return time of investment is very less. This system can be easily implemented in street lights, smart cities, home automation, agriculture field monitoring, timely automated lights, parking lights of hospitals, malls, airport, universities and industries etc.

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