

Design and Analysis of Image as A Street Light

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Abstract: Image is one of the gifts of nature. It may either be dark (night) or light (day). This may equally be the sun or any form of light (Huiyu, 2010). This paper is aimed at the use of image as a street light switch. The system is design in such a way that, the circuit will be in a casing, where there will be a provision for the sensor (LDR) to be outside the case to enable the light dependent resistor (LDR) senses either light of dark. If the LDR senses darkness, it will serve as a switch to ON the circuit where the output will display a 220v output, which any form of 220v bulb can be attached or connected serially or parallel inform of a street light. Likewise if the LDR senses light, it switches OFF automatically. The system work with respect to environmental sensor, which respond to the illumination intensity that switches ON when senses darkness and equally switches OFF when senses light. The application is made up of three units, the power control unit, the operating unit or sensor and the control system. The system is automatic and therefore has no need of manual switching of the system to operate but just the gift of nature, which is image.

Keyword: image, street light, sensor

I. Introduction

Most traffic congestion often get worse at night (when dark), though most town of early age started poor planning in terms of street light system. Suddenly the use of lamp was initiated at night serving the purpose of street light. With the recent development, street light was modified to the movement of automobile as well as to reduce traffic congestion at night (Windfield, 1980). The design at hand falls into automatic system. i.e. automatic control street light system with respect to environmental sensor (Jiahua, 2010).

One of the most important discoveries in the history of mankind is the invention of image activated switch (Ramsy, 2010). This has become one of the basic necessities of economic development. With increase rate of road accident and theft in our country, it is necessary to design a modern way to resolve the problems. There are various type of street light control system used, they are the manual control street light system, the timed control street light system and the automatic control street light system. This design concerns itself only with the automatic control street light system. the automatic control system is introduce to archive a desired performance with the help of photocell, the photocell is a semiconductor device which depends on the intensity of light, it is also known as the light dependent resistor (LDR) and it is expected to operate whenever it is dark (Windfielt, 1980). The circuit is not only design to switch ON only at night but to operate whenever it is dark in terms of ECLIPSE, SANDSTORM and so on. The design is then split into stages with the help of a block diagram to detail the mode of operation of the system as well as general execution of the control system.

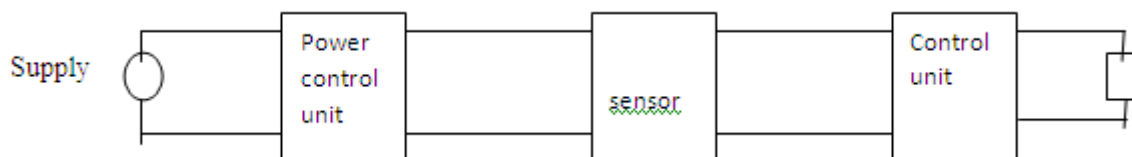


Figure 1: block diagram of image activated switch

II. The Operating Unit Of The System

2.1 SENSOR

The sensor circuit consists of light dependent resistor (LDR), the device has the characteristics of varying a resistance according to the light energy falling on it. The variable resistor allows us to adjust the brightness of the light below which we want the street light to ON which the light should go OFF.



Figure 2: sensor

III. The Control Unit

3.1 Comparator

This is the most important part of the control circuit. It is an operational amplifier with 8 pins dual in line. The op-amp 741 is used and configured as a comparator. The op-amp uses single power supply (+12V DC) as against the more dual power supply (Willey, 1969). The v_{cct} terminal (pin 7) of the comparator is connected to 12v DC supply, the negative v_{cc} (-pin 4) is connected to the ground, (pin 2) is connected between the LDR, R_2 and R_1 , while (pin 3) is connected to variable resistor and (pin 2) is the reference voltage at the output of (pin 6) which rises to saturate and the voltage at the output of (pin 6) rises to almost 12v. This happened when the LDR is illuminated. Under this condition the resistance of the LDR is low. The potential divider formed by the LDR and the variable resistor provide a low voltage at (pin 3), when the LDR is in darkness it resistance increases. The voltage at (pin 3) immediately the voltage exceed 6v, the amplifier saturate in an opposite polarity and the voltage at the output of (pin 6) reduces to zero so that

- ✓ The current through R_1 will be

$$I_1 = \frac{V_{dc}}{R_1} = \frac{12v}{10 \times 10^3} = 1.2 \times 10^{-3} = 1.2mA \text{ -----} 1$$
- ✓ The current through R_3 will be

$$I_3 = \frac{V_{dc}}{R_1} = \frac{12v}{470} = 25.5 \times 10^{-3} = 25.5mA \text{} 2$$
- ✓ The current through R_4 will the same as in R_1 and R_6 .
- ✓ The current through R_5 will be the same as in R_3 .
- ✓ The current through R_7 will be

$$I_7 = \frac{v_{dc}}{R_7} = \frac{12v}{1 \times 10^3} = 12 \times 10^{-3} = 12mA \text{} 3$$

The values of current across each resistance need to be shown to ensure accuracy; this shows that there is no cut off along circuit. These values of current must be accurate to have a perfect circuit with good working condition. If values of current around the circuit are not accurate, there will be a problem at the output.

General Schematic Diagram of the Circuit under Design

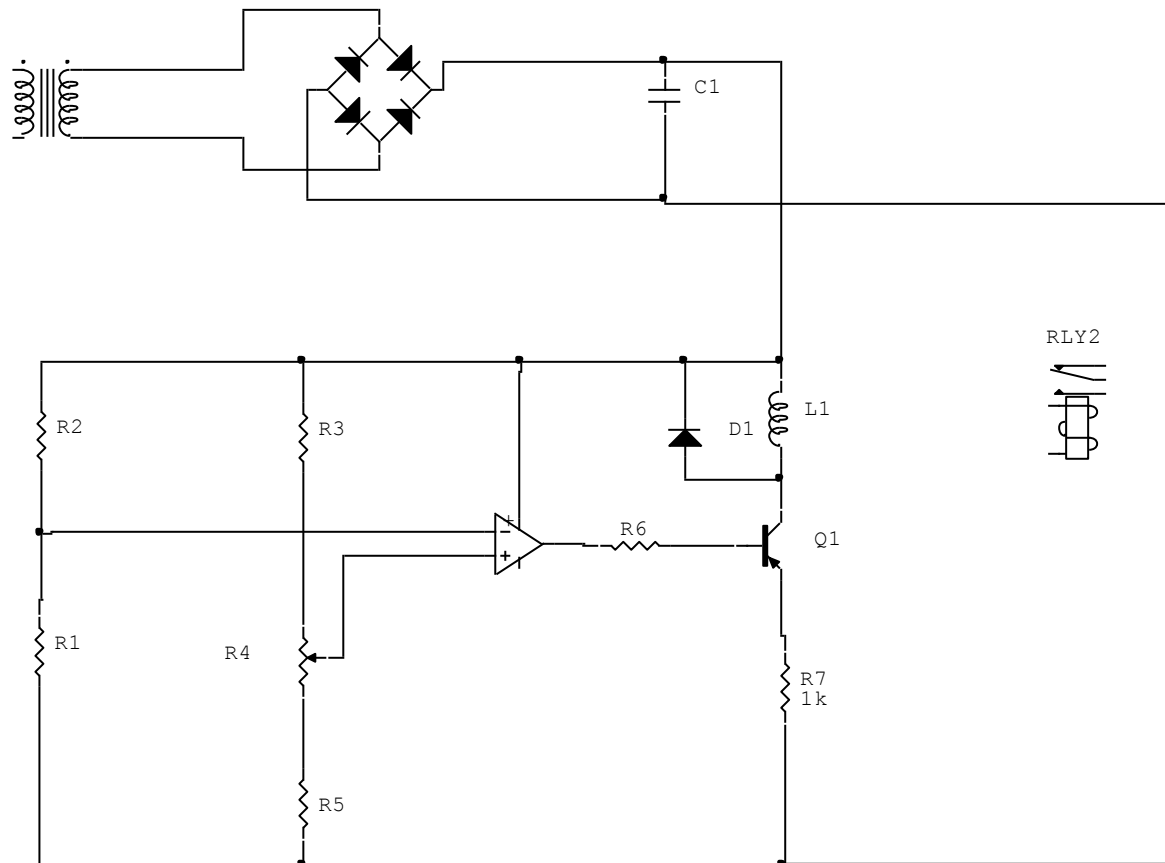


Figure 3: general schematic diagram of the circuit

IV. Result And Discussion

The system performance the image activated switch was evaluated with respect to power consumption efficiency to ON when the LDR sense darkness energies. It may be use as a security light in our banks, super market, at home etc. the design incorporate the characteristics of both night and day time using the sensor. Here light independent resistor (LDR) is used for its efficiency in detection and responding. When light falls on, the photocell is reduce to low level, the circuit is therefore dark.

Testing was aimed at the workability of the system which is concluded as the result to ensure that the system confirms to the desired operation. Test has been carried out and the following result was obtained.

- | | | |
|------|-----------------------------------|------|
| I. | Input voltage of the transformer | 240v |
| II. | Voltage output of the transformer | 12v |
| III. | Voltage across the detector | 6.1v |
| IV. | Voltage across the comparator | 6.1v |
| V. | Output voltage of the circuit | 220v |

The output result was successful it was shown to be 220v output, this output can be connected to a bulb as many as required in form of a street light. Therefore the result of the system was successful as was found operating according to the design specification. The design was achieved by making reference to power supply.

V. Conclusion

The main object of this design is to provide easy and efficient street lightening system using image as the switch and to undergo the design of an electronic detector used for security and street light purposes. This is due to the increase rate of accident at night due to darkness and theft at night. It is recommended that design should be improve using solar power system as the source as the source of power supply to the circuit, because it requires power supply for the system to operate which may be unavailable. It is also recommended that, the introduction of visual single or computer aided system should be applied.

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