

An Automated Road Light Control System using Relays and Light Sensors



Mihir Narayana Mohanty

Abstract: An automated road light control system is a simple and also a very useful concept for the human life, system comprises of a transistor used herein as a switch to control the ON/OFF the light automatically as per commanded by the microcontroller informed by the sensors. The lights turned ON automatically during night when there is presence of an object, and turned OFF at day time or the absence of the object. This is performed by the system with the help of photoelectric sensor and LDR.

Keywords: Road light, Relays, Light sensor, LDR, Photoelectric sensor, microcontroller.

I. INTRODUCTION

In the modern era as they know that the count of vehicle is increasing day by day and so the accidents rate. To decrease the rate of road accidents the proper lightning system must be established for lightning of roads during night the street lights are established[1]. The people are so much busy during these days that no one worries about switching ON/OFF the switch as soon as it is not obligatory, this results the wastage of electrical power[2]. This research paper introduced here to solve this issue by eliminating human involvement for switching off road light[3] .

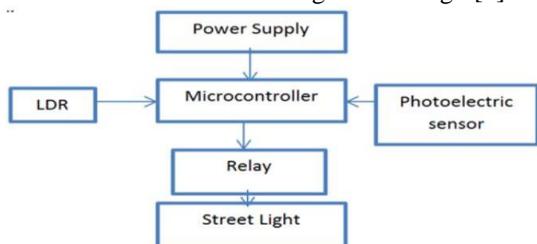


Figure 1: Block diagram of street light controlling system

This entails some elementary modules i.e. Microcontroller, Sensors & LDR. Road light is not required during day time hence a LDR turns the road lights OFF till the pitch is very low or the frequency of light is very low and the LDR's resistance is very high. This resist the current flow into base of a used transistor. Therefore, the road light will not glow[3].

II. AUTOMATED ROAD LIGHT SYSTEM CIRCUIT

The system mainly contains a LDR, photoelectric sensor, power supply relays and microcontroller.

LDR

LDR (light dependent resistor), as per the name, it offers resistance in reply to the ambient light. As the incident light increases the resistance decreases and vice-versa. As there will be no light, LDR exhibits a resistance of mega-ohms which will be decreased to few ohms if the light will be available. It may act as a sensor, resistance will vary the voltage drop across the sensor. LDR is made up of cadmium-sulphide (CdS)[4].

LDR has a helical cadmium-sulphide track. It's a bilateral device i.e. conduct in both directions at same fraction



Figure 2: LDR

Photo electric sensor

The movement on the road is detected with the help of photoelectric sensors have been proposed in this paper, where receiving and sending are in one unit as shown in the Figure 3. Light from emitter end strikes the target and reflected light is diffused to the surface in all angles. Output switches its state whenever enough light is received by the receiver. The output backs to its original state when no light is reflected back. The emitter is perpendicularly placed to its target in diffused scanning. To receive some scattered reflection the receiver is tilted at some angle[5].



Figure 3- Photoelectric sensor (MC005)

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Table 1: Photoelectric sensor specification

Photoelectric Sensors(MC005)	
Sensing range	3-80cm
Sensing object	Translucency, opaque
Supply voltage, current	DC 5V, 100mA
Output operation	Normally open
Output	DC three-wire system (NPN)
Diameter, Length	18mm , 45mm
Ambient Temperature	-25 70

Regulated Power supply

As the input is unregulated power ranging from 9 volt to 12 volt DC which further converted into 5 volt power supply, KA8705 shown in the below figure is voltage regulator IC has been used.



Figure 4: Power regulator

KA8705 is simple to use. The positive terminal should be connected from unregulated DC power supply anything (from 9VDC to 224VDC) to input terminal, the common pin must be connected to the negative lead on the power, a 5V supply connected to the output pin[6].

Relay

Relay offers quarantine in flanked by the controller and device, as known earlier devices can work on DC as well AC but microcontroller will work only on DC which is the main controller of the circuit. Hence, to link the gap they require relay. It is very important as well as useful for controlling huge quantity of current or voltage by way of the minor electrical signal[7].

Appropriate relay selection factors:

- Voltage & current that can reinforce the coil
- A voltage acquired on the production side
- Amount by armature
- The contacts volume of an armature
- Electrical associates figure (N/O and N/C)[8].

PIC16F877A Microcontroller

A Microcontroller is a computer controlled system on a single chip system. Many electronic circuits are built into the microcontroller, which is able to decide written instructions and to convert them to electrical signals. Then microcontroller will then step through this and execute one by one[9].

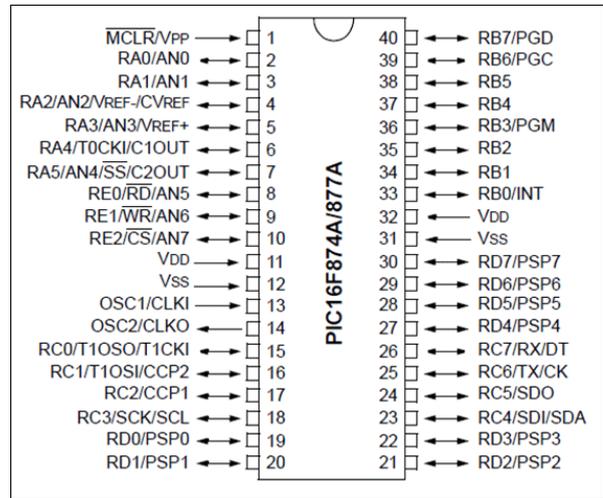


Figure 5: Pin diagram of PIC16F877A microcontroller

Automated road light circuit

The functioning principle by this circuit is identical. The IC CA3140 used in this circuit is an operational amplifier[10]. The comparison of the voltage and the output is provided by the pin 2 and 3 accordingly and also used as “potential divider” in its noninverting & inverting inputs (pin 2 &3). LDR & VR1 from first potential divider employed to avail the voltage on inverting side (i.e. 2) and 2nd [11]potential divider fabricated at “noninverting input pin” with the aid of R₁ & R₂ which is being granted by half of total voltage at noninverting pin.

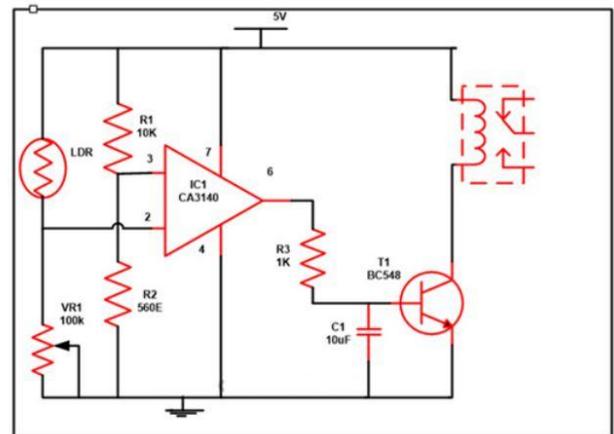


Figure 6: Automated road light circuit

Then again in dark or at night it is well known the resistance by a LDR is great henceforth voltage on “the inverting pin 2 of the IC CA3140” reduces than the noninverting pin 3 results at 2nd pin to move to up condition which makes transistors to depart and the LED or a bulb attached with it starts simmering[12].

When relay is associated with bulb they must need to be attentional. As they are aware that different bulb has variable wattage, so to supports a relay it may not be recognized by relay[13].

III. METHODOLOGY

The proposed system is basically focused towards the road light controlling system for controlling the lights installed on the road sides, the system is based on photoelectric sensor as well as LDR.

During the day time there is no need of street light so it must be switched off. The light observed by the LDR in day time is more so that LDR works as high resistance during day time and it resist the current flow and the lights get turned off, during night the resistance of LDR gets very low so it passes the maximum current which results the glowing of light during night.

Similarly the photoelectric sensor senses the presence of objects on the road and accordingly it operates the road lights. During night if there is no person walking or driving on the road then the light will be get turned OFF during night also to save the energy.

IV. RESULTS AND DISCUSSIONS

The aim of this project is to save the energy and to reduce the current side effects on the road light system. In this particular project, aim is to prepare inputs and the outputs of this system for the controlling of the lights on the roads. Archtype of the particular project as implemented and the result expected is proved to be very useful and it will fulfil all its current constraints if large scale implementation is done.

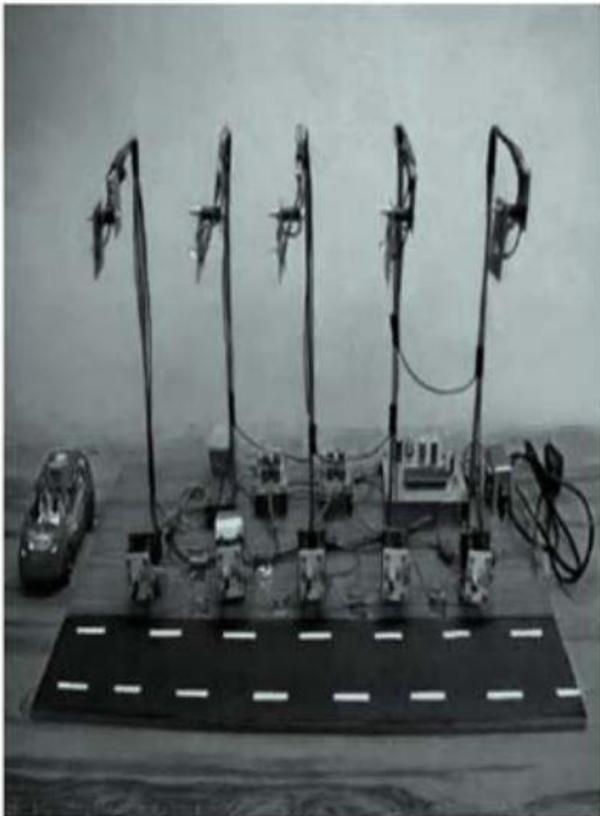


Figure 7. Prototype

V. CONCLUSION

This paper architecture of the automated road light is illustrated. The circuit works on the controlling of the street lights ON or OFF. The sensors such as LDR and

photoelectric sensor are main part of the circuit, both of them are needed to sense their best view and accordingly both information is observed and compared for the controlling of the system and it is programed accordingly for working according to the sensed information. Both the sensors are responsible for controlling of the light. The LED lights are controlled by microcontroller with commands from the controller pre-set instructions. Furthermore the drawbacks related to the road light system is removed and has been overcome, where the photoelectric sensors are used for sensing the light. The proposed circuit can be used at any road either short road or the long roadways also.

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