Connected Street Light Control System Using LDR Through PIC16F877A

Ei Ei Khaing
Dept of FCST
University of Computer Studies (Thaton),

Abstract- *the system is to design the automatic control of street light with change of the intensity of sunlight that is as the intensity of sunlight decreases, intensity of street light increases. LDR is used to detect light intensity. 555 timer control circuit is used to control the intensity of light .that it supply voltage is first integrated to obtain a sine wave that it so obtained is compared with a reference DC voltage, which is totally dependent on LDR resistance whose value change with intensity of light. The signal at output terminal is synchronized with the pulse and is delayed from the supply zero crossing signal. This circuit is analyzed and tested and various conditions and it provides an absolute result which shows the reliability of this circuit. Usually street light remain ON in morning time manual operation, which cause loss of energy and therefore this paper is very beneficial for saving power and energy by automatic control. This system also provides the ides of developing the driver circuit of LED lamp which is widely used nowadays. The microcontroller PIC16F877A is used as brain to control the street light system, where the programming language used for developing the software to the microcontroller is C-language.*

Keywords- Street light, LDR, 555 Timer, microcontroller, transformer, power supply and circuit design.

I. INTRODUCTION

The idea of designing a new system for the streetlight that do not consume huge amount of electricity and illuminate large areas with the highest intensity of light is concerning each engineer working in this field. Providing street lighting is one of the most important and expensive responsibilities of a city. Lighting can account for 10–38% of the total energy bill in typical cities worldwide [1]. Street lighting is a particularly critical concern for public authorities in developing countries because of its strategic importance for economic and social stability. 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. Manual control is prone to errors and leads to energy wastages and manually dimming during midnight is impracticable.

The light sensor will detect darkness to activate the ON/OFF switch, so the streetlights will be ready to turn on which can be controlled by microcontroller PIC16f877A. The block diagram of street light system as shown in Fig. 1 consists of microcontroller, LDR, and 555 timer. By using the LDR we can operate the lights, i.e. when the light is available then it will be in the OFF state and when it is dark the light will be in ON state, it means LDR is inversely proportional to light. When the light falls on the LDR it sends the commands to the 555 timers and then its send the microcontroller that it should be in the OFF state then it switch OFF the light.

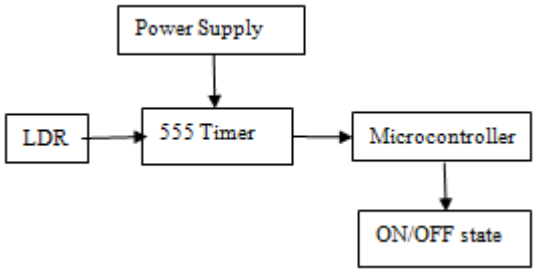

Fig:1 Block diagram

II. AUTOMATIC STREET LIGHT SYSTEM CIRCUIT DESIGN

The system basically consists of a LDR, 555 timer, Power supply, and Micro controller.

2.1 LDR

The LDR are made of High resistance semiconductor, when light fall on such a semiconductor; the bound electrons gets the light energy from incident photons. Due to this additional energy these electron become free and jump into conduction band. The electron hole pairs are generated. Due to these charge carries the conductivity of LDR increases, increasing its resistivity.

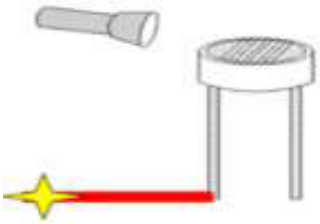

Fig:2 Light dependent resistor

The theoretical concept of the light sensor lies behind, which is used in this circuit as a darkness detector. The LDR is a resistor as shown in, and its resistance varies according to the amount of light falling on its surface. When the LDR detect light its resistance will get decreased, thus if it detects darkness its resistance will increase.

2.2 555 Timer

In the following fig:3, show the Monostable circuit of the 555 timer, it is pin 2 to ground turns off a transistor that otherwise shorts C1 to ground . The output pin 3 then goes high as C1 charges through R1. When the charge on C1 is 2/3 of the supply voltage, the 555 discharges C1 to ground .the output then goes low and stays that way until pin 2 is triggered again.

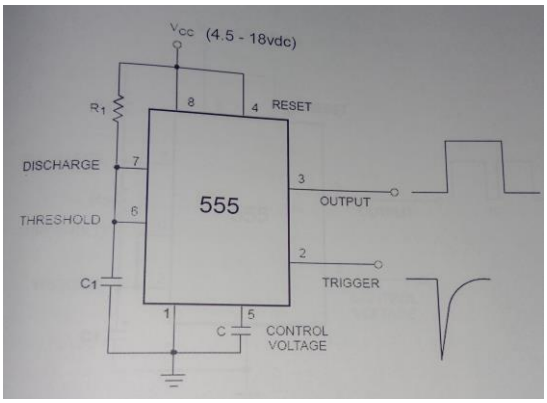

Fig:3 Monostable circuit

2.3.2Testing for Power Supply

The AC mains are fed to the transformer, which steps down the 230 volts to the desired voltage. The bridge rectifier follows the transformer thus converting AC voltage into a DC output and through a filtering capacitor feeds it directly into the input (Pin 1) of the voltage regulator. The common pin (pin2) of the voltage regulator is grounded. The output (pin 3) of the voltage regulator is first filtered by a capacitor and then the output is taken. Make the circuit on a general purpose PCB and use a 2 pin (5A) plug to connect the transformer input to the AC mains via insulated copper wires

2.4 PIC16F877A Microcontroller

A microcontroller is a computer control system on a single chip. It has many electronic circuits built into it, which can decode written instructions and convert them to electrical signals. The microcontroller will then step through these instructions and execute them one by one. As an example of this a microcontroller we can use it to controller the lighting of a street by using the exact procedures. Microcontrollers are now changing electronic designs. Instead of hard wiring a number of logic gates together to perform some function we now use instructions to wire the gates electronically. The list of these instructions given to the microcontroller is called a program. There are different types of microcontroller, this project focus only on the PIC16F877A Microcontroller.

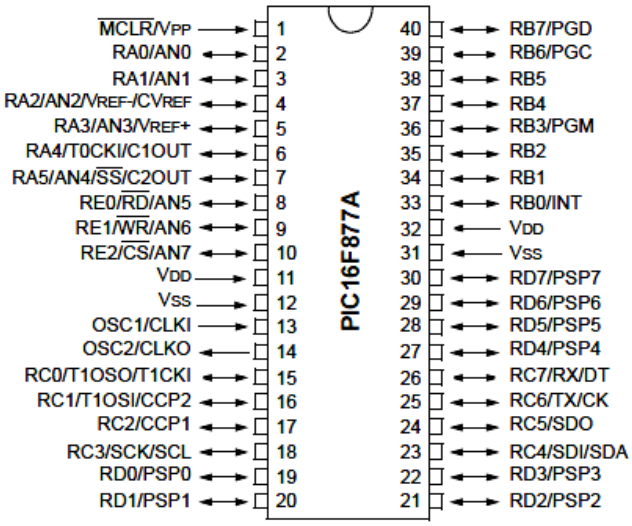

Fig:4 Pin diagram of PIC16F877A microcontroller

III. EXPERIMENTAL WORK

In this paper, I used Proteus software and Micro C language.in Proteus design, port D of PIC16F877A is used as input pin and Port B of PIC16F877A is used as output pin. LDR is used sensor that is connected to pin 4 of 555 timers. The output is become from pin 3 of 555 timers. Pin 3 is entered to port D of PIC16F877A.The output is become from Port B of PIC16F877A and then this system uses crystal that it connect pin 13 and 14. in this system ,proteus software ON state

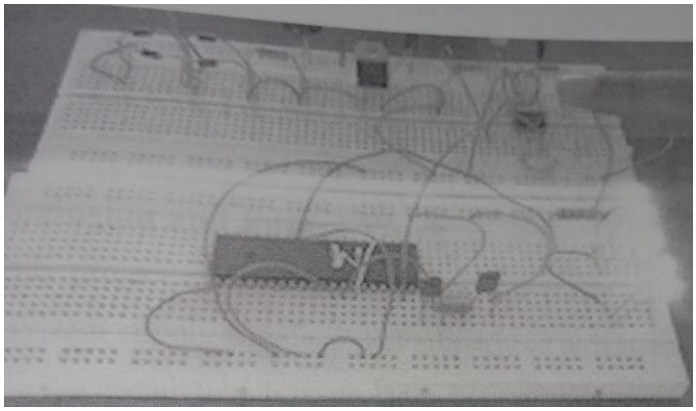

Fig:5 LDR is dark the light will be ON state

IV. CONCLUSION

This paper elaborates the design and construction of automatic street control system circuit. Circuit works properly to turn street lamp ON/OFF. After designing the circuit which controls the light of the street. LDR sensor and 555 timer are the two main conditions in working the circuit. If the two conditions have been satisfied the circuit will do the desired work according to specific program. Each sensor controls the turning ON or OFF the lighting column. The street lights has been successfully controlled by microcontroller. With commands from the controller the lights will be ON in the places of the movement when it's dark. Automatic control using LDR helps to save a large amount of electric power which is wasted in conventional street lighting system. The automatic switching operation observed using the developed control circuit is found to be very efficient and the maintenance cost is very less. Furthermore the drawback of the street light system by just using timer controller has been overcome, where the system depends on both timer and LDR sensor.

Finally this control circuit can be used in a long roadways between the cities.

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