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Implementation of Automatic Street Light Control System

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***Abstract*: Now-a-days, human has become too busy, and is unable to find time even to switch the lights wherever not necessary. The present system is like, the street lights will be switched on in the evening before the sun sets and they are switched off the next day morning after there is sufficient light on the roads. This work gives the best solution for electrical power wastage. Also the manual operation of the lighting system is completely eliminated. In this paper the two sensors are used which are Light Dependent Resistor LDR sensor to indicate a day/night time and the photoelectric sensors to detect the movement on the street. 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. Finally, the system has been successfully designed and implemented as prototype system.**

***Keywords*: circuit design, energy saving, microcontroller, photoelectric sensor and Street light, LDR.**

1. 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. 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 mid-night is impracticable. Also, dynamically tracking the light level is manually impracticable. The current trend is the introduction of automation and remote management solutions to control street lighting.

There are various numbers of control strategy and methods in controlling the street light system such as design and implementation of CPLD based solar power saving system for street lights and automatic traffic controller, design and fabrication of automatic street light control system, automatic street light intensity control and road safety module using embedded system, automatic street light control system, Intelligent Street Lighting System Using GSM, energy consumption saving solutions based on intelligent street lighting control system and A Novel Design of an Automatic Lighting Control System for a Wireless Sensor Network with Increased Sensor Lifetime and Reduced Sensor Numbers.

In this paper two kinds of sensors will be used which are light sensor and photoelectric sensor. The light sensor will detect darkness to activate the ON/OFF switch, so the streetlights will be ready to turn on and the photoelectric sensor will detect movement to activate the streetlights. LDR, which varies according to the amount of light falling on its surface, this gives an inductions for whether it is a day-night time, the photoelectric sensors are placed on the side of the road, which can be controlled by microcontroller PIC16f877A. The photoelectric will be activated only on the night time. If any object crosses the photoelectric beam, a particular light will be automatically ON. By using this as a basic principle, the intelligent system can be designed for the perfect usage of streetlights in any place.

The street light system consists of microcontroller, LDR, and photoelectric sensor. 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 microcontroller that it should be in the OFF state then it switch OFF the light, the photoelectric sensor will be used to turn ON or OFF the light according to the presence or absent of the object. All these commands are sent to the controller then according to that the device operates. We use a relay to act as an ON/OFF switch.

2. Overview of paper

The Overview of paper are as follows:

1. Introduction on the project.
2. Discuss different modules of the project.
3. Discuss about PIC microcontroller.
4. Discuss about the Hardware.

A. Light Dependent Resistor

LDRs or Light Dependent Resistors are very useful

especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000000 ohms, but when they are illuminated with light resistance drops dramatically. Electronic onto sensors are the devices that alter their electrical characteristics, in the presences of visible or invisible light. The best-known devices of this type are the light dependent resistor (LDR), the photo diode and the phototransistors

Light dependent resistor as the name suggests depends on light for the variation of resistance.

1. LDR are made by depositing a film of cadmium sulphide or cadmium selenide on a substrate of ceramic containing no or very few free electrons when not illuminated. The longer the strip the more the value of resistance.
2. When light falls on the strip, the resistance decreases. In the absence of light the resistance can be in the order of 10K ohm to 15K ohm and is called the dark resistance.

Depending on the exposure of light the resistance can fall down to value of 500 ohms. The power ratings are usually smaller and are in the range 50mw to .5w. Though very sensitive to light, the switching time is very high and hence cannot be used for high frequency applications. They are used in chopper amplifiers. Light dependent resistors are available as discs 0.5cm to 2.5cm. The resistance rises to several Mega ohms under dark conditions. The below figure shoes that when the torch is turned on, the resistance of the LDR falls, allowing current to pass through it is shown in Fig. 1.

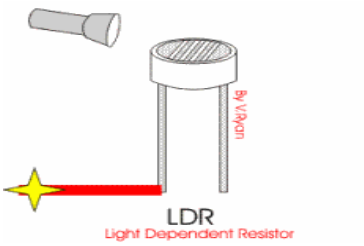

Fig. 1. LDR

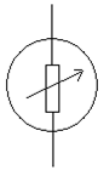

Fig. 2. Symbol of LDR

The basic construction and symbol for LDR are shown in above figures respectively. The device consists of a pair of metal film contacts separated by a snakelike track of cadmium sulphide film, designed to provide the maximum possible contact area with the two metal films. The structure is housed in a clear plastic or resin case, to provide free access to external light. Practical LDRs are available in variety of sizes and packages styles, the most popular size having a face diameter of roughly 10mm. practical LDR is shown in Fig. 3.

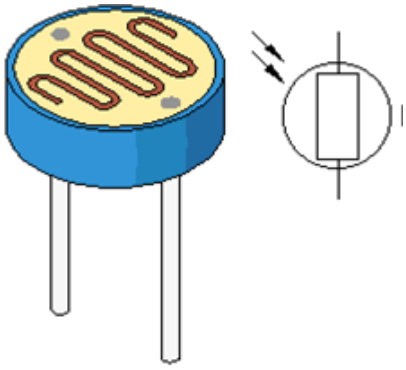

Fig. 3. Practical LDR

3. Circuit description

A. *Hardware implementation*

In this project the list of hardware components used are given below:

1. 18F452 Microcontroller.
2. Push Button for Reset.
3. RS232 IC.
4. 10 MHZ Crystal.
5. A Relay.
6. Light Dependent Resistor.
7. 16X2 Pic LCD Module.
8. Power Supply 5v dc with LED.

1) *Micro Controller*

This section provides an introduction to most common word in the embedded system “microcontroller”. It is written to familiarize you with microcontroller terminology and basic microcontroller architecture.

A microcontroller is a single chip, self-contained computer which incorporates all the basic components of a personal computer on a much smaller scale. Microcontrollers are often referred to as single chip devices or single chip computers. The main consequence of the microcontroller’s small size is that its resources are far more limited than those of a desktop personal computer. In functional terms, a microcontroller is a programmable single chip which controls a process or system. Microcontrollers are typically used as embedded controllers where they control part of a very larger system such as an appliance, automobile, scientific instrument or a computer peripheral.

Microcontrollers are designed to be low cost solutions; therefore using them can drastically reduce part and design costs for a project. Physically, a microcontroller is an integrated circuit with pins along each side. The pins presented by a microcontroller are used for power, ground, oscillator, I/O ports, interrupt request signals, reset and control. In contrast,

the pins exposed by a microprocessor are most often memory bus signals (rather than I/O ports).

4. Conclusions

This 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 as illustrated in the previous sections. LDR sensor and the photoelectric sensors 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 have 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. Furthermore the drawback of the street light system using timer controller has been overcome, where the system depends on photoelectric sensor. Finally this control circuit can be used in long roadways between the cities.

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