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Development of Automatic Street Lighting using Micro Controller

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ABSTRACT: This Automatic Street light aims at designing and executing the advanced development in embedded systems for energy saving street lights. The present system resembles 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. Here, the Light Dependent Resistor (LDR) sensor is used to indicate a day/night time. The micro controller 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 or Arduino programming. Here in this we need to design street lamps which were controlled by manual control where a control switch is set in each of the streets. Automatically all the street lights on at the evening and vice-versa. Depending upon the highways we will be categorizing the lights with respect to road performance. We use LED lights which saves the energy and the power consumption is less than high pressure sodium lights. As a whole, 77-81% of the power consumption can be reduced by using LED lamps.

KEYWORDS: Ultrasonic Sensor, LDR, LEDs, Breadboard, Arduino, Regulated Power Supply.

I. INTRODUCTION

Automatic control of street lights is designed to turn on and turn off street lights automatically. If light is 80 percent available, it automatically turns off street lights. But if amount of light is less than 80 percent, this project will automatically turn on street lights. One can also adjust it according to its requirement. Light sensor is used to detect intensity of light. Control signal is generated with the help of a microcontroller after analysing amount of light. Control signal generated by pic microcontroller is used to turn on transistor which in turn energize the relay coil and relay turn on the street light. To use it practically, you can use as many street lights as many you want to control through this automatic control of street lights.

II. FORMER WORK

Automatic Street Light Control System is a simple but still a powerful concept, which uses PIC micro controller. By using this system manual works are totally removed. It automatically turns ON lights when the Car is passing by the way. This is done by a sensor called Infrared (IR) which senses the light. and automatically switches OFF lights whenever the car is passed away.

A. Automatic Street Light Control System Using Microcontroller

The proposal 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. In this paper, two kinds of sensor being used which are light sensor and photo electric 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

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movement to activate the streetlights. The photoelectric will be activated only on the night time and a particular light will be automatically on if any object crosses the photoelectric beam.

Another system “Automatic Street Light Control with Different Light Intensity”

Automatic Street Light Control System is a simple but still a powerful concept, which uses PIC microcontroller. By using this system manual works are totally removed. It automatically turns ON lights when the Car is passing by the way. This is done by a sensor called Infrared (IR) which senses the light. At the beginning, street lamps were controlled manually in which the control switch was set in each of the street lamps. That was called as the first generation of the original street light. the objective of this project is to provide a fully automated street light control which will definitely affect mankind. It will provide a public lighting system which is cost effective; it will help in reduction of crime, & it has less effect on environment.

Another approach for automatic street lighting system is “Street Lighting System Based on Vehicle Movements”. In this system, the main function of street lighting is to illuminate the city's streets during dark hours of the day. The design and verification of Automatic Street light successfully. The main advantage of the present system is power saving. It requires the initial cost only for designing and installation and not for utilization. such systems are very much convenient for the government to reduce the utilization of conventional power (generated by hydraulic power stations).Therefore, such systems are once implemented on a large scale can bring significant reduction of the power consumption caused by street lights. This initiative will help the government to save this energy and meet the domestic and industrial needs.

Another system “Design and Implementation of Automatic Street Light Control System using Light Dependent Resistor”. This system The project aims to eliminate the manual operations and to design an energy efficient automatic streetlight controller using light dependent resistor and microcontroller. The microcontroller ‘ATmega8’ is used as brain to control the streetlight system. The programming language used for developing codes to the microcontroller is C language. This automatic streetlight controlling system requires less maintenance and it is highly reliable. Automatic control using LDR helps to save a large amount of electric power which is wasted in conventional street lighting system. The circuit controls the turning ON or OFF the street light. The street lights have been successfully controlled by microcontroller.

III. METHODOLOGY

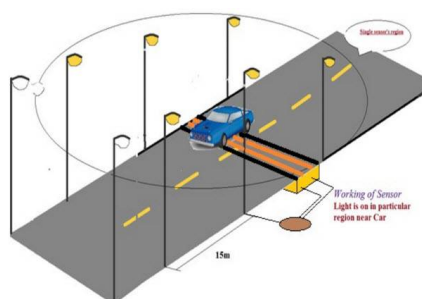


Fig:1 proposed system architecture

Figure 1 shows the general architecture of the proposed system. It primarily consists of 2 components:

- A. The receiver side
- B. The sender side

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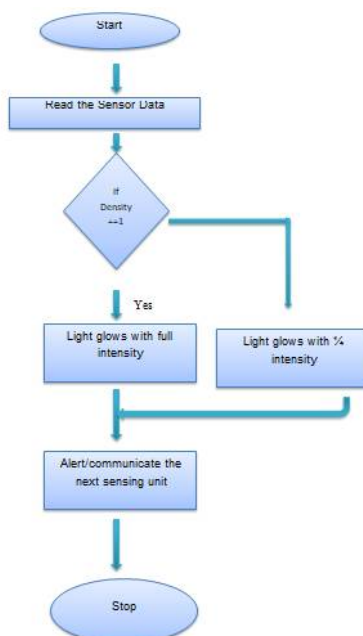
Vol. 7, Issue 5, May 2019

A. The receiver side:

The receiver side consists of the LDR (Light Depending Resistance). An LDR or Light Dependent Resistor is also known as photo resistor, photo conductor. It is a type of a resistor whose resistance varies depending on the amount of light falling on its surface and when the light falls on the resistor, the resistor changes. The resistors are used in many circuits where it is required to sense the presence of light. When the LDR is in darkness, it can be used to turn on the when it is in light. LDR are made by depositing a film of cadmiumsulphideorcadmium selenite on a substrateofceramic containing no or very free electrons whennot illuminated. The longerstrip the more thevalue resistance, whenlight fallson the strip the resistance decreases. In the absence of light the resistance can be in the order of 10Kohm to 15K ohm and is called dark resistance. Though LDRis very sensitive to light, the switchingtime is very high and hence cannot be used for highfrequencyapplications. And **Ultrasonic Sensor** whichmeasures distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the way reflected back from the target. Ultrasonic sensors measure the distance to the target by measuring the time between the emission and reception. An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor head.

B. The sender side:

It is also carried out by ultrasonic sender. The sensor head emits an ultrasonic wave and receives the way reflected back from the target. It measure the distance to the target by measuring the time between the emission and reception. An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception.



Our smart street lighting system is basically an intelligent system which is designed such that the street lights automatically switches OFF and ON based on the sunlight. For this feature we have used a very common and easily available light sensor called as LDR (Light Dependent Resistor). However our proposed system utilizes the latest technology for the light sources as LED (Light Emitting Diode) lamps instead of generally used street lamps such as High Pressure Sodium Lamps, etc. There are several advantages of LED technology over other traditional technologies like energy saving due to high current luminous efficiency.

- Automatic Switching / Dimming of Street lights.



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- Automatic fault detection through sensors.
- Intensity Control of LEDs on Detection of vehicle or human movement

IV. SYSTEM IMPLEMENTATION

Current street lights are controlled only by means of manual power or the sensors which turn on when it becomes dark and automatically turn off when it becomes bright. There are some attempts in which the energy wastes of the street lights are reduced. The main aim of smart street light systems is that lights turn on when needed and turned dimmed when not needed.

Features of Smart Street Lights:

- Easy installation and extension:
Each smart street lights can be installed one by one to the network of street light systems by setting the parameters and the system is autonomous- distributed controlled and no host computer is needed.
- Low cost:
The aim of smart street lights is to save energy and to save the cost. Smart street lights whose cost is more than the cost of energy that is saved by the smart street lights do not become widely used. Thus, it uses only the parts of mass production to keep the cost of smart street lights as low as possible.
- Easy update:
The product of each company of smart light systems must be updated easily. Algorithms for controlling the units such as street lights or sensors should be developed for the situations such as residential, shopping streets and mountain roads.
- No difference from usual lights:
Whenever pedestrians or drivers of the vehicles see lights, the lights have already turned on. And do not notice that light turn off or that the lights that they see are Smart Street lights.
- Safety:

Usually the street lights do not always turn on with the specific brightness and therefore public safety may get worst and the main aim is to keep public safety and save energy. For keeping the public safety smart lights that are within the views of pedestrians or vehicles but not near them must increase its brightness. There are two ways of determining the street lights that are related with safety, they are:

- 1) Configure manually where each light of the specific area in which pedestrians or vehicles are detected to increase the brightness of the light.
- 2) To configure automatically of the specific area of each light.

Components of Smart Street Lights

1) Lamp Unit:

It consists of power adjustable LED lights, the brightness sensor, and MotionSensor and communication devices with the controller. It turns on for several minutes if a motion is detected in the specific area by sensors including its own. Then it sends the message to the other units. It reduces the brightness to save electric power under the condition that any motion is not detected in the specific area.

2) Ultrasonic Sensor:

Ultrasonic measures distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the way reflected back from the target. Ultrasonic sensors measure the distance to the target by measuring the time between the emission and reception.

An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor

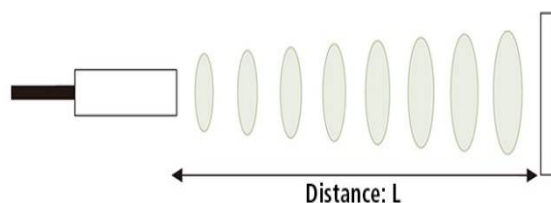


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V. CONCLUSION

In this paper, automatic street lighting on microcontroller is proposed. This system is equipped with the Streetlight controller using LDR based Light intensity & traffic density, in the today's up growing countries will be more effective in case of cost, manpower and security as compare with today's running complicated and complex light controlling systems. The aim of this project was to design and implement an automatic street light using PIC microcontroller, which can be used to avoid manual operation for switching street light on and off. In order to save and conserve energy in an efficient manner, street lights are on only when a movement is detected by a movement detection sensors. 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 as illustrated in the previous sections.

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