

Movement Aware Street Lights

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Abstract-The aim of this project is to design an embedded system which is used to save energy of street light and reduce power wastage. It is an intelligent and developed technology. At present we are using a technology where the street lights are operated manually i.e. it requires human presence for its operation. That means the lights will be in ON throughout the night and even in the morning if we ignore to OFF them. Also we need lights only when a human or vehicle passes in that way. There will be a great wastage of power if lights are ON continuously all over the night. This paved way to a brilliant technology called street light automation. The proposed system eliminates manual operation and reduces power wastage. This system helps in making street light automation upon sensing an obstacle using Atmega microcontroller which is costeffective and is processed by arduino board which is very easy to implement. Thus the system ensures secured lighting in a cost effective manner.

Keywords: Atmega 328p microcontroller, PIR sensor, Ultrasonic sensor, Street light, Arduino Uno.

1. INTRODUCTION

Generally street lights are switched on for whole night and during the day they are switched off. It requires a manual presence. Sometimes during the time also the lights will be in ON condition which leads to wastage of energy. As energy resources are declining day by day, we have a responsibility to Secure them and our project strictly aims to reduce their usage. So our next generation may not face problems related to lack of natural resources. This article describes about the street light automation based on motion of object. The street light will be ON/OFF based on the detection on any moving object.

Here we are using Atmega328p micro controller, due to this cost can be reduced to a great extent. Atmega controller is an 8-bit controller along with some addition features like internal EPROM, 6 ADC channel with 10-bit resolution, spi and i2c protocol. It has 28 pins. We are using high performance PIR sensor and Ultrasonic sensors for motion detection. We use a power supply block for converting 230v a.c. to 5v d.c as using a.c. is Hazardous to users as current fluctuates and converting to d.c stabilizes the circuit. Relay is used as switch used for operating circuit.

Hardware & Software requirements:

S.no	Hardware requirement	Software requirement
1	Atmega328p micro controller	Arduino compiler
2	Power supply	c/c++ programming language

3	Relay unit	
4	PIR sensor	
5	Ultrasonic sensor	
6	LED light	
7	Battery	

2. LITERATURE REVIEW

Compared to the previous systems, our system contains low cost and high performance features. Here we are using Atmega controller and Arduino as a tool which is very easy to install and maintain based on the controller actions the street lights will be operated. The total system consists of:

a. Street light control using Arduino UNO:

In our system we are using Arduino UNO as a microcontroller board having Atmega328p as a single chip microcontroller created by Atmel. The Atmel 8-bit AVR is a RISC based micro controller. Here the code we write for the Arduino is executed by this controller. A simple c or c++ code can be dumped on Arduino. Sensor senses the motion and will give results to the controller. According to these the street lights will be on/off.

b. Advanced and low cost sensors:

Now a day's streets light are the major requirement in our day to day life. The maintenance of this streetlight has become complex due to rapid growth of cities. During night time these are not necessary if there is no traffic. So for detecting the motion we are using PIRsensor which is most effective and low cost. This sensor senses the detection of motion of humans .It detects objects in 180 degrees .Another sensor used is Ultrasonic sensor. It is used for the detection

of specific distance objects in the range of 360 degrees.

3. METHODOLOGY

Street automation box will be a stand independent device. These must be placed for every pole separately. Buttypes of sensors used are same.

Block diagram: The block diagram of this system basically consists of a power supply unit, a relay,PIRsensor,Ultrasonic sensor, Atmega microcontroller and a street light. The clear cut working of each block is as follows:

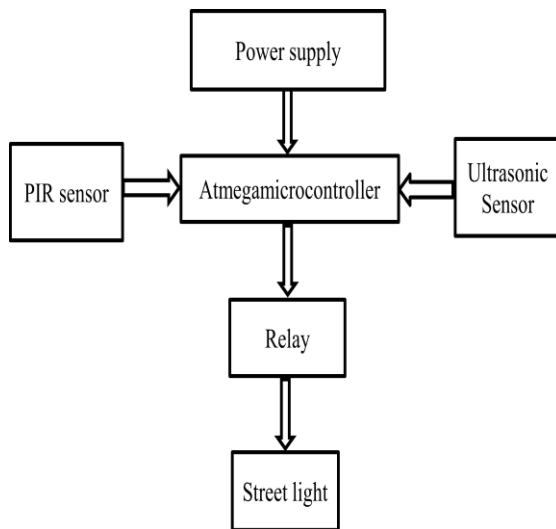


Fig 1: Basic block diagram of system

Power supply:

Our general main supply is 220v/230v a.c. whereas we require only 5v d.c for this project. For this purpose we have power supply blocks as step down transformer, a rectifier and a voltage regulator. A transformer which reduces its voltage from primary to secondary is called step down transformer ($N_1 > N_2$). For an input of 230v a.c, a step down transformer will have around 12v, a.c as output. A rectifier transforms the secondary winding AC voltage into a pulsating DC voltage of 12v. A filter, which is formed by one or more capacitors, smoothen the wave eliminating ac components delivered by the rectifier. A voltage regulator eliminates the ripples and makes the output stable. Here LM7805 is used as a voltage regulator.

Sensor section:

We use two types of sensors in our project. They are (passive infrared) PIR sensor and Ultrasonic sensor.

PIR sensor:

It is mostly used to detect the motion of human/animals. These are usually small, inexpensive, low power and easy to use. These adjust to changes

slowly but have high output response. These continuously transmit IR rays and when these rays strike human/animal they reflect back. These reflected signals are converted into current by the sensor and intimation of detection is given to controller.



Fig 2: PIR Sensor

Ultrasonic sensor: These can broadcast a powerful ultrasonic frequency and are mostly used to measure speed or direction and can effectively determine position of detected object. These have two nodes i.e. transmit node and an echo node. Transmit node always transmits signals and when an object is detected the waves are reflected to echo node which intimates it to controller.



Fig 3: ULTRASONIC Sensor

Relay section:

It is having a relay of 5v and a BC547 transistor. As arduino doesn't supply enough voltage to drive relay, we use a transistor. It is a remote control switch which is used to provide isolation between high and low currents. A relay is used to switch between high and low currents. When controller sends commands to relay, it performs the ON/OFF functions of light. That means using small current flow circuit to control a higher current circuit.

Control section:

Atmega 328p is used as a controller in this process. The PIR sensor output connections are given to PIN-

10 and Ultrasonic is given to pin-(8, 9) of arduino board. Arduino reads these signals and give output command to relay for control switching of light. We are using a D.C battery of 9v directly to the controller .we here connect + ve end of battery to arduino Vin and -ve end to arduino GND. We can see the green light on Arduino board to indicate that it is powered.



Fig 4: circuit of system.

4. DRAWBACKS OF EXISTING TECHNOLOGIES

a. Solar lighting system:

Initial investment and cost of equipment is high. It doesn't work well in weather changes.

b. Street light controller using singlechip microcomputer:

Maintenance must be made regularly.

c. Zigbee based system:

It is having complex circuitry.

d. Street light automation based on 8051 micro controller:

It needs additional blocks.

5. FUTURE SCOPE

- Pole damage can be detected by adding suitable sensors.
- By proper sensors light intensity can be controlled when there is enough traffic lighting.
- By using GPS/GPRS any accident occurred in that location can be intimated to nearby hospitals.

6. CONCLUSION

The proposed system is to offer a very low cost and easily programmable automation system for street

lights. It can be easily integrated into present system and can be easily installed and operated. Our proposed system helps in preventing accidents by switching ON the light whenever a movement occurs and also saves power by switching OFF the light whenever there is no movement. These can be applicable for lighting in industries, parking lots and campuses etc. The proposed system is thus very safe and secured and easy to use. It is highly efficient and simple to programmable.

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