

Street Light Automatic Intensity Controller

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Abstract - In present day, the maintenance of street light is one of the major problem for electricity boards in India. Also, there is scope for saving power during off peak time i.e. in from around midnight 12AM to 04AM in the morning. The methods that are currently used to maintain and control the street light is more complex and uneconomical. In this paper a new technique is proposed to control the intensity of LED Street lights using LDR, and to automate street lights using PIR sensors, and LDRs, resulting in power saving. Implementation is done using Arduino UNO. For effective communication, a wireless messaging system through SMS has been adapted in the system to monitor the working of the street lights.

Key Words: SMS, GSM, PIR, LDR, Street lights, Power, Arduino UNO

1. INTRODUCTION

Electricity is the major demand in the developing countries like India. One of the major area where power is consumed is in street lighting. It is found that there is wastage of power by operating the street lights due to manual operation. Also the power is wasted when there is no person or animals in the street. During this time if street light is OFF or if the intensity is brought down, then some amount of power could be saved. So, this paper proposes an advanced system to maintain street lights and save the power wastage in street lights.

The electricity board can reduce the maintenance cost and number of personnel by automated control. In the proposed system, street lights can be operated (ON and OFF) by sending SMS through GSM. In proposed system we can control and monitor the street light with feedback module using Global Service for Mobile communication (GSM) via Short Message Service (SMS). Feedback module provides the acknowledgement for each SMS by checking the status of the light, For example if an operator sends a message as „ON street light, the acknowledgement is received as „YES“ if the respective light is ON or else „NO“ if the respective light is unable to switch ON.

In rural areas at midnight the necessity of the street light is very less. Here too, there is wastage of power. This can be prevented if the street light can sense and operate only when a vehicle, human or an animal come in its vicinity. In

proposed system this has been taken care by sensing them using PIR and LDR module.

A brief view of the Methodology is described in section I, Experimental results and performance analysis is presented in Section II. Section III concludes the paper.

2.BLOCK DIAGRAM

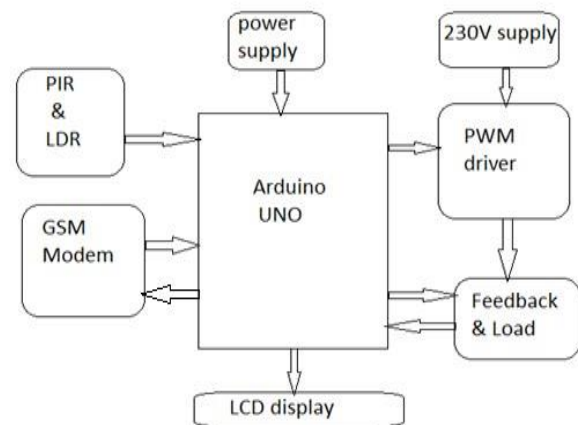


Fig -1: Block Diagram

The PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects. This motion can be detected by checking for a high signal on a single I/O pin which operates on 5V supply. The PIR sensor has elements made of a crystalline material that generates an electric charge when exposed to infrared radiation. The changes in the amount of infrared striking the element change the voltages generated, which are measured by an on-board amplifier.

The device contains a special filter called a Fresnel lens, which focuses the infrared signals onto the element. As the ambient infrared signals change rapidly, the on-board amplifier trips the output to indicate motion. It senses humans or animals near by the respective light. If the PIR senses anything nearer to the light, causes the change in amount of infrared striking the element which in turn changes the voltage generated. Hence suddenly the Arduino UNO increases the intensity of the respective light.

The feedback unit consists of the SN74LS245 is an Octal Bus Transmitter/Receiver designed for 8-line asynchronous 2-way data communication between data buses. Direction Input (DR) controls transmission of Data from bus A to bus B or bus B to bus A depending upon its logic level.

The important feature of this is 2-Way Asynchronous Data Bus Communication. It receives the control signal and sends the acknowledgement to the operator.

A photoresistor or Light-Dependent Resistor (LDR) or photocell is a resistor whose resistance decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photoresistor is made of a high resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

Two LDRs are used in our system. One for checking the day light and the other to sense the status of the light. The First one senses day light and signals the microcontroller to turn OFF the light during the day and turn ON during Night. The second LDR senses the light of the street light and is used to send SMS if there is any malfunctioning of the bulb. This enables automatic control of the light and also intimates the maintenance personnel in case of any malfunctioning of the light bulb.

3.METHODOLOGY

The Block diagram of the proposed system is shown in fig1. It mainly consists of Power supply unit, PIR Module, GSM modem, Arduino UNO and feedback unit. The main components used for power supply circuit is 1 Transformer, 2 Diodes, 1000uF Filter Capacitor, LM7805, 3 PIN Voltage Regulator.

The 230V 50 Hz AC supply from the mains is used to feed the power supply circuit to generate 5V regulated supply for energizing The GSM modem, Arduino UNO and LCD Display. The power supply circuit consists of a centre tap transformer, rectifier made of full wave rectifier circuit and filter circuit which provides a regulated 5V supply.

Regulator is used to regulate the output from the Transformer to the required voltage level. In a typical 12-0-12 transformer with a bridge rectifier and a filter the output voltage is unregulated 12V DC, if the desired output voltage is 5V, then a regulator needs to be used. 7805 regulator indicates positive voltage with 5 volts as the output. The GSM modem is used for a duplex wireless communication. The authenticated operator mobile is configured with SIM (Subscriber Identification Module) which is inserted in the GSM modem.

The message is sent in text format which is received, extracted and fed to Arduino UNO. The Arduino UNO uses the SMS received by GSM modem and switches the streetlight ON/OFF. The UNO has in-built memory which is used to store the code which in turn controls the load.

The UNO used in the receiver side helps in decoding the AT commands and taking decisions. The load which is street-light, is connected to microcontroller. Using PWM Driver, we switch ON/OFF the street-light. The darlington pair which accepts the triggering voltage from Arduino UNO is separated from the 230V 50Hz AC supply by using suitable opto-isolator. The power electronic devices like thyristors are used to implement the PWM Driver.

The street-light is embedded with a photodiode to get the feedback. The photodiode produces voltage according to the intensity of the street-light and informs the microcontroller whether the light is ON/OFF.

4.EXPERIMENTALRESULT AND PERFORMANCE:

Initially set a baud rate of 9.6 Kbps between the GSM modem and Arduino UNO. The GSM modem is initialized. The AURDINO UNO configures port-0 as input port. The GSM modem then scans for any new message.

If a new SMS is received, the phone number and message is extracted from it. If the received message is in the correct format the UNO proceeds for the future operation such as switching on the lights, checking the light's status, turning OFF the lights etc.,

For e.g. the operator send a message as Lamp 1 ON. The UNO receive the message and switches the Lamp 1 to turn ON, after a second it checks for status of the light. If the Lamp1 is in ON status then the UNO send acknowledge as Lamp1 ON.

Also, PIR module fixed with all the device to detect vehicles, human or animals nearby the correspondence light. PIR can detect up to 20 feet from the device. If the PIR detects human then the respective light's intensity is turned to 100%. Else, the intensity of the light is turned down to 50%.



Figure 4(a): mHardware implimention of the proposed system



Figure 4(b) message from lamp to operator



Figure 4(c) shows message from lamp to operator to attend the problem.

5.CONCLUSION

In most of the countries, mainly the power wastage occurs in street lights and also manpower is very less. The proposed system can be installed to automate as well as save power. As the proposed system uses wireless based closed loop automation of street light control using PIR. It is a low cost remedy for remote controlling and monitoring of the street-lights. It has a more time efficient way to switch ON/OFF street-lights. Up to 70% of power wastage can be reduce by implementing the proposed system. It provides an effective measure to save energy by preventing unnecessary wastage of electricity, caused due to manual switching or lighting of street-lights when it is not required. This concept can also be used to control lighting system of industrial areas, college or university campus. The proposed system may also be used for home security and automation.

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