

Power Saving Mechanism for Street Lights by Using Wireless Communication GSM

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Abstract— Now-a-days, Energy saving is an important aspect of Power system. This Paper discuss the Idea about controlling operation of street lights in Real Time Application, Which enables Operation in Bright and Dim Mode. Depending upon the Light Intensity this Street lights Can be turned ON and OFF or Dim and Bright. In this paper, I suggest mechanism to control street lights with Automatic Dim-Bright control by using LDR and PIR sensor. PIC Microcontroller is used for Controlling and enhancing all the operations. When any Human Being or Any vehicle is Detected then PIR will send command to Microcontroller. Then Particular street light will turned Bright as compared to others. The use of Wireless communication provides fast action. At Particular area, If any Kind of Failure takes place it will send message through GSM to the Operator. Thus appropriate control of Street Light takes place.

Keywords: PIC microcontroller, GSM,PIR, LDR,LCD, Street Light.

Introduction

In Electrical power system. Electricity saving is also termed as Power Generation. Power Saving in Street Light still has main problem of electrical power supply system because it is install in the out space expose to the atmosphere and It is along the road side for the long distance. There are big trouble conditions like heavy rain traffic accident etc, so the counter measure on safety problems should be on every street light problem. Maintenance is one of the key issues. At the present condition in urban area is, manual control of street lamps, control switch set is required for every street light which requires manpower and is inefficient. In the purposed system, GSM (Global system for mobile communication)and PIC microcontroller circuit is used to control and monitor straight light. This system is bring controlled by sending short message service (SMS) for mobile hand set.

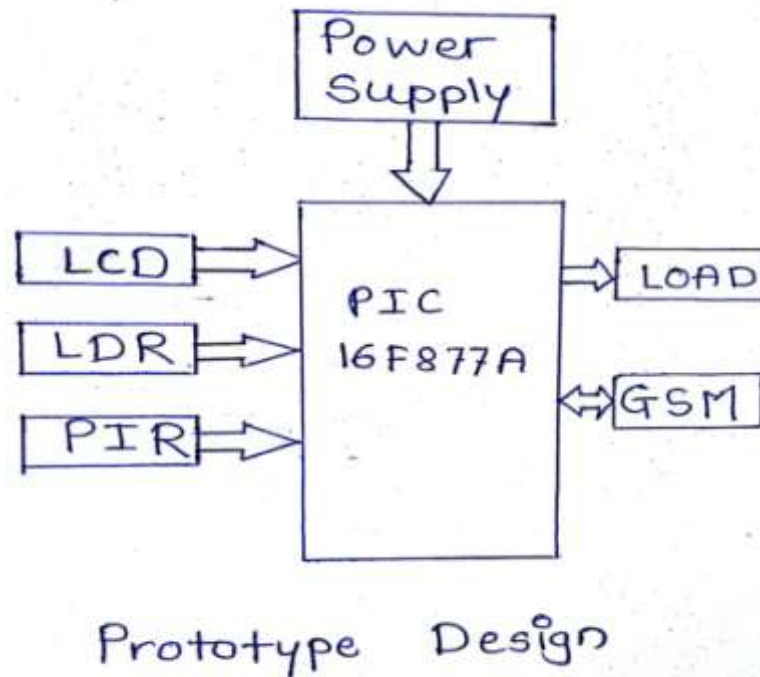
Literature review:

The system reduces power consumption in Street lights, so reduces Energy Wastages and also used for monitoring System. The system uses PIC 16F877A Microchip microcontroller. Remote Control Equipment for monitoring and managing of street light is presented in this proposed scheme. Remote controllable and energy saving architecture mechanism is proposed to reduce standby power consumption. The feasible tapping into short message service components for today's existing mobile communication network infrastructure, in fact GSM act as a communication medium. This scheme will provide Energy Efficient and low cost Solution for Street Light Control. Also The benefits of this setup will include: Flexibility and modularity in control by the use of a PICmicrocontroller.GSM network use for Global Coverage, Efficient and cheap means of communication by use of SMS. The PIC microcontroller has high Reliable, high Accuracy, compact size, low cost , maintenance becomes Free.

Proposed Method:

Now a days in a Power system there is considerable need to Energy Saving. Now a days Human being is too busy and does not have enough time to switch the lights when not necessary. In the Present System, the generally Street lights are turned ON at the Evening before Sun Set and street lights are turned OFF, after Sun rises when sufficient light is on roads. So this method gives a best solution to reduce the Energy Savings. Also manual operation is eliminated completely. In this Proposed scheme, there are two sensors are used and they are Light Dependent Resistors(LDR) and Photoelectric Sensor. LDR is used to detect day and night timing and hence it will turn ON or OFF the street Lights. Movements on the Road can be Find out by PIR sensor. The PIC Microcontroller 16f877A is the Brain of the Street Light Control System and while Programming language used for developing software is C Language. PIC Microcontroller has a Fast processing Speed and also has Large Memory capacity, in built ADC, Self Programmable And Finally system is designed successfully and can be implemented as prototype.

WORKING PRINCIPLES OF BLOCK DIAGRAM



Power supply unit:

1. Transformer :

The transformer is device which step-up or step-down the voltage to the required value. It does not change the frequency. In power supply unit the transformer is used to step-down the voltage to 12V to 5V. The transformer which has primary voltage greater than secondary voltage is called the step down transformer. It provides step downed voltage to rectifier unit

2. Rectifier :

Rectifier consists of power electronics device which used to convert AC voltage to Variable DC voltage.

3. Filter:

Filter is device convert pulsating DC into Fixed DC which remove unwanted AC components.

4. Regulator:

Voltage regulator is an integrated circuit. IC7805 voltage regulator used to maintain positive output voltage at constant value i.e. +5V regulated power supply.

5. Load :

In proposed mechanism, street light is used as load.

PIC 16F877A Microcontroller :

PIC 16F877A is the brain of this circuit. The main advantage of the PIC 16F877A is that it has inbuilt ADC, which converts analog value to digital value (sampled value). This sampled values of ADC compared with preset values and decision is taken according to programming, hence PIC microcontroller is decision making device. [3]

PIC 16F877A is simple and compact circuit, and gives fast response as compared to other microprocessor. It has low Power consumption. It has 40 Pins, 8bit CMOS flash PIC microcontroller from micro chip and its architecture is high performance RISC. PIC means peripheral interface controller and is designed by microchip technology

Relay Driver Circuit :

In this circuit, NPN transistor is used for controlling operation of Lamp. Microcontroller sends trip signal to this circuit.

LCD Display :

LCD is used to display value of Light Intensity. With respect to change in load, the power and temperature is changes accordingly.

It is used to display condition of overload and overheat as per changes in load and it will be displayed on LCD display. So, we can see normal and abnormal conditions on display. As per this we can take necessary action

GSM :

Global system for mobile communication and it is used for digital cellular communication. Its frequency range is 900 MHz to 1900 MHz. PIC microcontroller sends actual load value to authority via SMS by using GSM.[1,2]

COMPONENTS USED

Step Down Transformer: (230/12V)

Power Supply Circuit-

- Bridge Rectifier
- Capacitor (1000 μ F, 12V)
- Regulator (7805), +5
- Capacitor (470 μ F, 12V)

Sensing Circuit-

- Variable Resistor (10K)
- Capacitor (100 μ F)
- Diode (1N4148),
- Resistor (10K)

GSM Module (SIM900A)

Microcontroller Kit

- Bridge Rectifier
- Regulator (7805)
- Capacitor (1000 μ F)
- Resistor (330 Ω , 10K)
- Crystal Oscillator (4 MHz)
- Capacitor (22 μ F, 5V)
- Reset Switch
- Controller 16F877A (5V, 40 Pin IC)
- LCD (16x2)

PRACTICAL CIRCUIT



Fig.working circuit

Working of the Circuit:

The circuit is used to save the Energy consumption and also monitoring the Lighting System. By using the step down transformer, a supply voltage is step down 230v/12v.

The step down voltage is then given to the Rectifier unit circuit to get pure DC voltage from the power supply. This circuit consist of bridge rectifier, filter, regulator IC and harmonic distortion capacitors.

The LCD will continuously monitor the light intensity and output from the PIR and display its values by specific delay.

If the value of Light intensity is more than the précised value then Street lights will be off. When light intensity is less than précised value it will turned on the street light.

But at the same time it will check output from PIR sensor, If any vehicle is detected and also light intensity is less than the précised value, then only it will turn on the Street light and it will glow Brightly

If the Light intensity is less than the précised value but the Vehicle is not detected by the PIR sensor , then it will Glow the street Dim i.e. 30%-50%.

When the any maintenance has to be carry on the street light or in case of any abnormal condition, Then SMS message sent by the operator person of the electricity board is received by the Subscriber Identification Module (SIM) inserted in the GSM module in system. The message is sent in text format which is received, extracted and then fed to microcontroller. The microcontroller uses the SMS received by GSM modem and switches the street-light ON/OFF or make it Bright/Dim. The microcontroller has in-built memory which is used to store the code which in turn controls the load.

The load which is street-light in our project is connected to microcontroller. Using solid state relay, we switch Bright and Dim operation of the street-light. The street-light is connected with a LDR to achieve feedback. The LDR produces signal according to the intensity of the street-light and informs the microcontroller whether the light is ON/OFF or DIM/Bright

CONCLUSION

Now a days, In urban areas , Street Lights are the Largest consumer of electricity and can increase up to 40% of total budget. If every urban and suburban city installed proposed mechanism then there will be a lot of Power can be saved and Proposed scheme is Power saving Mechanism for street Light using Wireless Communication i.e. GSM. This scheme is a Low cost, Remote controlling capability, and can be used to monitor the street lights. Maintenance of street lights, Load maintenance and any complaint regarding Power it can be resolve through GSM. Using this Technique, the power consumption is reduced to great extend and also the operational cost get reduce. In future, Electricity Department might adopt this kind of systems in order to save power as well as the cost. It is a most reliable and time efficient way to switch ON-OFF the street lights. While in practical applications, This scheme is used to control lighting scheme of industrial Areas , colleges and also used in university campus.

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