

WIRELESS BASED CLOSED LOOP AUTOMATION OF STREET LIGHT CONTROL USING PIR

V.VELLINGIRI^[1]Dr.M.THIRUMARIMURUGAN^[2]Dr. T.KANNADASAN^[3]

Abstract :— Nowadays the maintenance of street light is one of the major problems for electricity Board. On the other hand it also has the problem to save the powers which are consumed by the street lights. To maintain and control the street light is more complex and economical. At present we are having various street light controlling systems. To advance the street light maintenance in the technologies related to wireless communication has led to fulfill the human requirements. In this paper I propose a new mechanism to maintain the street light with Automated ON-OFF control by using PIR and Power saving mechanism. Also implementing the wireless communication to facilitate and to receive the acknowledgement when the light is turned ON or OFF and also we check the status of the light (i.e. whether the light is ON or OFF) via sending SMS.

Keywords --- SMS, GSM, PIR, Street lights, Power, Microcontroller

I. Introduction

Electricity is the major demand in the developing countries like India. According to my thought most of the power is consumed by the street lights and also there is wastage of power by operating the street lights manually. Also the power wastage is assumed if there is no person or animals in the street sides, during this time if street is in OFF condition then some amount of power is saved. So, this paper gives the advanced system to maintain street lights and save the power wastage due the street light.

V.VELLINGIRI, Director for Sri Nandhanam Group of Institutions, Tirupattur, Tamil Nadu, India-635601 Mobile No., 91508 01635

Dr.M.THIRUMARIMURUGAN, Chemical Engineering, Assistant Professor, Coimbatore Institute of Technology Coimbatore - 641 014. Tamil Nadu, India Mobile No., 09943549700

DR.T.KANNADASAN, Professor, Head Department of Chemical Engineering Coimbatore Institute of Technology Coimbatore Tamilnadu India-641014 Mobile No., -98941 00454

Also the board can reduce the maintenance cost and no. of persons needs to operate. At present the street light can be controlled by manual control and also in advance it can operated (ON and OFF) by sending SMS through GSM. But there is no system to monitor street light also no other system to provide the automatic ON and OFF by sensing humans and animals. If these factors are implemented then the wastage of power will be saved. 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 provide the acknowledgement for each SMS. For example if a operator send a message as ON street light No1 after that the acknowledgement is received as 'YES' if the respective light is ON or else 'NO' if the respective light is unable to ON.

In rural areas at midnight the significance of the street light is very less. So here also the wastage of power is raised. To tolerate this wastage it is possible to operate the street light only when the human or an animal is seen near by the respective light. In proposed system we also implement one more application i.e. the automatic ON and OFF the street light when the human or an animal seen nearer to that light by sensing them using PIR module. This case is also combined with the feedback module. Feedback module provides the status of the light and also sends a message when the light turned ON and turned OFF via SMS.

This paper is organized as follows. We briefly review the related work is described in section II. Methodology is described in section III, Experimental results and performance analysis is presented in Section IV gives. Section V concludes the paper.

II. Related Work

A new design of high power factor low cost electronic ballast with intelligent energy saving control for water treatment system ultra-violet lamps (UVL) drive is described in [1] to obtain truly pure and safe drinking water. Street lighting control system based on power line communication on demand market is described in [2]. The feasibility of tapping into the Short Message Service component of existing mobile communications network infrastructure, particularly the GSM network to act as a medium for the communication of hydrogen sensors

control signals are discussed in [3]. Remote control equipment for monitoring and managing a street lighting system is presented in [4]. It is composed by a local control, realized by master boards located inside electrical panels and slave boards mounted on each lamp post, and by a remote control realized by a central unit for the remote communication with the local control system. Remote controllable and energy-saving room architecture proposed in [5] to reduce standby power consumption and to make the room easily controllable with an IR remote control of a home appliance. The concept of a double layer capacitor (super capacitor) based hybrid power train for light rail vehicles and city bus is presented in [6]. The simulations of the hybrid power train and first practical test-bench results which have been recorded from a prototype inverter made for integration into a diesel electric bus are also presented in [6]. Energy efficient and low cost solution for street lighting system using GSM and General Packet Radio Service (GPRS) has been discussed in [7]. Paper presents design and prototype implementation of a basic home automation system based on SMS technology. The describes system consists of two main components; the GSM modem, which is the communication interface between the home automation system and the user. GSM modem uses SMS technology to exchange data, and signaling between users and home automation system [8]. Design of Intelligent Traffic Light Controller Using Embedded System describes the light controlling performance evaluation using GSM [9]. The H/W design of new street light control system designed by using Zigbee communication protocol is described in [10].

III. Methodology

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

The block diagram gives the simplest working of the proposed system. In the receiver side of the GSM modem is using the regulated voltage of 5V which is being generated by the power supply circuit. The 230V 50 Hz AC supply from the main electric line is used to feed the power supply circuit to generate 5V regulated supply for energizing the microcontroller and GSM modem. 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 required 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 received and extracted and fed to Microcontroller (ATMEL 89C51). The microcontroller uses the SMS received by GSM modem and switch the street-light ON/OFF. The microcontroller has in-built memory which is used to store the code which in turn controls the load.

The microcontroller used in the receiver side helps in decoding the AT commands and taking decisions. The load which is street-light in our project is connected to microcontroller. Using solid state relay, we switch ON/OFF the street-light. The solid state relay which accepts the triggering voltage from microcontroller is separated from the 230V 50Hz AC supply by using suitable opto-isolator. The power electronic devices like thyristors are used to implement solid state relay. The street-light is embedded with a photodiode to achieve feedback. The photodiode produces voltage according to the intensity of the street-light and informs the microcontroller whether the light is ON/OFF.

Block diagram

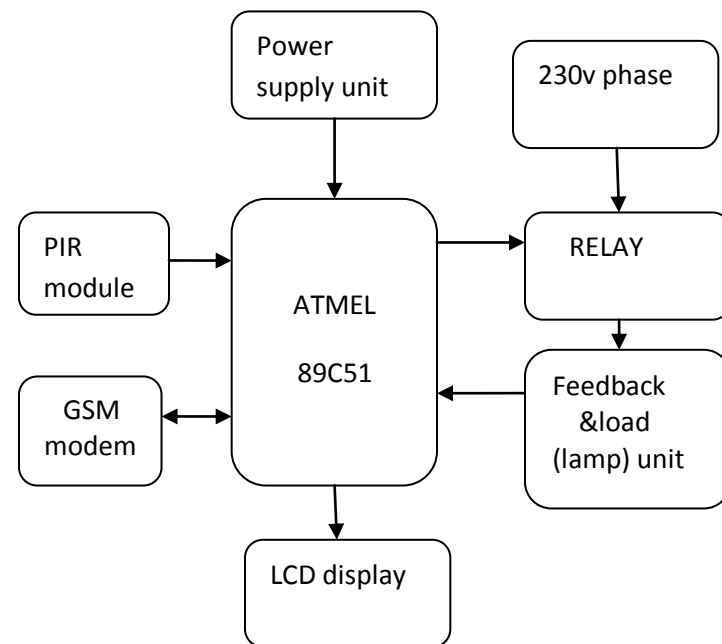


Fig 1 Block diagram.

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 sense the Human or animals near by the respective light. If the PIR sense anything nearer to the light, causes the change in amount of infrared striking the element change the voltage generated. Hence suddenly the microcontroller switch ON the respective light and send the signal to the GSM modem to send the information about that 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.

IV. Experimental result and Performance

Initially set a baud rate of 9.6 Kbps between the GSM modem and Microcontroller. The GSM modem is initialized. The microcontroller configures port-O 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 microcontroller proceed for the further operation such as switching ON the lights, checking the switch status, turning OFF the lights etc.

If the received command is for switch ON/OFF the light, after proceeding the operation the microcontroller check for status of the respective light and then send the respective command as an acknowledge. For e.g. the operator send an message as Lamp 1 ON. The microcontroller receive the message and switching the Lamp 1 to ON, after a second it check for status of the light. If the Lamp1 is in ON status then the microcontroller send acknowledge as Lamp1 ON.

Also PIR module fixed with all the device to detect the 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 is turned ON and send a message to the operator as the Lamp (NO) is ON. For e.g. if a person cross the Lamp 1 the the microcontroller switch the Lamp 1 and send a message as Lamp 1 ON to the operator. Following fig will show the operational message display,

Fig 2 Describes the message send by an operator to ON Lamp 1 and to OFF Lamp 2. Fig 3 gives the acknowledgement for the message send by an operator. Always the Acknowledgement contains the information of some set of lights which is configured with that switch.



Fig 2 Message send by an Operator to ON Lamp



Fig 3 acknowledgement received by an operator

If the operator want know the status of the lights, then send a message as STATUS after the microcontroller receives the message and send acknowledgement as shown in Fig 4, describes status of set of lights to the microcontroller.



Fig 4 Message send by an operator to check status

V. Conclusion

In most of the countries, mainly the power wastage is occurred due to the street lights and also man power is very less. If every country installed this proposed system then there will be lot of power and manual operators can be saved. Proposed system wireless based closed loop automation of street light control using PIR. It is a low cost, 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 manual operator and 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.

VI.Reference

1. Shun-Chung Wang Chi-Feng Su Chien-Hung Liu, "High Power Factor Electronic Ballast with Intelligent Energy Saving Control for Ultraviolet Lamps Drive", 0-7803-9208-6/05/\$20.00 © 2005 IEEE
2. SungKwan Cho, Vijay Dhingra, "Street Lighting Control based on LonWorks Power Line Communication", 978-1-4244-1976- 0/08/\$25.00©2008 IEEE.
3. Daniel J.S. Lim, Vishy Karri, "Remote monitoring and control for the Hydrogen safety via SMS", 1 st International Conference on Sensing Technology November 21-23, 2005 Palmerston North, New Zealand.
4. R. Caponetto, G. Dongola, L. Fortuna, N. Riscica and D. Zufacchi, "Power Consumption Reduction in a Remote Controlled Street Lighting System", SPEEDAM 2008 International Symposium on Power Electronics, Electrical Drives, Automation and Motion, Page 428-433.
5. Jinsoo Han, Haeryong Lee, and Kwang-Roh Park, "RemoteControllable and Energy-Saving Room Architecture based on ZigBee Communication", IEEE Transactions on Consumer Electronics, VoL 55, No. 1, FEBRUARY 2009. Page 264-268.
6. A. Lohner and W. Evers, "Intelligent Power Management of a Super-capacitor based Hybrid Power Train for Light-rail Vehicles and City Busses" 2004 351 h Annual IEEE Power Electronics Specialists Conference Aachen, Germany, 2004.
7. C.Maheswari, RJeyanthi, Dr.K.Krishnamurthy, M.Sivakumar "Implementation of Energy Management Structure for Street Lighting Systems", Modern Applied Science June, 2009.

8. ElKamchouchi, H. ElShafee, A. " Design and prototype implementation of SMS based home automation system" Electronics Design, Systems and Applications (ICEDSA), 2012 IEEE International Conference on 5-6 Nov. 2012.

9. Chavan, S.S Deshpande, R.S. ; Rana, J.G. "Design of Intelligent Traffic Light Controller Using Embedded System" Emerging Trends in Engineering and Technology (ICETET), 2009 2nd International Conference on 16-18 Dec. 2009.

10. J. D. Lee, K.Y. Nam, S.H. Jeong, S.B. Choi, H.S. Ryoo, D.K. Kim, "Development of Zigbee based Street Light Control System", 142440178X106/\$20.00 ©2006 IEEE, PSCE 2006. Page 2236-2240



Received the B.E degree from coimbatore institute of technology, India in 1995. He received M.E degree from SR University in 2008. At present he is working as Director for sri nandhanam group of institutions, and doing research in Mobile Communication & Embedded System under Anna University-coimbatore.



Received the B.Tech degree from Bharathiar University Coimbatore, India in 1995. He received M.Tech degree from Bharathiar University Coimbatore in 1997. At present he is working as Associate Professor for Coimbatore Institute of Technology, doing research Chemical Engineering.



At present he is working as Head of Chemical Engineering Department at Coimbatore Institute of Technology, Coimbatore, doing research Chemical Engineering.