

Automatic System for Street light Monitoring with Micro controller

Voruganti Bharath Kumar¹, Vanta Karthik Reddy², Veeraboina Kalyan Kumar³, Veeravalli Guru Venkat Sai⁴, Velmala Koushik⁵, Manala Sai Pradeep⁶, Kandula Lokesh⁷

¹Department of Electrical and Electronics Engineering, Faculty of Electrical and Electronics Engineering
St. Martin's Engineering College, Secunderabad, Telangana, India

^{2, 3, 4, 5, 6, 7} Department of Electrical and Electronics Engineering, UG Students
St. Martin's Engineering College, Secunderabad, Telangana, India

ABSTRACT: This paper aims at designing and executing the advanced development in embedded systems for energy saving of street lights. Nowadays, human has become too busy, and is unable to find time even to switch the lights wherever not necessary. The present system is like, 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. This paper gives the best solution for electrical power wastage. Also the manual operation of the lighting system is completely eliminated. In this paper the two sensors are used which are Light Dependent Resistor LDR sensor to indicate a day/night time and the photoelectric sensors to detect the movement on the street.

I. INTRODUCTION

The idea 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. Providing street lighting is one of the most important and expensive responsibilities of a city. Lighting can account for 10–38% of the total energy bill in typical cities worldwide [1]. Street lighting is a particularly critical concern for public authorities in developing countries because of its strategic importance for economic and social stability. Inefficient lighting wastes significant financial resources every year, and poor lighting creates unsafe conditions. Energy efficient technologies and design mechanism can reduce cost of the street lighting drastically. Manual control is prone to errors and leads to energy wastages and manually dimming during mid-night is impracticable. Also, dynamically tracking the light level is manually impracticable. The current trend is the introduction of automation and remote management solutions to control street lighting [2]. There are various numbers of control strategy and methods in controlling the street light system such as design and implementation of CPLD based solar Power saving system for street lights and automatic traffic controller.

II. LITERATURE SURVEY

Some authors mentioned the use of LED DC road lights as opposed to conventional AC lights in view of their longer lifespan, higher effectiveness, lower support costs and mercury free, thus eco-friendly. Some others suggested that changing lights with LED will save 50% energy from the street lights. To control and manage the street lights several new technologies are being developing as of what many research endeavors in the writing talk about. Tang, Hengyu [1] proposed a control core framework based on AT89S52 which controls street lights. This framework combines the various technologies of LCD, digital clock and a timer, photosensitive induction etc. when vehicles crossed by to conserve electricity the lights will turn on and vice versa. With this technology a large amount of power can be saved. In order to get the details of spoiled light and its information an auto-alarm function is used in this framework. Xudan, Siliang [2] came up with a system with wireless sensor networks frame work to observe the progress. Based on latitude and longitude information the system is adjusted. Using sunset and sunrise procedures and the information of light intensity the system controls the street lights being kept in automatic programming mode. The system in addition makes use of digital temperature humidity sensor to humidity, real time and temperature of street lights. Primase and Radhi [3] nominated control arrangement for a LED road lighting framework. The proposed control

organization empowers disconnection of the road lighting framework from the mains amid pinnacle load time, lessening its effect in the distributed power framework natural utilization, decline the administration cost and screen the status data of every road lighting unit. A.C. Kalaiarasan [4] volunteered a solar powered vitality-based road Light with auto-following framework for augmenting power yield from a solar system that is desirable to increase the efficiency. So as to expand the power yielded from the sun light-based boards, one needs to keep boards lined up with the sun. By utilizing this approach, we can gain the maximum utilization from sun rays. This is a far most financially savvy arrangement than buying extra solar panels. Budike. E.S. Lothar [5] invented a lightening control system consisting of modules like ballast control module, data processing module. The data processing module is connected with number of repeaters. The connections between data processing module, ballast module, repeaters and computer system through wireless connection comprises of a local area network. This system is developed to give the benefits of operating and controlling light intensity, automatic running of street lights and scheduling through web browser. S.H.Jeong [6] set forth the development of Control System for street lights using Zigbee communication system. This system is presented in order to reduce the difficulties in maintenance of the lighting systems as well as to decrease the uneasiness of handling the same. This is monitoring and control system of street lights which makes use of system's control command to make the street lights on and off automatically. Rajput and katav [7] propounded an intelligent street lighting system to lessen the large amounts of power wasted in street lightening system. This system makes use of different kind of sensors like CO2 sensor, noise sensor, light intensity sensor etc. To receive and send data between concentrator and system GSM modules are utilized. Somchai Hiranvarodom [8] describes a similar analysis of photovoltaic (PV) road lighting framework in three distinct lights. To be specific, a low weight sodium light, a high weight sodium light and a fluorescent light have been utilized for establishment in every pole to decide the reasonable framework to introduce in a regular provincial zone of Thailand.

III.EXISTING SYSTEM

Industry of road lighting frameworks are developing quickly and going with fast development of industry and urban areas. Mechanization, Power utilization and Cost Effectiveness are the imperative contemplations in the present field of gadgets and electrical related advances. To administer and keep up complex road lighting frame of reference all the more financially, different road light control frameworks are created. These frameworks are created to control and diminish vitality utilization of a town's open lighting framework utilizing distinctive advancements. The current work utilizes the high power release light (HID). Stowed away by and utilized for urban road light and is dependent on rule of gas release, In this manner the power isn't been controllable by any voltage decrease technique as the release path is broken. HID lamps are a category of electrical gas remittance lamp which bring forth light by means of an electric arc in middle of tungsten electrodes resided inside a translucent or crystalline fused quartz or inter fuse alumina arc tube. Gas and metal salts are recycled to permeate the tube. The arc's fundamental opening is done with the benefit of gas. Once the arc is initialized, it heats and disperse the metal salts materializing plasma, the plasma thus generated greatly boosts the concentration of light emitted by the arc and power consumption is curtailed. Arc lamps belongs to the category of high intensity exoneration lamps. The existing system possess the main disadvantage of want of people to turn off and on the street lights to hand-operate which, requires formidable human competency to monitor the process. Also, we need to check regularly weather all the street lights are functioning properly or not. If the street lights stop functioning properly many accidents may occur. So regular monitoring of street lights is also required. We propose a contemporary method of which reduces cost, human potential and energy consumption.

III. PROPOSED SYSTEM

The Proposed work is to control exchanging of road light naturally as indicated by light force to create stream based powerful control measurements utilizing infrared identification innovation and keep up remote correspondence

among lamp post and control terminal utilizing Zig-Bee Wireless convention. This proposed framework uses the most recent innovation for the wellsprings of light as LED Lamps rather than for the most part utilized road lights, for example, High compression Sodium Lamps, and so forth. The LED innovation is favoured as it offers a few points of interest over other conventional advancements like vitality sparing because of high current iridescent productivity, low upkeep cost, high shading rendering list, quick start up speed, long working life and so forth. The main components used in the proposed system include are explained below.

LDR:The theoretical concept of the light sensor lies behind, which is used in this circuit as a darkness detector. The LDR is a resistor as shown in Fig. 2, and its resistance varies according to the amount of light falling on its surface. When the LDR detect light its resistance will get decreased, thus if it detects darkness its resistance will increase.

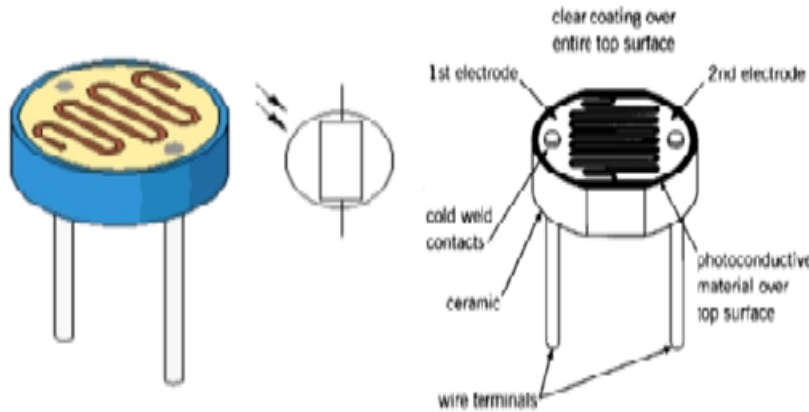


Fig.1 LDR

Photoelectric Sensor

To detect the movement in the street, the photoelectric sensors have been used in this paper, Where emitter and receiver are in one unit as shown.



Fig.2 Photoelectric Sensor

Table 1 Photoelectric sensor specifications

Photoelectric Sensors (MC005)	
Sensing range	3-80 cm
Sensing object	Translucency, opaque
Supply voltage, current	DC 5V, 100mA
Output operation	Normally open
Output	DC three-wire system (NPN)
Diameter, Length	18mm, 45mm
Ambient temperature	-25_70

Regulated Power Supply

Usually, we start with an unregulated power supply ranging from 9volt to 12volt DC. To make a 5volt power supply, KA8705 voltage regulator IC as shown has been used. The KA8705 is simple to use. Simply connect the positive lead from unregulated DC power supply (anything from 9VDC to 24VDC) to the input pin, connect the negative lead to the common pin.



Fig.3 Powerv Supply Regulator

Relays

Relays are remote control electrical switches that are controlled by another switch, such as a horn switch or a computer as in a power train control module. Relays allow a small current flow circuit to control a higher current circuit. Several designs of relays are in use today, 3-pin, 4-pin, 5-pin, and 6-pin, single switch or dual switches. Relays which come in various sizes, ratings, and applications, are used as remote control switches. Fig.shows different types of relays. In this paper, the 4-pin relay will be used.



Fig.4 Different types of Relays

PIC16F877A Microcontroller

A microcontroller is a computer control system on a single chip. It has many electronic circuits built into it, which can decode written instructions and convert them to electrical signals. The microcontroller will then step through these instructions and execute them one by one. As an example of this a microcontroller we can use it to control the lighting of a street by using the exact procedures. Microcontrollers are now changing electronic designs. Instead of hard wiring a number of logic gates together to perform some function we now use instructions to wire the gates electronically. The list of these instructions given to the microcontroller is called a program. There are different types of microcontroller, this project focus only on the PIC16F877A Microcontroller where its pins are shown in Fig

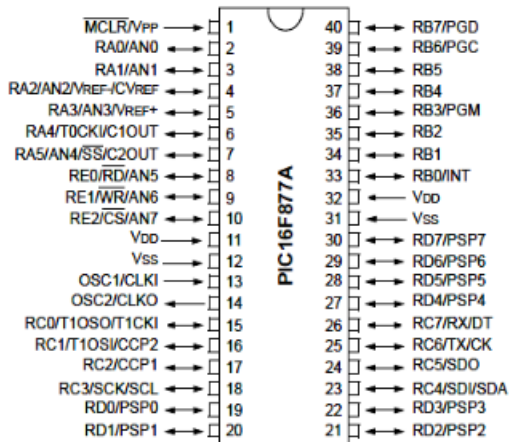


Fig.5 Pin diagram of PIC16F877A microcontroller

Automatic Street light control Circuit Design

The inputs in the streets lighting system are LDR and photoelectric sensors, after dusk the light sensor will activate the system, to be ready to detect any object by photoelectric sensors, on the road to turn ON the streetlights. Lamps will be used as streetlights in this paper. In this section each circuit, which has been designed will be discussed. Firstly the LDR circuit as shown in Fig. 7, the LDR and RV1 form one arm of the bridge, and R1-R2 form the other arm. These arms can actually be regarded as potential dividers, with the R1-R2 arm applying a fixed half-supply voltage to the non-inverting input of the op-amp, and with the LDR-RV1 divider applying a light-dependent variable voltage to the inverting terminal. The project aims were to reduce the side effects of the current street lighting system, and find a solution to save power. In this project the first thing to do, is to prepare the inputs and outputs of the system to control the lights of the street. The prototype as shown in Fig has been implemented and works as expected and will prove to be very useful and will fulfil all the present Constraints if implemented on a large scale.

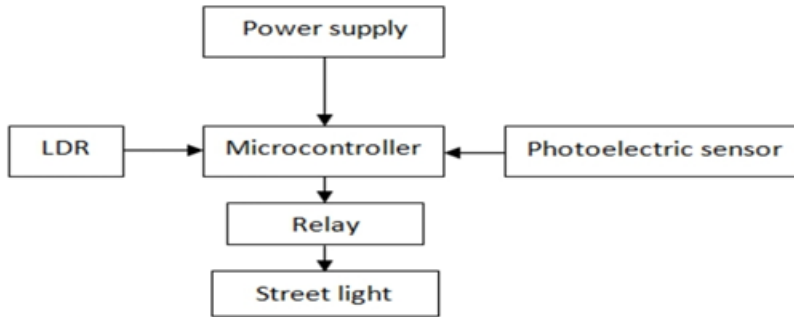


Fig.6 Block diagram of street light system

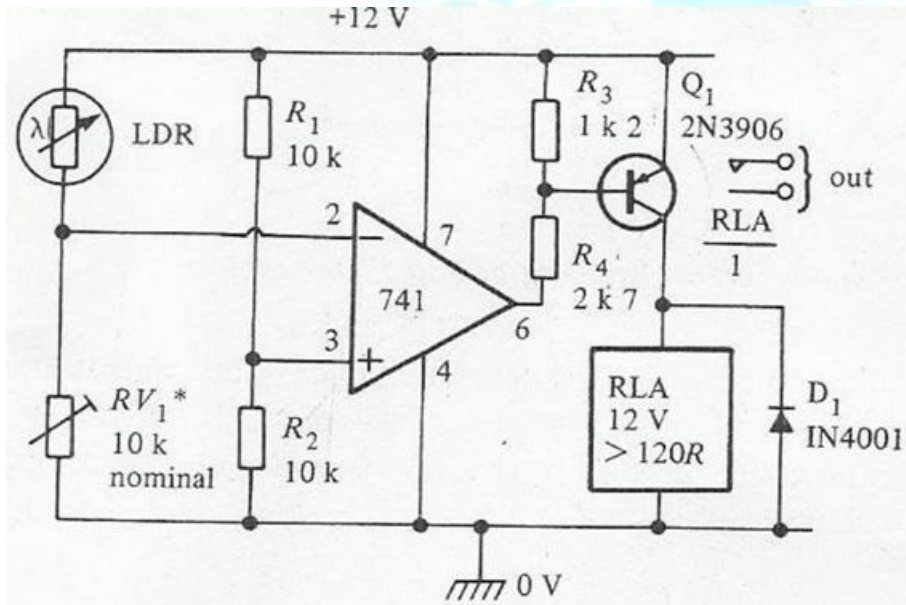


Fig.7 LDR circuit

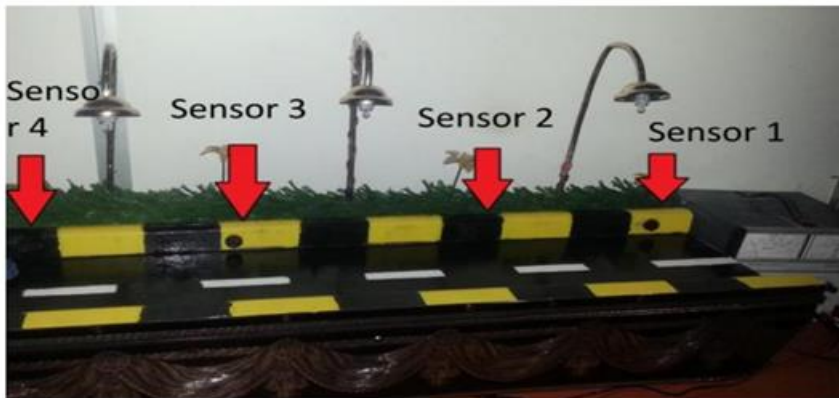


Fig.8 Prototype of street light system

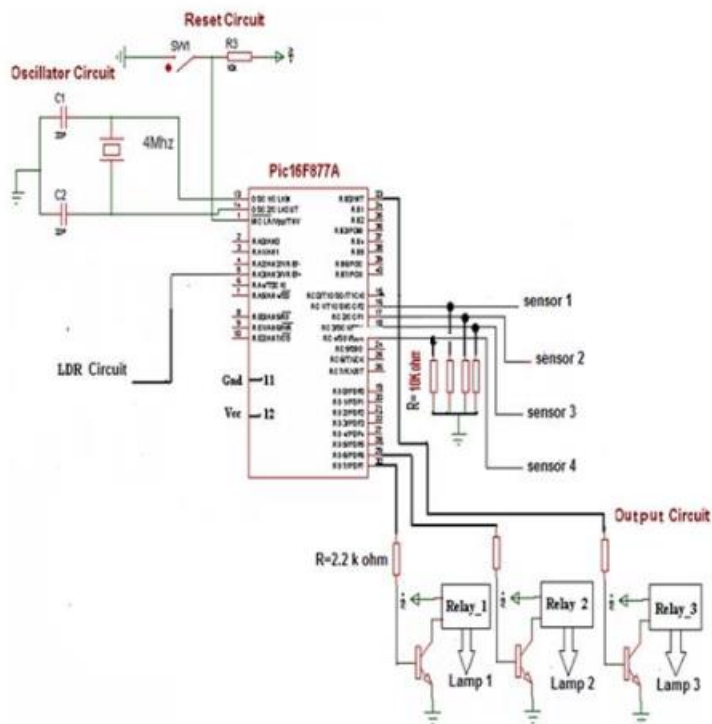


Fig.9 Schematic circuit of the street light system Conclusion

CONCLUSION

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. LDR sensor and the photoelectric sensors are the two main conditions in working the circuit. If the two conditions have been satisfied the circuit will do the desired work according to specific program. Each sensor controls the turning ON or OFF the lighting column. The street lights has been successfully controlled by microcontroller. With commands from the controller the lights will be ON in the places of the movement when it's dark. Furthermore the drawback of the street light system using timer controller has been overcome, where the system depends on photoelectric sensor. Finally this control circuit can be used in a long roadways between the cities.

REFERENCES

1. Hengyu Wu, Minli Tang and Guo Huang, "Design of multi-functional street light control system based on AT89S52 single-chip microcomputer," The 2nd International Conference on Industrial Mechatronics and Automation, Wuhan, 2010, pp. 134-137. DOI: 10.1109/ICINDMA.2010.5538068.
2. X. Shentu, W. Li, L. Sun and S. Gong, "A new streetlight monitoring system based on wireless sensor networks," The 2nd International Conference on Information Science and Engineering, Hangzhou, 2010, pp. 6394-6397. DOI: 10.1109/ICISE.2010.5691530.
3. Priyasree, Radhi & H Kauser, Rafiya & E, vinitha & Gangatharan, N. (2012). "Automatic Street Light Intensity Control and Road Safety Module Using Embedded System," International Conference on Computing and Control Engineering (ICCCE 2012), At Coimbatore Institute of Information Technology, 2012.
4. C.Bhuvaneswari, R.Rajeswari and C.Kalaiarasan "Analysis of Solar Energy Based Street Light with Auto Tracking System," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 2, Issue 7, July 2013.

5. “Wireless internet lighting control system”, Budike. E.S. Lothar (Power web Technologies), US patent 7,167,777, Jan 23, 2007.
6. J. d. Lee, K. y. Nam, S. h. Jeong, S. b. Choi, H. s. Ryoo and D. k. Kim, "Development of Zigbee based Street Light Control System," 2006 IEEE PES Power Systems Conference and Exposition, Atlanta, GA, 2006, pp. 2236-2240. DOI: 10.1109/PSCE.2006.296311.
7. K.Y.Rajput, Gargeyee Khatav, Monica Pujari, Priyanka Yadav, “Intelligent Street Lighting System Using Gsm,” International Journal of Engineering
8. D. A. Devi and A. Kumar, Design and Implementation of CPLD based Solar Power Saving System for Street Lights and Automatic Traffic Controller, International Journal of Scientific and Research Publications, Vol. 2, Issue11, November 2012.
9. J. Mohelnikova, Electric Energy Savings and Light Guides, Energy& Environment, 3rd IASME/WSEAS International Conference on, Cambridge, UK, February 2008, pp.470-474.
10. M. A. Wazed, N. Nafis, M. T. Islam and A. S. M. Sayem, Design and Fabrication of Automatic Street Light Control System, Engineering e-Transaction, Vol. 5, No. 1, June 2010, pp 27-34.
11. R. Priyasree, R. Kauser, E. Vinitha and N. Gangatharan, Automatic Street Light Intensity Control and Road Safety Module Using Embedded System, International Conference on Computing and Control Engineering, April 2012.
12. K. S. Sudhakar, A. A. Anil, K. C. Ashok and S. S. Bhaskar, Automatic Street Light Control System, International Journal of Emerging Technology and Advanced Engineering, Vol. 3, May 2013, PP. 188-189.
13. K.Y. Rajput, G. Khatav, M. Pujari, P. Yadav, Intelligent Street Lighting System Using Gsm, International Journal of Engineering Science Invention, Vol2, Issue 3, March 2013, PP. 60- 69.
14. M. Popa, C. Cepișcă, Energy Consumption Saving Solutions Based on Intelligent Street Lighting Control System. U.P.B. Sci. Bull., Vol. 73, April 2011, PP. 297-308.
15. Lighting Control System for a Wireless Sensor Network with Increased Sensor Lifetime and Reduced Sensor Numbers, Sensors, Vol. 11, PP. 8933-8952.
16. L. Jasio, T. Wilmshurst, D. Ibrahim, J. Morton, M. Bates, J. Smith D. Smith and C. Hellebuyck, PIC Microcontrollers: know it all, Publishing Elsevier Science, 2008.
17. W. Bolton. Instrumentation and Control Systems, Elsevier Science & Technology Books, August 2004.
18. PIC16F87XA Data Sheet. 2003 Microchip Technology.