

DESIGN OF ENERGY EFFICIENT STREET LIGHT FAULT MONITORING SYSTEM USING GSM NETWORKS

¹Mrs.M.Shagar Banu., Assistant professor ²K.Kathija Yasmeen,
³M.Sumiya Banu

^{1,2,3}Department of Electrical and Electronics Engineering,
Dhaanish Ahmed College of Engineering, Chennai, (India)

ABSTRACT

This project proposed with a new innovative street light system with optimized street light management and efficiency is presented. It uses sensors to control and offer a most efficient system. Presence of any object or human is detected by using the presence detector sensors. Street lights will be switched ON only when a person or an obstacle comes in the detection range else it will be in DIM state. GSM, wireless communication devices which allow more efficient street lamp management system and control. PIC controller will check the state of street lamp and informs to electricity board to control the system by sending message through GSM module. The system allows abundant energy savings with increased consummation and maintainability. The manual works will be reduced to a greater extent.

Keywords— Piezoelectric effect, Vehicle movement sensing, Dimming, Power consumption, GSM communication

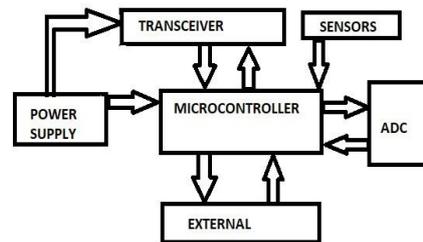
I. INTRODUCTION

Nowadays street lamp lightning is the part of infrastructure, which plays a major role at traffic safety, illuminate the city's streets lamps during dark hours of the day, society security, city appearance style and feature. Road lighting is an application of illumination system along roadways primarily for the purpose of improving safety by increasing visibility of roadside hazards. The maintenance of the street lighting network is one of major duties of the electrical distribution companies.

Since the monitoring and GSM system reports the street light faults, we will benefit from time saving, less maintenance cost and higher system reliability. It can bring about considerable energy saving by monitoring the faults in street lightning networks and controlling the lamp brightness intensity.

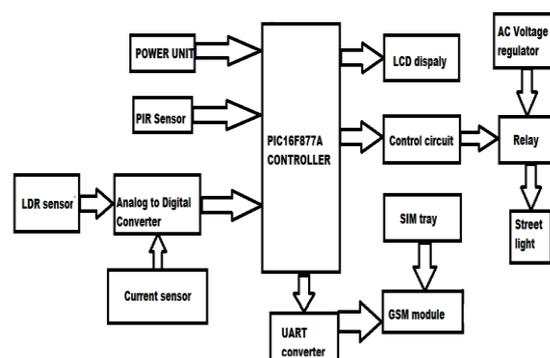
Smart wireless street lightning system using sensors that are able to make the system more efficient and reliable. The control is implemented through a network of sensors to collect the relevant information related to the management and maintenance of the system, transferring the information via wireless using the GSM control.

II.EXISTING SYSTEM



- Street light is poorly designed and not regularly maintained.
- The switches of street lights are switched ON/OFF manually by the workman in the entire zone.
- This leads to the rise of man power and time.
- As it's human operation it lead to errors.
- The street lights are switched ON/OFF manually by the workman in all the zones.
- This leads to the rise of man power and time. As it is human operation it is prone to errors.
- There is a complaint register in every zonal office street light section.
- The maintenance of street light is done by the line technician.
- The complaint received from public and corporation officials either over phone is in person being recorded in the complaint register.
- The complaint which is entered and cleared by the technician.

III.PROPOSED SYSTEM



- In this project a new innovative street light system with optimized street light management and efficiency is presented.
- Hence the health of the street lamp status is monitored by this system .
- Instead of switching off the lamps we control the intensity of the lamp which reduces the maintenance as well as increases life of lamp.
- This feature allows a greater energy conservation.
- In addition, any faulty lamp will be automatically turned OFF which avoid more energy wastage causes by the faulty lamps.
- Instead of using microcontroller, advanced PIC16F877A controller is used to check the status of street lamp and informs through GSM module to the control by sending a message to the prescribed number.
- PIR sensor is used, instead of using piezoelectric sensor.
- The system allows substantial energy savings with increased performance and maintainability.
- By using this system the manual works will be reduced to a great extent.

GSM Module:

This GSM Modem can accept any GSM network act as SIM card and just like a mobile phone with its own unique phone number. In this modem, RS232 port to communicate and develop embedded applications. The SIM800C is a complete Dual-band GSM/GPRS solution in a SMT module featuring an industry-standard interface, the SIM800CS is a quad-band GSM/GPRS module that works on frequencies GSM850MHz, delivers performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption.

Fig 1. Gsm communication



Sensor module:

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. Pyroelectric devices, such as the PIR sensor, have 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.

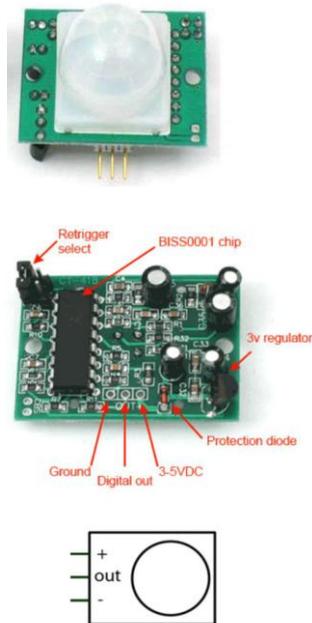


Fig 2. PIR sensor

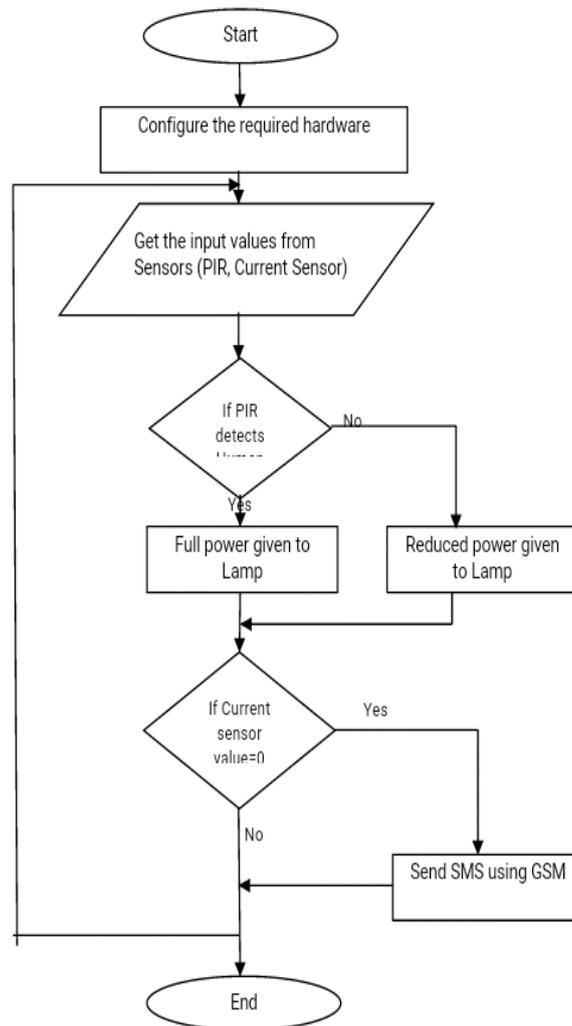
PIC controller:

This board is build with PIC16F877A as a microcontroller unit. The input supply to the board can be fed from both ac and dc. A serial communication is achieved by an UART protocol. This board is specially designed for connecting digital and analog sensors which has input voltage range 5 or 12V_{DC} as well as it can be interfaced with serial communication devices, relay boards etc. The output can be monitored in LCD as well as pc. Data EEPROM is used to store data defined by the user. When a variable is defined it is stored in program memory and the value of the variable is stored in data EEPROM Synchronous serial ports are used to communicate with other peripheral devices. They have two modes: 1) SPI Serial Peripheral Interface & 2) I2C Inter Integrated Circuit.

Fig 3.PIC controller



IV.FLOW CHART



V. IMPLEMENTATION

Flow of the implemented system is explained with the help of flow chart given above.

The given flowchart is based upon the initialize all the devices such as, PIR sensor, current sensor, lamp and LCD etc.

After the initialization, the hardware configuration is done. Then the input of the PIR sensor is taken from the command signal of PIC16F77A.

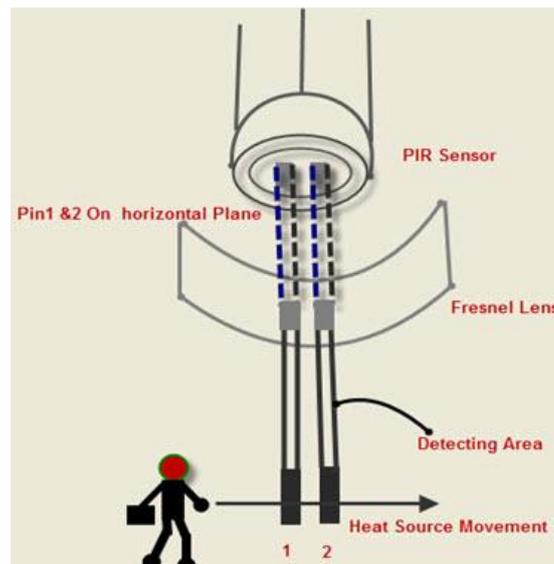
If the PIR sensor is detecting the value is zero [key=0] , then the lamp will be glowing with the full intensity. After that the current sensor producing the value , if the current sensors value is zero[value=0], the loop of the flowchart is going again to the previous one.

Then it taking the values process going on. Otherwise the value of the sensor is one [key=1], after that the power given to the lamp is reduced. The lamp will goes to the dimmer stage.

The current sensor if producing the key=0 the SMS will be send to the GSM and the process to be end.

VI. EXPERIMENT DEVELOPMENT

The LDR sensor is having an input of 9v dc supply from the whole power unit circuit. It will operate at low light intensity in the surroundings. The both of current sensor and the LDR sensor is give the input for analog to digital converter. Then the ADC is given the specified input for the PIC controller. The PIC controller is place a major role in the system. The for the PIR sensor.



The control circuit is to provide for triggering process of PIC and whole circuit. Every control circuit is composed of a number of basic components connected together to achieve desired performance. The control circuit having the components of resistors, capacitors, LEDs, transistors, inductors and integrated circuit in build in the control circuit. Input supply for the PIC controller fed to both ac and dc.

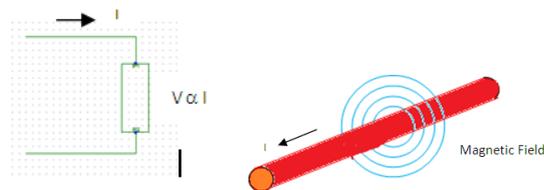
Then the serial communication protocol in PIC controller is archived by UART. The GSM module is send the message to the control center or the individual person mobile network. The GSM module has a SIM tray to place the subscriber identity module. If any fault occurs in our lamp, that will send the message to the control center. The instruction is given on the LCD display. The process is mainly processed by the PIC controller. It has a programmable memory and also the programming instruction inside the PIC controller. When an LDR is brought from a certain illuminating level into total darkness, the resistance does not increase immediately to the dark value.

The LDR sensor is resistance range from, kilo ohm to mega ohm. The resistance of the LDR sensor is depends upon the illumination, the illumination of the lamp and the resistance both are in inverse proportionality. If the light intensity is increase the resistance should be decrease visa versa... The light intensity archives 1000lumens in the LDR sensor.

A current sensor is a device that detects and converts current to an easily output voltage which is proportional to the current through the measured path.

When a current flows through a wire or in a circuit, voltage drop occurs. Also, a magnetic field is generated surrounding the current carrying conductor. Both of these phenomena are made use of in the design of current sensors. Thus, there are two types of current sensing: direct and indirect. Direct sensing is based on Ohm's law, while indirect sensing is based on Faraday's and Ampere's law.

Direct Sensing involves measuring the voltage drop associated with the current passing through passive electrical components.



VII. CONCLUSION

The intelligent street light system designed in this paper, easy to detect the system fault detection using GSM network. Application of this system is used in rural areas, highways and urban areas. The system can be extended easily, is flexible and also adjustable according to the need of user. Use of GSM technology made the system wireless, less complex. The system should be more efficient in case of supply usage compare with other systems.

The LDR is used In order to reduce power consumption. Better configuration is reached for intensity control. It is also one of the economical efficient projects in future implementation.

REFERENCES

- [1] R.Abinaya, V.Varsha, Kaluvan Hariharan, "An intelligent street light system based on piezoelectric sensor networks", 2017 4th International Conference on Electronics and Communication Systems(ICECS), 978-1-5090-3355-3/17/\$31.00 ©2017 IEEE.
- [2] Ms. Swati Rajesh Parekar, Prof. Manoj M. Dongre, "An Intelligent System for Monitoring and Controlling of Street Light using GSM Technology", 2015 International Conference on Information Processing (ICIP) Vishwakarma Institute of Technology. Dec 16-19, 2015, 978-1-4673-7758-4/15/\$31.00 ©2015 IEEE .
- [3] Shubhangi N Danke, Jayashree P Ingale, Sonali N Landge, Prof.Ritesh A patil, Prof. Saurabh M Ingale, "Automatic Street Light Control and Fault Detection", Resinacp International Journal of Science & Engineering Volume 1, Issue 3, April 2017, Paper ID:EE6012.

- [4] Abdul Latif Saleem, Raja Sagar R, Sachin Datta N S, Sachin H S, Usha M S, “Street Light Monitoring and Control System”, International Journal of Engineering and Techniques - Volume 1 Issue2, Mar – Apr 2015.
- [5] Yongtao Yu, Jonathan Li, Haiyan Guan, Cheng Wang, Jun Yu, “Semiautomated Extraction of Street Light Poles From Mobile LiDAR Point-Clouds”, IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING, VOL. 53, NO. 3, MARCH 2015, 0196-2892 © 2014 IEEE.
- [6] Sakshi Anand, Dr.Neelu Jain, “Intelligent Street Light using RF Transmission”, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 5, Issue 5, May 2015, ISSN:2277 128X, ©2015, IJARCSSE.
- [7] Lucky Gangwar, Mohd Azaz, Mohit Singh, Mubashir, Dr. Farooq Hussain, “Vehicle Movement Based Street Light Using Laser Light”, Imperial Journal of Interdisciplinary Research(IJIR), Vol-3, Issue-5, 2017, ISSN: 2454-1362.
- [8] Chaitanya Amin, AshutoshNerkar, Paridhi Holani, Rahul Kaul, “GSM Based Autonomous Street Illumination System for Efficient Power Management ”, International Journal of Engineering Trends and Technology- Volume4Issue1- 2013, ISSN: 2231-5381.