

STREET LIGHT MONITORING AND CONTROLLING SYSTEM

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Abstract--The objective of the project is to provide automatic control and monitoring on street light. The project deals with designing a lighting system which targets the energy saving and autonomous operation on economical affordable for the streets and immediate remedy on complaint. The Energy Consumption of street light of a specified area can be recorded and accounted on Energy Saving Lighting System with integrated sensors and controllers. Moreover, errors which occur due to manual operation can also be eliminated. Also the street lights can be switched ON/OFF through computer from central control station or can be automated using light sensors embedded in the street light pole circuit of the application. With these facilities the performance and life of the lamps will be increased. The application is based on client server model.

Keywords--Sensors, GSM module, Microcontroller, Street Light controlling, Fault Detection

I. INTRODUCTION

A well-designed, street lighting system should permit vehicles /pedestrians to travel at night with good visibility, in safety and comfort, while reducing many malfunctions that occur during night and enhance the appearance of the neighborhood. Conversely, poorly designed lighting systems can lead to poor visibility which may not be helpful for any pedestrian or vehicle passing by that street.

Quite often, street lighting is poorly designed and inadequately maintained (e.g., there are large numbers of burned-out lamps), and uses obsolete lighting technology, thus consuming large amounts of energy and financial resources (due to street lights glowing during the day time), while often failing to provide reliable lighting System.

Providing street lighting is one of the most important and expensive responsibilities of a city. Street lighting is particularly a critical concern for public authorities in developing countries because of its strategic importance for economic and social stability. Our proposed plan for street light monitoring and control system can provide automated street lighting maintenance. This maintenance can also enable municipalities to expand street lighting to additional areas, increasing the availability of street light for all the streets and also other underserved areas. In addition, improvements in lighting quality and expansion in services can improve safety conditions for both vehicle traffic and pedestrians.

In recent years there has been an increased amount of attention paid to the condition of electrical distribution systems, including those supplying street lights. The consequences of these incidents range from pedestrians reporting a “tingling” sensation to cases which have resulted in fatality. The application is designed in such a way that we place light sensors in all the street lights circuit and which are responsible to switch on and off automatically. Once the lights are switched on, current sensors placed at every light pole are responsible to report problem status to the centralized system with the help of GSM module attached with the circuit. With the status available in the centralized system, the workman now can easily locate the faulty light for repair hence reducing the time to search it and repair. The system also collects useful information from each street light at the end of each day. The information is stored in the database and based on this information charts are derived. The charts are

displayed in the street light section which contains information like power consumption, total number of burning hours, total number of interruptions, tally the actual power consumption with the power supplied, details of fault detection i.e. actual location of street light.

The proposed system aim to achieve individual faults repaired within few working hours instead of taking days/even months time spent in current system where a staff actually goes on “light patrols” six/eight times a year to check for such faulty lamps. Generally, they rely on residents or other municipal employees to report active lights (in other words, faulty street lights).

II. LITERATURE SURVEY

[1] Automatic Street Lights, This project is all about to control the power consumptions at the streets and eliminating manpower. This includes controlling a circuit of street lights with specific Sensors, LDR and Microcontrollers during day and night. This requires three basic components i.e. LDR, Sensors and microcontroller. During daytime there is no requirement of street lights so the LDR keeps the street light off until the light level is low or the frequency of light is low the resistance of the LDR is high. This prevents current from flowing to the base of the transistors. Thus the street lights do not glow.

[2] Automatic Street Light Control System Using Microcontroller, 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. 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. the microcontroller PIC16F877A is used as brain to control the street light system, where the programming language used for developing the software to the microcontroller is C-language.

[3] Automated street lighting using PLC, Street light controlling using PLC is a novel concept using XD26 PLC controller. In this system manual work is not required. Automatic switch ON and OFF of light in response to sunlight is done by using LDR, which plays a major role. Effect of seasonal variations; increased energy efficiency; low operating costs low maintenance costs are advantages of this method. The testing and analysis of this project with accurate operation of the streetlights is done involving Crouzet Millennium software.

[4] GSM based smart street light monitoring and control system, it is an automated system designed to increase the efficiency and accuracy of an industry by automatically timed controlled switching of street lights they are basically two modules which include the client side and the server side. the client side consists of GSM modem which is further connected to the microcontroller. the server side consist of java based web server

[5] Intelligent Street Lighting System Using GSM, Conventional street lighting systems in areas with a low frequency of passersby are online most of the night without purpose. The consequence is that a large amount of power is wasted meaninglessly. With the broad availability of flexible-lighting technology like light-emitting diode lamps and everywhere available wireless internet connection, fast reacting, reliably operating, and power-conserving street lighting systems become reality. The purpose of this work is to describe the Intelligent Street Lighting (ISL) system, a first approach to accomplish the demand for flexible public lighting systems.

[6] GSM based RFID approach to automatic street lighting system, This system proposes a new way of reduced power consumption. With this system, recovering from power failure period can be reduced. Street light maintenance, load maintenance and if there is any complaints regarding power it can be intimated through GSM. In future the Electricity department can adopt this system in order to save

power as well as time. This system can be extended in such a way that time taken for processing any new power connection request can be minimized by using RFID.

[7] Arm Based Street Lighting System with Fault Detection, In this paper a new innovative street light system with optimized street light management and efficiency is presented. It uses many sensors to control and guarantee a better efficient system. Presence of a person or an obstacle 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 switched OFF. Wireless communication uses GSM devices which allow more efficient street lamp management system and control. Arm processor will check the state of street lamp and informs through GSM module to the control by sending a message to the prescribed number. 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.

[8] CitiPower and Powercor - Report Streetlight Fault, the project is committed to maintaining the highest of standards of street lighting quality and reliability, and will attend to faulty streetlights as soon as practicable when notified of their condition, or immediately when they are identified through our regular patrols. Customers can assist us in keeping streetlights in top working order by reporting faults directly to CitiPower or Powercor. You can report the exact address of damaged streetlights on our 24 hour Service Faults and Difficulties telephone lines or via the online reporting services.

III. EXISTING SYSTEM

Street light is poorly designed and inadequately maintained, there are large number of burned out lamps which leads to insecurity. There is a complaint register in every zonal office street light section. It is being maintained by the line inspector. The complaint received from public, councilors and corporation officials either over phone is in person being recorded in the complaint register(Fig 1). The complaint thus entered is being handed over to the fieldwork man so as to rectify the complaints. the field staff will have the rounds in the respective areas twice in a week and the complaints about non burning are also being attended then and there. But this is not the immediate remedy on complaints and has many disadvantages like the repair work takes days/even months instead of taking few hours which results in delay, telephone line may be busy, sometimes no response.



Figure 3.1.

The switches of street lights are switched ON/OFF manually by the workman in all the zones(Fig 2). This leads to the rise of man power and time. As it is human operation it is prone to errors.



**Operating street
light manually**

Figure 3.2.

IV. PROBLEM STATEMENT

Existing methods like registering the complaint, switching on/off the light manually is time consuming & requires man power. The new method automatic ON/OFF and fault detection without human intervention is easier when compared to the existing system.

V. OBJECTIVE

The objective for this project is to design a lighting system which targets the energy saving and autonomous operation on economical affordable for the streets and immediate remedy on complaints. The Energy Consumption of various services can be recorded and accounted. Build an energy saving lighting system with integrated sensors and controllers. Moreover, errors which occur due to manual operation can also be eliminated. As all the Street Lights can be switched ON/OFF through computer from central control station and no labor is required for switching ON/OFF. Doing all these in turn increases the performance and life of the lamps

VI. SCOPE

- Switch on and off automatically.
- Street light fault detection.
- Automatic switching off alternate lights during late night to limit the power consumption.
- If complaint not rectified by area wise system then information to higher level office(Zonal level) based on some constraint like not rectified even after two days.
- Alert notification and automatic off for particular street light if there is any abnormal or subnormal consumption of power to avoid short circuit or any such related problems, also message to the respective workman.
- The useful information is collected from the street light at the end of each day this information is stored in a database and based on this information charts are derived.
- Chart contains information like, Power consumption, Total number of burning hours, Total number of interruptions.

VII. DESIGN DIAGRAM

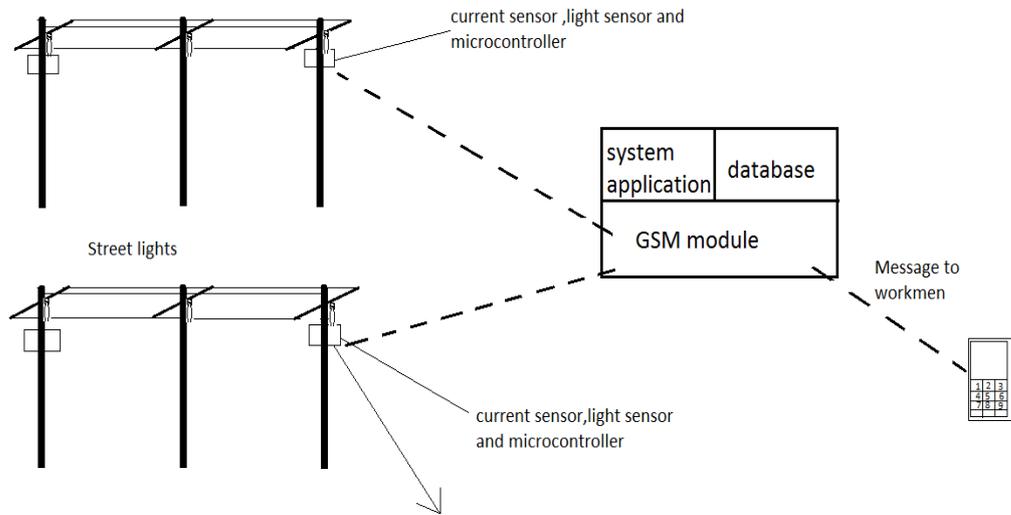
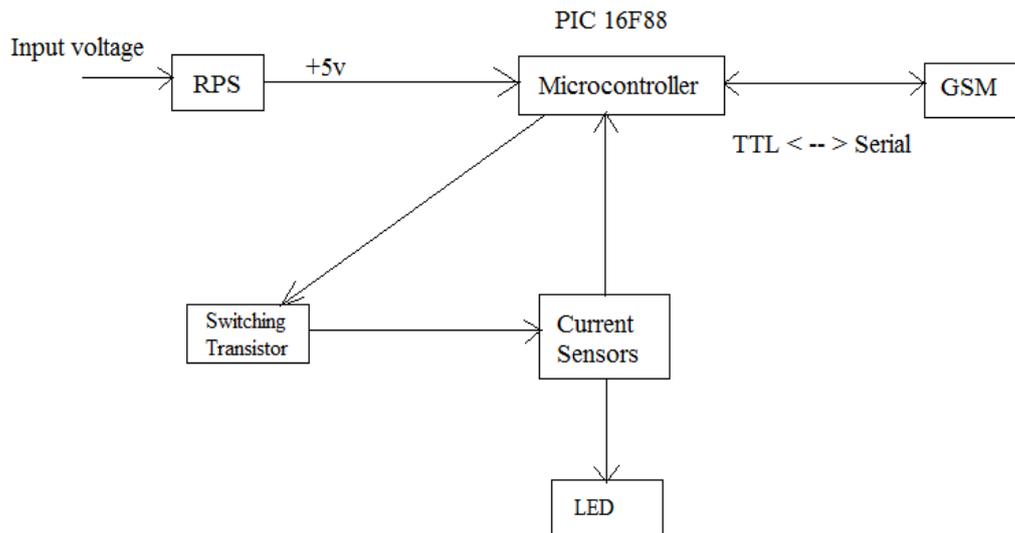


Figure 7.1



Block Diagram of Street light monitoring and controlling system

Figure 7.2

VIII. USE CASE DIAGRAM

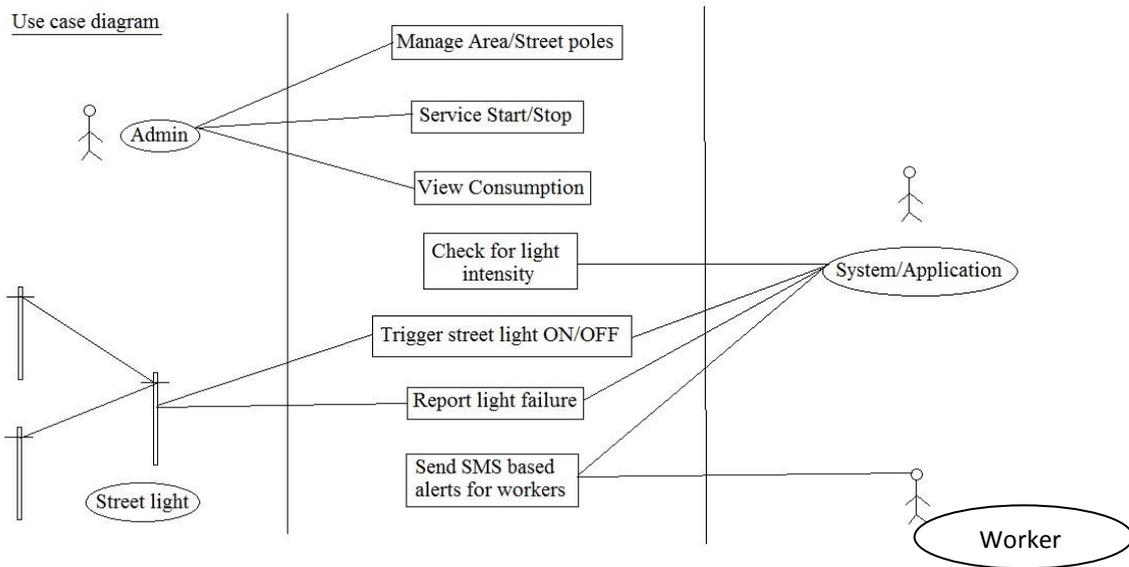


Figure.7.3

Fig.7.3 shows the Use Case diagram that introduces the major characters of the project i.e. Admin , System/Application , Street light and the worker . It also mentions their respective functions and the operations they are involved in.

The admin is mainly responsible for managing the area and also responsible for when to start or stop the service. System/application periodically gets light intensity value from the light intensity sensor based on that it triggers street light ON/OFF. The Street light actor report the failure to system then the system sends SMS based alerts to the authorized worker.

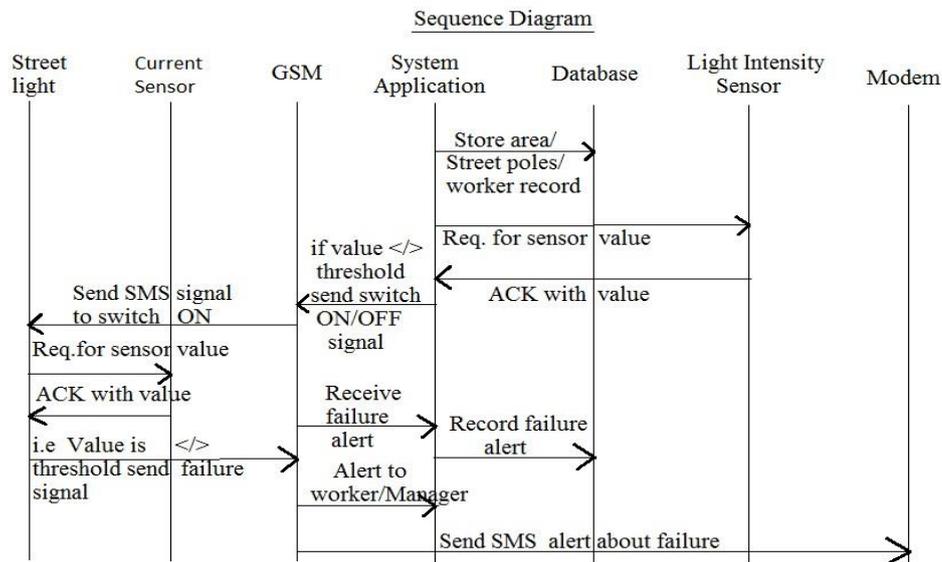


Figure.7.4

IX. SEQUENCE DIAGRAM

Fig 7.4 shows the step by step tasks that occur during the course of the project are mapped using the Sequence system. A continuously running application manages the database containing the number of areas, number of street light poles, information regarding the workman assigned to a street etc. it also periodically asks the sensor value from the light intensity sensor based on the value received then it sends signal to GSM whether to switch ON or OFF the lights then the GSM sends a message to the microcontroller located in pole to switch ON the light. The microcontroller periodically asks sensor value from the current sensor located in the pole this sensor sends response by sending the value if the received value is less than the fixed threshold value then microcontroller reports the failure to GSM then it sends message to the concerned workman to rectify the problem and also to the application system to update the database.

X. HARDWARE REQUIREMENTS

- System Compactable with Visual Studio .Net 2010 [Windows Forms]
- Microcontroller [PIC 18F Family]
- Current Sensor [1 Ampere]
- Light Sensors [LDR]
- GSM Module [Sim900]

XI. SOFTWARE REQUIREMENTS

- Windows Version
- Microsoft Visual Studio .Net 2010 [C# Language]

REFERENCES

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