STREETLIGHT CONTROLLING AND MONITORING USING GSM TECHNOLOGY

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***Abstract*: Street light is a raised source of light that is commonly used along walkways and streets when the surrounding turns dark. Nowadays, most of the existing street light systems are wired which are not only difficult to construct but also has poor flexibility. To overcome this, wireless system is required. In this report, we are using GSM technology which uses power efficiently by remotely monitoring and controlling the system. This system will ease the fault detection and maintenance. System allows us to make the most efficient use of the energy received from the sun to power street lights. Solar energy is collected with the aid of solar panel and battery is charged during day time and this energy is used to power street lights during night. Developed intelligent system turns the light ON and OFF depending on the vehicle or pedestrian movement, Real Time Clock and light intensity at the same time. Microcontroller processes the information from the sensors and is transferred to nearby control terminal (Base station with Raspberry PI as a compute module) to monitor the status of the street lamp using GSM technology via Short Message Service (SMS). Designed system is visualized by creating Graphical User Interface (GUI). Thus, the implementation of such system will result in energy saving, lower cost of maintenance, increased lifespan and hence the enhanced performance of the system.**

***Keywords*: Atmega, GSM, LED, Raspberry Pi, Sensors, Street Light.**

1. INTRODUCTION

Today, Street lamp lighting is city's part of infrastructure, which plays major role at traffic safety, illuminate the city's streets during dark hours of the day, society security, city appearance style and feature. The main purpose of road lighting is to make people, vehicles and objects on the road visible. Number of streets in the town and the city before were small, so controlling these street lamps was not so hard, but growth in urbanization, has increased the number of streets in the town rapidly which made street lamp's control and management difficult. At present, street lamps are controlled manually in most of the cities, a control switch set in each of the street lamps, which is inefficient and a waste of manpower as well as electricity, also difficult to operate street light opening and closing time, so large amount of power is wasted which leads to street light's automation.

In view of the present specific situation in engineering field green issue has been raised where many researchers and engineers are involving themselves to find the techniques to reduce energy consumption, environment friendly equipment and to increase product efficiency. The best method is the smart system when it is applied in industrial, residential and commercial areas etc. Smart system is an autonomous operation which detects the change in environment with the help of sensors and act to correct the offset cause of the environment. The systems perform continually to reach the optimal solution. The main advantage of the street light is the extension of human life quality for the dark period of the day. Life quality comprises the crime prevention, traffic safety on road, aesthetic impact, behavior of human and many more. Street lighting consumes two percent of global energy and also responsible for the annual exhaust of millions of CO2.

Many researches and techniques are made by engineering students, faculty of universities, colleges and research organizations to make the outdoor lighting system less power consuming. The latest technology, which is used globally in these days is light emitting diode based system, it is treated as energy efficient and reliable lighting technology, which reduced the public lighting cost as well as energy consumption up to 80% and also responsible for the reduction of carbon dioxide emissions. Life span of LED lamps is about 50 times longer than other conventional lamps. Busy areas should be lighten all the time; however, this is not the case with rural areas. Sometimes, when people leave their shops, restaurants, cinemas, they keep walking around midnight, latter, there are very few people on the road at night. So, there is a temporary need for lighting streets or road, in relation to a continuous illumination of streets or road in urban areas. For energy saving on street lights we can install an automatic system which can turn on or off lighting system or the brightness of lamps increase or decrease according to detection of traffic on the road.

2. BLOCK DIAGRAM

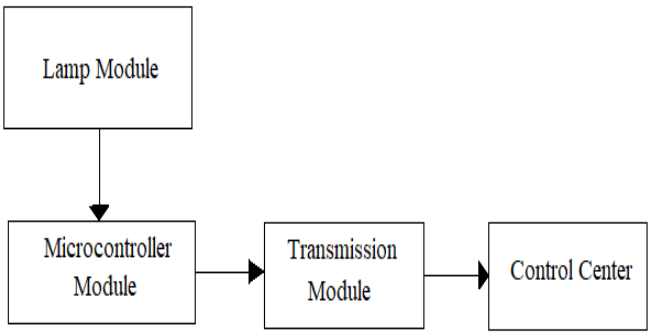

Fig.-1 Block Diagram of the Complete Smart Street Lamp Monitoring System

2.1 HARDWARE DESCRIPTION

Various hardware components involved in the development of the system at Street Unit (Transmitter End) are shown in following Fig. 2.1 (a). It shows the block diagram of proposed system at transmitter end. It consists of various components viz. microcontroller (ATmega 16), sensors, GSM module for wireless communication, solar panel and battery, Real Time Clock (RTC) and 16x2 LCD for display purpose. By considering the time set by Real Time Clock (RTC) and from the status of LDR sensor, controller turns the light ON/OFF. Also Presence sensor (IR Obstacle sensor) turns on the light only when the presence is detected during night time and current sensor (ACS712) will sense the current value from which power consumed is calculated. It also provides the information about the faulty lamps which ease the fault detection.

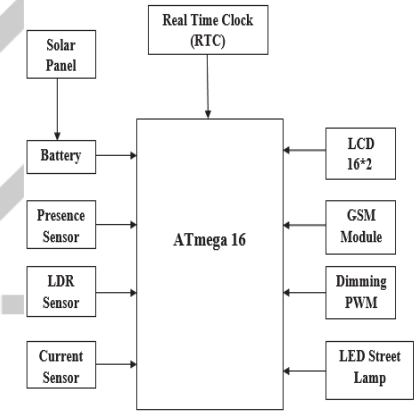

Fig.-2.1(a) Block Diagram at Street Unit

This entire information of desired system's parameters is sent to the controller which executes the code for the analysis of system. Street lights are dimmed by Pulse Width Modulation (PWM) using 8-bit timer/counter 0 of ATmega 16 microcontroller. GSM Module sends the status of street light to the base unit which includes the total power consumption, is there any faulty lamp present. If the fault is detected then the same message is forwarded to electrician for immediate repairing or replacement.

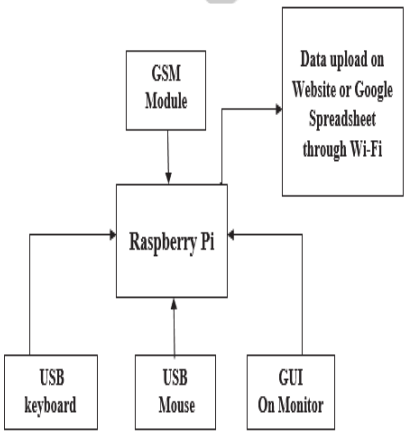

Fig.-2.1(b) Block Diagram at Base Unit

2.2 SOFTWARE DESCRIPTION

In the proposed system, we have programmed ATmega in 'C' language by using AVR Studio 5 and Python is used for programming the Raspberry Pi. AVR Studio 5, produced by Atmel, is a software development environment, family of AVR microcontroller for its AVR 8-bits and 32-bits. It is a full software development environment with an editor, simulator, programmer, etc. It comes with its own integrated C compiler the AVR GNU C Compiler (GCC). As such you do not need a third party C compiler.

Python is a high-level, object-oriented scripting language. Python is interpreted as it is processed by the interpreter at runtime and also it is an interactive. Python is highly readable and it is also called as beginner's language. Python is easy to learn, easy to read, maintain, has standard library and is very much portable.

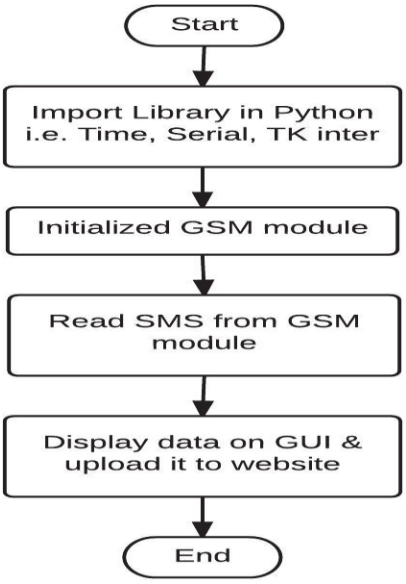

Fig.-2.2 (a) Flowchart for Base Unit

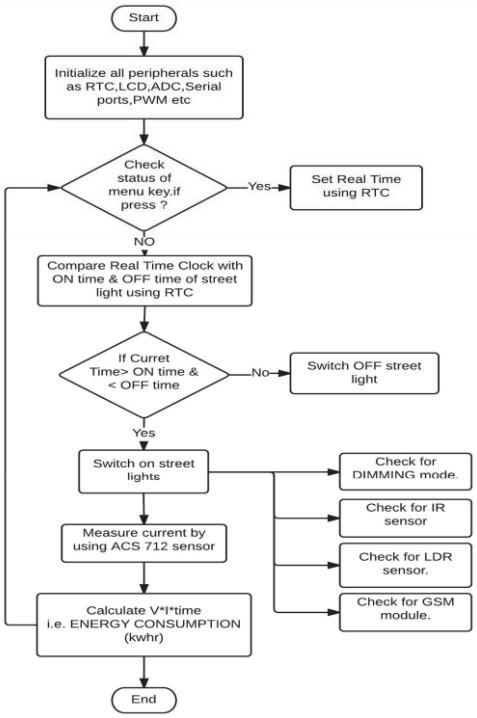

Fig.-2.2 (b) Flowchart for Street Unit

3. METHODOLOGY

Firstly, Chips would be made to be installed on the lights. These chips will consist of a micro-controller along with various sensors like CO2 sensor, fog sensor, light intensity sensor, noise sensor and GSM modules for wireless data transmission and reception between concentrator and PC. The data from the chips would be received on a remote concentrator (PC) and the PC would also

transmit the controlling action to the chip. According to the survey of variation in the intensity of light in the field area, efficient programming would be done to ensure minimum consumption of energy. The emission in the atmospheres would be detected.

3.1 ADVANTAGES

1) Prevention of accidents and increase in safety.
2) Enables reliable communication.
3) No short circuit problem.
4) LEDs reduce CO2 emissions and increases power efficiency.
5) Linear power supply during rainy season.

3.2 APPLICATION

1) Remote on/off, Dimming and on-site Status Check.
2) System Fault Detection Alarm.
3) Anti-theft Detection/Alarm.
4) Date Management (energy consumption report).
5) 24-hours online Monitoring,
6) Reduce energy use by up to 40%.
7) Reduce maintenance by up to 50%.
8) Increase bulb life by up to 25%

4. CONCLUSION

In this paper, Street lighting system is described that integrates new technologies offering ease of maintenance and energy savings. The proposed system is appropriate for street lighting in remote as well as urban areas where traffic is low at times. Along with energy saving it also tackles with the problem of power theft it is capable of taking corrective actions in case of unprecedented events of climatic changes.

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REFERENCES

[1] Abdul Latif Saleem, Raja Sagar R, Sachin Datta N S, Sachin H S, Usha et al. , "Street Light Monitoring and Control System", *in International Journal of Engineering and Techniques* - Volume 1 Issue2, Mar – Apr 2015, pp. 68-71.

[2] B K. Subramanyam K. Bhaskar Reddy, P. Ajay Kumar Reddy "Design and Development of Intelligent Wireless Street Light Control and Monitoring System Along With GUI", *International Journal of Engineering Research and Applications.* Vol.3 Issue 4. Jul-Aug 2013.

[3] Deepak Kapgate "Wireless Streetlight Control System" *International Journal of Computer Applications,* Volume 41 Number 2- March 2012.

[4] K.Santha Sheela S.Padmadevi "Survey on Street Lighting System Based On Vehicle Movements", *International Journal of Innovative Research in Science, Engineering and Technology* Vol. 3 Issue 2. February 2014.

[5] Mustafa Saad, Abdalalim Fary, Alamed Salah and Abdalroof Abdaljail "Automatic Street Light Control System Using Microcontroller".

[6] N. Nithyaa, M. Hemalathaa, "GSM based cost effective street lighting application", *in International Conference on Communication Technology and System Design 2011*, pp. 737-741.

[7] Nuraishah Sarimin, Shereen Lina d/o Isaac2. Najmah Radiah Mohamad "Zigbee based Smart Street Lighting System", *International Journal of Computer Trends and Technology.* Volume 4 Issue4- 2013.

[8] Omkar Natu et. "GSM Based Smart Street Light Monitoring and Control System", *International Journal on Computer Science and Engineering (CSE)* Volume 5 No. 03 March 2013.