ISSN 2349-7815

International Journal of Recent Research in Electrical and Electronics Engineering (IJRREEE)
Vol. 4, Issue 2, pp: (86-90), Month: April - June 2017, Available at: www.paperpublications.org

Modern Street Lightening System with Intensity Control using GSM

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Abstract: **As the LED's lumen efficiency increases rapidly in recent years, many new LED illumination applications are emerging. LEDs have features such as long-life, small and low power consumption. Therefore, they are used in various occasion such as full color large sized LED displays, traffic lights, and etc. In this paper, an energy efficient street lighting system is proposed. The presented system consists of a LED lamp module, which can be controlled from remote location. The proposed remote-control system can optimize intensity and efficiency of street lighting systems. It uses GSM based wireless devices which enable more efficient street lamp-system management, thanks to an advanced interface and control architecture. It uses a sensor combination to control and guarantee the desired system parameters; the information is transferred point by point using GSM Module and is sent to a control terminal used to check the status of the street lamps and to take appropriate measures in case of failure.A developed prototype system will be presented in this paper and experiments will be performed to verify the correctness of the proposed system. According to the experimental results, the lighting efficiency is 85 % and the conversion efficiency is 90 %.**

Keywords**: WSN (Wireless Sensor Network), GSM (Global System for Mobile Communication), IR (Infrared) CEPT (Conference of European Posts and Telegraphs),** IDEN **(Integrated Digital Enhanced Network).**

I. INTRODUCTION

A. Problem Definition:

The world is converging towards wireless as a communication channel and at the same time facing energy and environmental problems. The solution is by mingling the information technology (IT) and power. Streetlights are among a city's most important and expensive assets usually costs one third of the electricity bill.

Energy efficiency is the key factor while designing indoor or outdoor lighting systems. To efficiently utilize the limited power resources, energy efficient lighting system is needed which can manage the energy knowledgeably. However, the traditional lighting systems are not reliable because of its design based on the old lighting standards and inefficient instruments and devices. Thus, it results in energy losses, frequent replacement of devices, suffers from the lack of pervasive and effective communications, monitoring, automation, and fault diagnostics problems.

B. Overview:

To address these challenges, many technologies has been utilized in the literature to save energy such as; the utilization of the light emitting diode (LED) instead of metal halide lamps, But the systems based on these technologies need further improvement to overcome the energy crisis. To further reduce the energy consumptions and to simplify the wiring structure, numerous lighting control systems have been proposed to solve that problem such as; occupancy sensing approach, light level tuning.

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Figure 1 Schematic image of the system.

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 protocol. The field of the GSM remote sensing and control system is widely present in the literature; we can also find GSM systems similar to (the) lighting systems in structure and management.In this paper, we present our system, which is able to integrate the latest technologies, in order to describe an advanced and intelligent management and control system of the street lighting.

The rest of the paper is organized as: section II describes the GSM Standard overview. In section III, we present the system implementation details. Finally, in section IV we draw conclusions.

II. GSM STANDARD

Global System for Mobile communications (GSM) is that it is an international standard. If you travel in Europe and many other parts of the world, GSM is the only type of cellular service available. Originally, the acronym GSM stood for Group Special Mobile, a group formed by the Conference of European Posts and Telegraphs (CEPT) in 1982 to research the merits of a European standard for mobile telecommunications. Commercial service using the GSM system did not actually start until 1991. Instead of using analog service, GSM was developed as a digital system using TDMA technology.GSM systems provide a number of useful features:

- Uses encryption to make phone calls more secure
- Data networking
- Group III facsimile services
- Short Message Service (SMS) for text messages and paging
- Call forwarding
- Caller ID
- Call waiting
- Multi-party conferencing

GSM operates in the 900 MHz band (890 MHz - 960 MHz) in Europe and Asia and in the 1900 MHz (sometimes referred to as 1.9 GHz) band in the United States. It is used in digital cellular and PCS-based systems. GSM is also the basis for Integrated Digital Enhanced Network (IDEN), a popular system introduced by Motorola and used by Nextel. The incredible growth of GSM is a big part of why the acronym is now commonly thought of as standing for the Global System for Mobile communications.

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III. PROPOSED SMART SYSTEM ARCHITECTURE

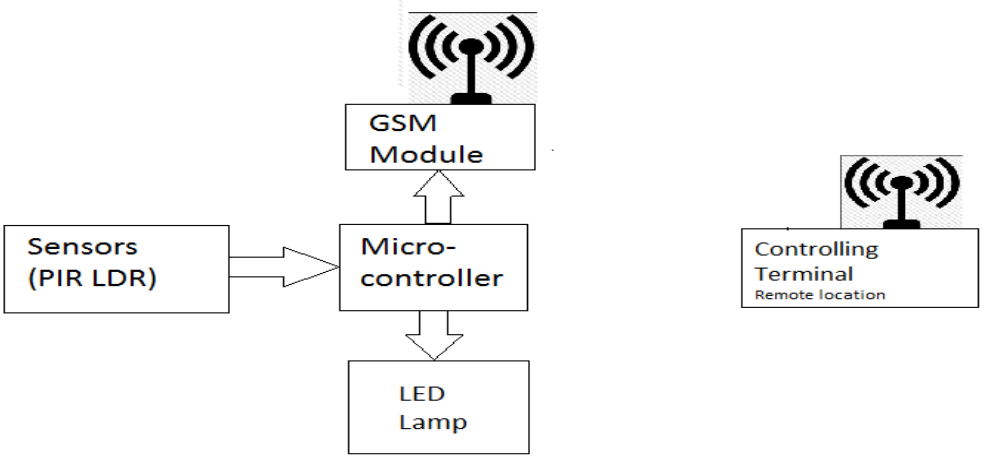

Figure 2 General Block Diagram

PIR sensor senses vehicle movement and LDR is used for day/night condition. Signal sensed by sensors given to microcontroller. According to sensor signal Microcontroller takes action what to do. As well as it gives LED condition status to the GSM module which transmits this signal to the controlling terminal which is at remote location

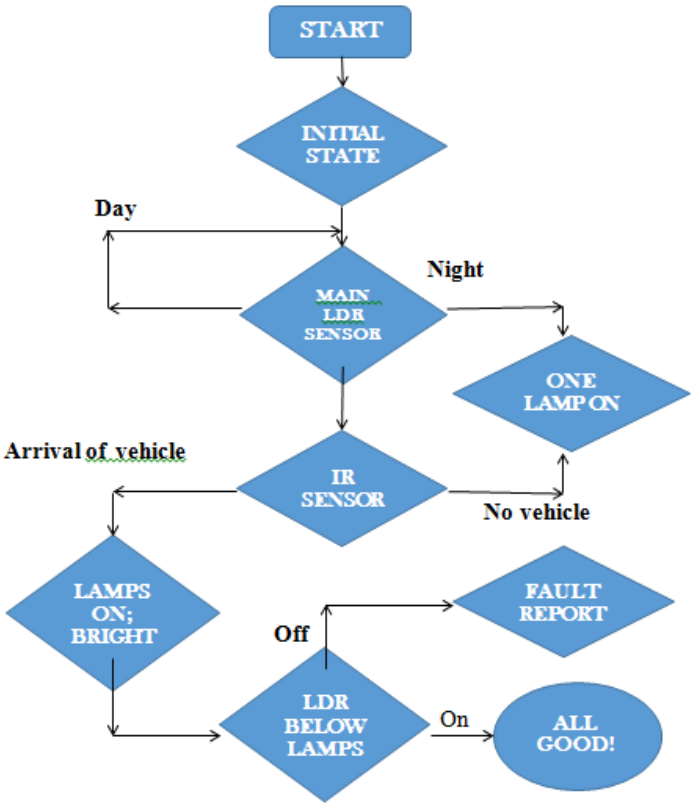

Figure 3 Flow chart of Operation

The LED lamp controlling and monitoring wirelessly involves the designing of complete node. The need of such kind of node which must have an ability to send the commands wirelessly to main control centre and controller board which can control the LED lamp in terms of ON/OFF and dim commands and the accessories attached to the lamp. Then the focus part of the design is the energy consumption for the benefit of user and environment concurrently.

A. Microcontroller:

The main part of our design is the controller, which acts as the heart of the node. The controller sends the appropriate signals to the LED lights after receiving signals from the sensors. the overall functionality of the controller involved is explained by the node block diagram in fig.

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

B. Sensors:

A Light Dependent Resistor (LDR) or a photo resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells. They are made up of semiconductor materials having high resistance. There are many different symbols used to indicate a LDR, one of the most commonly used symbol is shown in the figure below. The arrow indicates light falling on it.

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors.

IV. CONCLUSIONS

This paper describes a new intelligent street lighting system which integrates new technologies available on the market tooffer higher efficiency and considerable savings. This can be achieved using the highly efficient LED technology, combined to an intelligent management of the lamp posts derived by a control system switching on the light only when necessary, increasing the lamps' lifetime.

Another advantage obtained by the control system is the intelligent management of the lamp posts by sending data to a central station by GSM wireless communication. The system maintenance can be easily and efficiently planned from the central station, allowing additional savings.

The proposed system is particularly suitable for street lighting in urban and rural areas where the traffic is low at a given range of time. The independent nature of the power-supply network enables implementing the system in remote areas where the classical installations are prohibitively expensive. The system is always flexible, extendable, and fully adaptable to user needs.

The simplicity of GSM, the reliability of electronic components, the feature of the sensor network, the processing speed, the reduced costs, and the ease of installation are the features that characterize the proposed system, which presents itself as an interesting engineering and commercial solution as the comparison with other technologies.

The system can be adopted in the future for loads supplied by the power system, which enables the monitoring of energy consumption.

This situation is particularly interesting in the case of economic incentives offered to clients that enable remote control of their loads and can be useful, for example, to prevent the system blackout. Moreover, new perspectives arise in billing and in the intelligent management of remotely controlled loads and for smart grid and smart metering applications..

REFERENCES

[1] W. Yongqing, H. Chuncheng, Z. Suoliang, H. Yali, and W. Hong, "Design of solar LED street lamp automatic control circuit," in Proc. International Conference on Energy and Environment Technology, 2009, pp. 90–93.

[2] W. Yue, S. Changhong, Z. Xianghong, and Y. Wei, "Design of new intelligent street light control system," in Proc. IEEE International Conference on Control Automation, 2010, pp. 1423–1427.

[3] C. Ozcelebi, and J. Lukkien, "Exploring user-centered intelligent road lighting design: a road map and future research directions," IEEE Trans. Consum. Electron, vol. 57, pp. 788-793, May 2011.

[4] C. Chun, C. Hung, L. Kun, C. Kuan, and Y. Chun, "A digitally wireless dimmable lighting system for two-area fluorescent lamps," in Proc. IEEE Region 10 Conference, 2010, pp. 2173-2178.

[5] C. SungKwan and V. Dhingra, "Street lighting control based on LonWorks power line communication," in Proc. IEEE International Symposium on Power Line Communications and Its Applications, 2008, pp. 396-398.

[6] L. Chushan, W. Jiande, and H. Xiangning, "Realization of a general LED lighting system based on a novel Power Line Communication technology," in Proc. IEEE Applied Power Electronics Conference and Exposition, 2010, pp. 2300-2304.

[7] H. Penagos and G. Tache, "Noise and Interference in Power Line channels," in Proc. Electronics, Robotics and Automotive Mechanics Conference, 2009, pp. 269-274.

[8] A. Pandharipande and L. Shuai, "Light-Harvesting Wireless Sensors for Indoor Lighting Control," IEEE Sensors J., vol.13, no.12, pp. 4599- 4606, Dec. 2013.