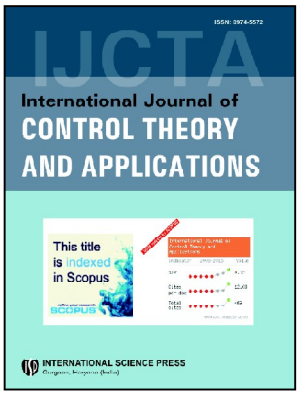

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Automated Intelligent High Range Lightening System

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Abstract: Automated Intelligent High Range Lightening System describes an improvement in controlling of light in the rural areas. Now a day in most high ranges as well as in rural areas there does not have a proper lighting system. To achieve an automatic operation and build a better energy saving system with the use of sensors and controller is proposed in this paper. Several sensors are used such as photo sensor, which detects whether the lamp is ON or OFF, light dependent resister senses the ambient light intensity then passive infrared resistor monitors the parameters like temperature and motions of living beings and also ATMEGA8 microcontroller is used for controlling the system which receives inputs from various sensors. Whenever the lamps are one by one continuously ON and OFF the traveller can identify that some vehicle is coming from opposite side, on the other hand when at distant only one light is ON then the traveller can identify that some living being is near by the post. A smart lighting system is proposed which targets the energy saving and autonomous operation on economical affordable for the streets.

Keywords: Sensors, Microcontroller, Proteus, Lamppost

1. INTRODUCTION

Right now a perfect lightning system is not there in forest areas and rural areas. In some places normal street light system is used and in some other areas there is not having a perfect lightning system. This may be because in such system there need an operator for switch on and off the lightning source. The cost of the overall system is increased and this operator does not switch on the light of lightning source correctly. So we need to introduce a new technology for the lightning in such places and which should be energy efficient and low maintenance. Also we don't need the system to be in ON condition throughout night and hence sensor network is needed to switch on the system on night. Because in light is needed only when there is presence of animals or human.

To implement such a sort of system recent technologies applicable for source of light is to be used.

Also central system [1] has to be incorporated in such a way the forest lamp can be monitored easily. Finally, renewable sources can be opted for usage throughout the night.

Rajput *et al.,* [2] proposed a Lighting system using GSM technology in which tremendous amount of power is wasted is one of the drawbacks.

Most widely used automated system for traffic signaling systems [3] uses wireless sensor networks to find the traffic by sensing the vehicles. Microcontroller based routing algorithm is preferred for routing the traffic.

Padmaja and Venkateshwarulu [4] developed an energy-saving lighting system which is applicable for industrial and domestic use. The system developed consumes low power as well as the cost is very low.

Siddiqa [5] proposed prioritized vehicles for controlling the traffic. Initial model was simulated in Proteus and a real-time prototype of the proposed system was tested successfully.

Subramanyam *et al.,* [6] implemented a proper solar based lighting system on Streets. Graphical User Interface (GUI) is used for controlling purpose.

Kaladhara *et al.,* [7] proposed to automate the streetlights using the AVR Microcontroller with the help of a clock and intensity sensor.

The main scope is to use a lamp post which can be controlled by remote system for that renewable source is used [8].Also for managing the network and for maintenance sensors can be used [9]. It is more convenient to use ZigBee technology since it is widely used [10]

To design a smart lighting system [11] is the main objective of this paper. Section 2 describes the proposed system and remaining section dealt in detail the result and conclusion of our work.

2. PROPOSED SYSTEM

Electrically powered ON/OFF [12] of street lighting is free from danger or risk but in some cases the light is in ON throughout the night such as street lights in town centre, traffic lights and pedestrian crossings. Continuous ON state of street light leads to power wastage. In other case, it is getting very difficult to analyze the failure of street lights in all places.

This paper uses a device [13] in such a way in order to monitor the environmental parameters like motion and ambient light intensity, sensors are used. The proposed method make use of measuring stations in the forest .The measuring stations notifies the intensity of daylight and based on it the lamp is either activated or in off condition. The base station continuously monitors for proper operation of the lamp and passes the information to the operator.

The high range light system has two sections the high range section and remote control section. Figure 2 depicts the block diagram of a high range transmitter section and Figure4 depicts the block diagram of a remote control receiver section.

(A) Transmitter Section

The block diagram consists of three sensors such as LDR sensor, PIR sensor and photo sensor. AVR microcontroller is used and ZigBee to ZigBee transmission is carried out in transmission section. The street light part is outfitted with various sensors to read surrounding environmental parameters like strength of light and presence of motion. The street light section uses an LDR (Light dependent Resistor), to detect the intensity of ambient illumination. While the intensity of ambient light becomes much less than a predefined level the street light section automatically activates the street light system and sends various monitoring details to the control section. If the street light system is in activated condition, it will automatically monitor presence of motion using PIR sensor (Passive Infrared Sensor).

Here the PIR sensor acts as a movement detector, which detects changes in ambient temperature. While detecting motion, the street light section automatically switches on the street lights and sends state of each light to remote control section.

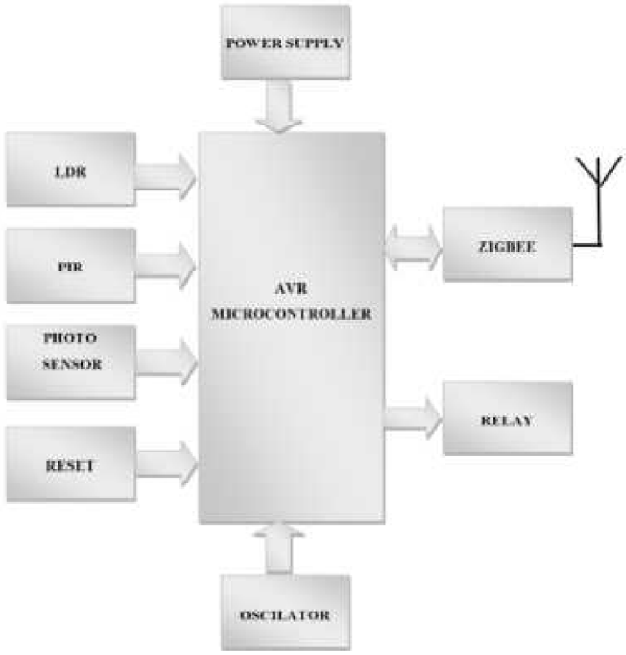

Figure 1: Transmitter Section

Each street light is equipped with photo detector to observe state of each light source. This data is then transmitted to the remote control section which displays the state of each light and it can be applied by the technician to troubleshoot problems easily and helps to offer enough help in time. AVR microcontroller is used for controlling all the operation of this system, which receives inputs from various sensors and converts analog signals to digital data using the internally integrated ADC chip, and process these data according to the program stored in its flash program memory. The programming of AVR microcontroller is done in embedded C by using Atmel Studio software.

(B) Circuit Diagram

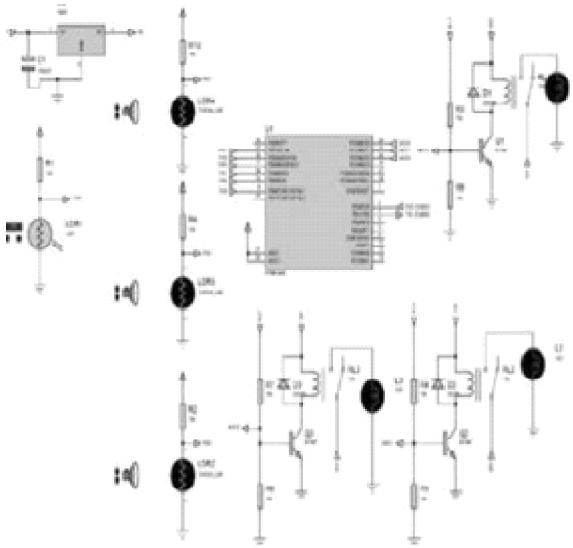

Figure 2: Transmitter Circuit Diagram

The circuit diagram corresponds to the transmitter section in which ATMEGA8 microcontroller is used here. There are three post lights and three LDR sensors were connected for each post lambs. Switches were connected to each posts and it detects whether any presence of human or animals at night .The switches were automatically turn ON and that the particular post light will be in ON position.

2.3. Flow Chart

The flow chart describe about the working of three sensors and ZigBee transmission. Three sensors are mainly used, light dependent sensor (LDR), passive infrared sensor (PIR) and photo sensor. First the LDR sensor read the intensity of light and detect whether day or night. During day time the light is off. During night the PIR sensor activates and sense presence of living object.

If the PIR sensor detect any human presence the light will automatically ON otherwise light will OFF the photo sensor is activated and continuously check whether the light is on or off. Status will continuously send to the receiver section by using ZigBee to ZigBee transmission.

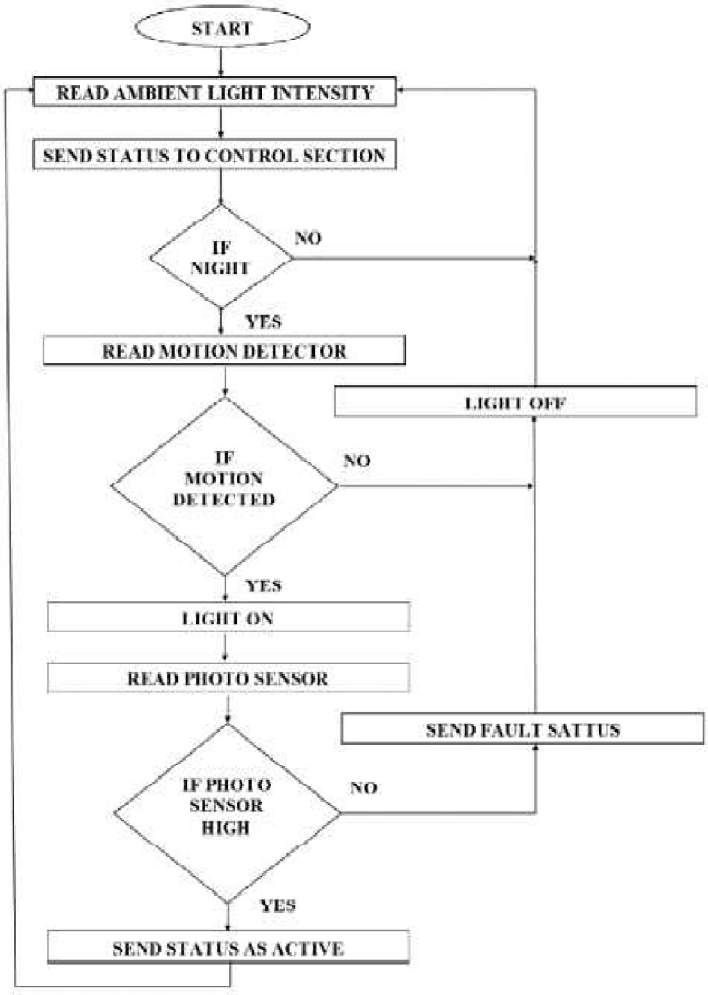

Figure 3: Flow chart

The control room will receive all the information and check the continuous status at the transmitter section. The present status of each post is shown in a computer at receiver section using GUI.

(C) Receiver Section

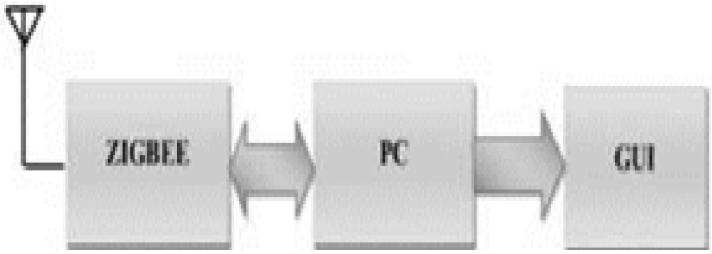

Figure 4: Receiver Section

The communication between the high range section and the remote monitoring section is achieved by using a ZigBee protocol based wireless transceiver module and is shown in the above Figure 4. The status of the post was checked by GUI and the corresponding circuit diagram for the receiver section is shown in Figure 5.

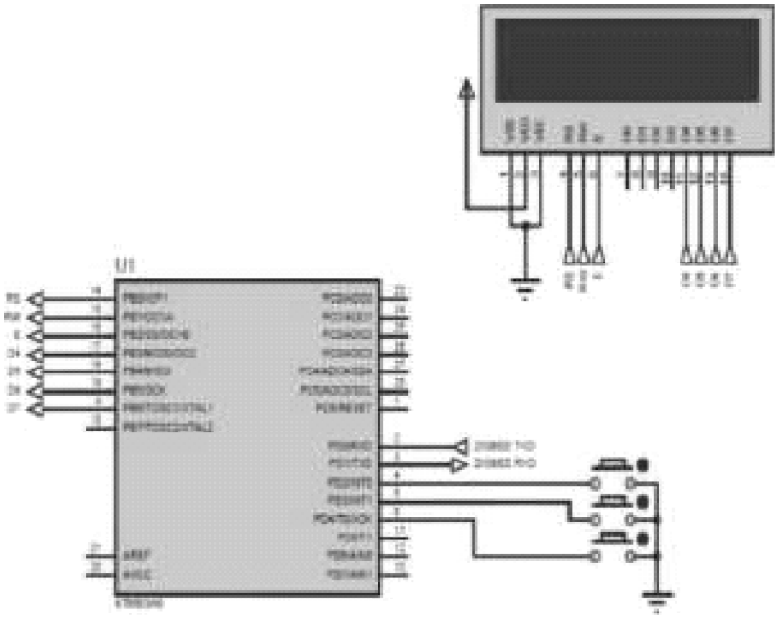

Figure 5: Receiver Circuit Diagram

3. EXPERIMENTAL RESULT

The below Figure 6 shows the designed PCB board for the control section of the hardware part. After designing the PCB board soldering were done.

The below PCB design is for the relay layout. For this work four relay layout board was designed and soldered for the three post lamps and for the solar power supply.

The below PCB board was designed for the power supply board and after this PCB board design is finished, soldering were made for the hardware section.

The hardware model for intelligent lightening system is shown below as Figure 9.

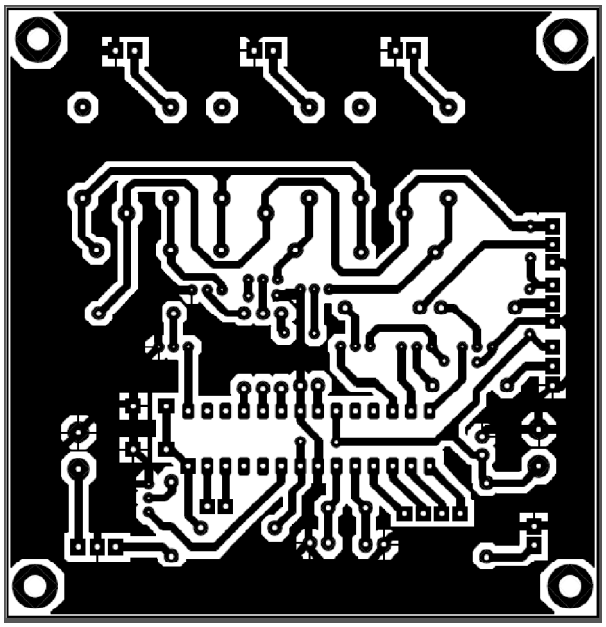

Figure 6: PCB Design of control section

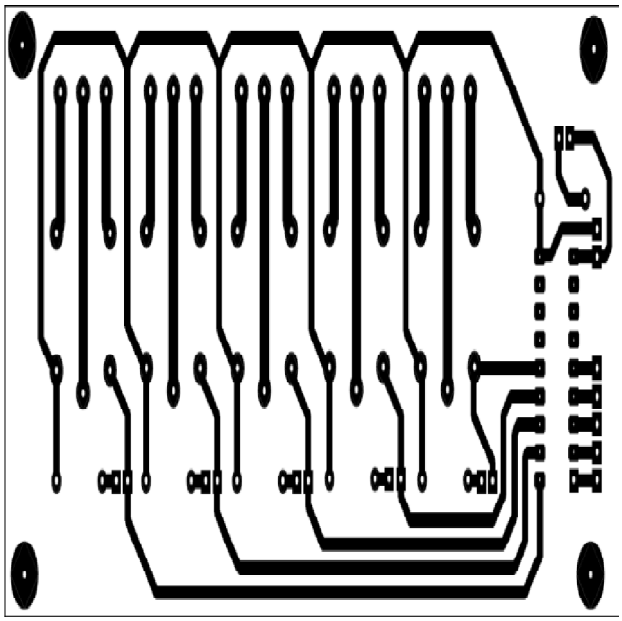

Figure 7: PCB Design Relay layout

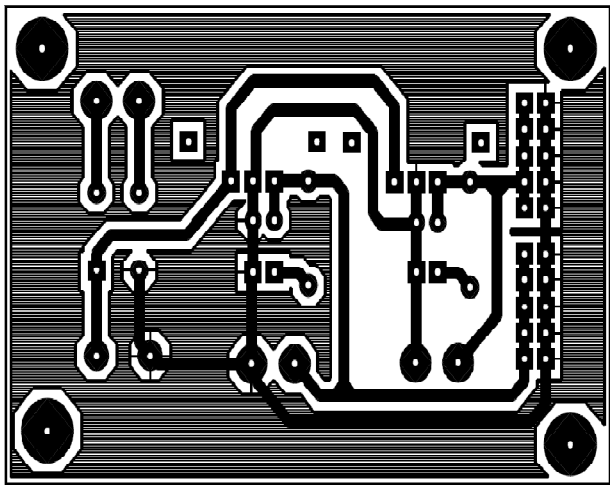

Figure 8: PCB Design Power supply

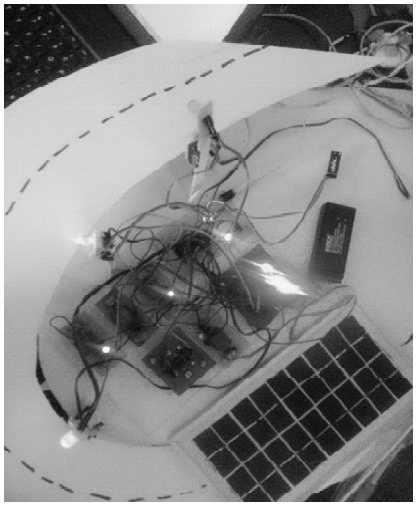

Figure 9: Hardware Model

In this hardware three posts were implemented, each post consisting lamp, PIR sensor and a photo sensor. An LDR sensor is connected common for the three posts in order to detect the intensity of light. Four relay was implemented, one for the solar and the other three for the posts and Atmega8 microcontroller is used. Solar panel is used to run the hardware in case of any power failure.

Simulation of the proposed scheme has been carried-out in Proteus Simulation Package. The snapshot of the Proteus simulation result for automated intelligent lighting system is shown in Figure 10

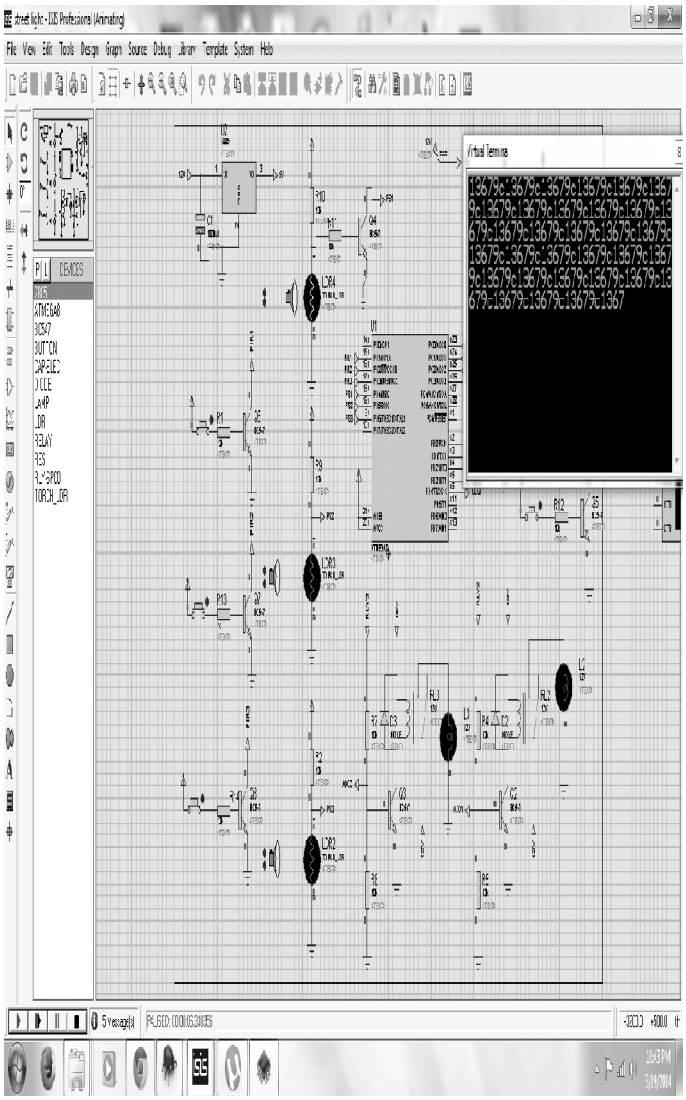

Figure 10: Simulation result

4. CONCLUSION

In this paper an energy efficient system such as forest lighting system is proposed in which the system is not in ON condition throughout night. Sensors are used and the system is ON in that particular area only when there is a presence of animals or human.

This is obtained by using the highly economical lamp post placed in the forest zone which uses renewable energy provided by the solar panels and also by the control unit of the lampposts. By using LDR and IR sensors, power and energy can be saved. Streetlights can be monitored and controlled using GUI application

REFERENCES

[1] CaiBai-gen, ShangGuan Wei, Wang Jian& Chen Rui,"The Research and Realization of Vehicle Detection System Based on Wireless Magneto-resistive Sensor", Second International Conference on Intelligent Computation Technology and Automation, pp.476- 479, 2009.

[2] Prof. K.Y.Rajput, Gargeyee Khatav, Monica Pujari, Priyanka Yadav;"Intelligent Lighting System Using GSM", International Journal of Engineering Science Invention, Volume 2,Issue 3, PP.60-69, 2013.

[3] Vignesh Vishwanathan and Vigneshwar. Santhanam;"Intelligent Traffic Signal Control Wireless Sensor Network", 2nd International Conference on Advances in Electrical and Electronics Engineering (ICAEE'2013), Dubai (UAE), 2013.

[4] Y.Padmaja, Venkateshwarulu;"Energy Saving Intelligent LED lightening System using PWM Signal", International Journal of Eminent Engineering technologies, Volume 4, Issue 1, 2015.

[5] Humeral Siddiqa;"Intelligent traffic light system to prioritized emergency purpose vehicles based on ZigBee" International Journal of Advanced Research and Innovation, Vol.7, Issue I, pp.505-509, 2014.

[6] B.K.Subramanyam, K. Bhaskar Reddy , P.AjayKumar 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, pp.2115-2119, 2013.

[7] P.Uday Kumar, G.R.C Kaladhara Varma;"An Embedded System in automation of street light using ATMEGA8035L microcontroller", International Journal of Science, Engineering and Technology Research (IJSETR) Volume 2, No 6, pp.1380-1387, 2013.

[8] M. A. D. Costa, G. H. Costa, A. S. dos Santos, L. Schuch, and J. R.Pinheiro, "A high efficiency autonomous street lighting system based on solar energy and LEDs," IEEE Trans. On Consumer Electron, vol. 56, no. 1, pp. 231-239, 2010.

[9] Po-Yen Chen, Yi-Hua Liu, Yeu-Torng Yau, Hung-Chun Lee, "Development of an energy efficient street light driving system", IEEE International Conference on Sustainable Energy Technologies(ICSET), pp.761-764,2008.

[10] Wang Yongqing, HaoChuncheng, Zhang Suoliang, Huang Yali, Wang Hong,"Design of Solar LED Street Lamp Automatic Control Circuit",8th IEEE International Conference on Control and Automation (ICCA), 2010.

[11] Wu Yue, Shi Changhong, Zhang Xianghong, Yang Wei," Design of new intelligent street light control system, Control and Automation(ICCA)", 8th IEEE International Conference, pp.1423-1427, 2010.

[12] V.Srinath and S.Srinivas;"Street light automation controller using ZigBee network and sensor with accident alert system" International Journal of Current Engineering and Technology, Vol.5, No.4, pp.2819-2823, 2015.

[13] Caponetto R, Dongola G, Fortuna, L., Riscica, N. and Zufacchi, D,"Power consumption reduction in a remote controlled street lighting system", International Symposium on Power Electronics, Electrical Drives, Automation and Motion (SPEEDAM 2008), Ischia, pp. 428-33, 2008.