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Arm Controlled Energy Savings Scheme For Street Lighting

P.Mounica Bhavani* .M.B.R Murthy**
* PG Scholar **Professor
Dept of ECE, CMR College of Engineering and Technology, Hyderabad-501401
* mounicaputta@gmail.com

Abstract:
Keeping street lights switched ON continuously throughout the night irrespective of presence or absence of traffic leads to wastage of power. There is no need for bright light whenever there is no traffic on roads. A new method is proposed in this paper presence or absence of traffic and adjusts light level intensity in case of street lighting system. Detection of no traffic actuates in the dimming of lights thus reducing energy consumption. The proposed system uses ARM 7 controllers for implementing the scheme.
Index terms: ARM7 (LPC2103), Presence Sensor, Light Sensor, RFID, ZigBee

I. INTRODUCTION

The main purpose of providing adequate lighting level on roads is to ensure good visibility to drivers for safe journey. Public lighting accounts for about 35% of the total energy bill in typical cities worldwide [1]. It is observed that the street lights are always ON throughout during nights. But at times there may be no vehicular traffic and in such case there is no need for higher illumination. Hence employing controlled street lighting there will be energy savings and costs can be reduced drastically upto 60%. [1]

Street lighting requirements in India are specified in the Indian Standard (BIS, 1981), based on the traffic density of the road and they are given in table1. When there is traffic is on the road the illumination level required for the main road is about 500lux and when there is no traffic on the road the level can be 50 lux [1,2].

Generally between late night and early morning hour's traffic density will be significantly low. This paper proposes a scheme of street lighting control. The light intensity level is maintained at a minimum level of illumination during the periods of no traffic and is increased to required brightness level when traffic is detected.[1-4] This results in energy savings throughout night. Further by using LED lights in place of halogen lamps the power consumption can be reduced considerably without affecting illumination level. The system uses sensors to collect the required data, and data are transferred to the base station using Zigbee protocol. Based on these data the controller at base station initiates necessary control.

II PROPOSED STREET LIGHTING SYSTEM

In the proposed street lighting system, there will be two sections namely lamp station and base station as indicated in fig1. Each existing lamp post will act as Lamp station with some additional circuitry. Each lamp station consists of Light sensor, Zigbee module, RFID, lamps and micro-controller. Presence sensors are placed between every two lamp stations to identify the arrival of a vehicle. A Light Sensor (LDR) is used to provide the level of brightness. The recommended distance between two lamp posts is 30 meters. Every 100 meters stretch of road will have three lamp stations connected to one base station. At dawn based on light sensor data, the controller switches ON the lamps such that intensity is 50lux.

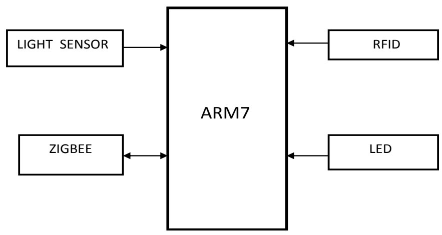
ACTIVITY	ILLUMINATION(lux, lumen/m^2)
Public areas with dark surroundings	20-50
Simple orientation for short visits	50-100
Warehouses,Homes,Theatres, archives	150
Normal office work, PC work, study library, Groceries, show rooms, laboratories, main road lighting	500
Supermarkets, mechanical workshops, office landscapes	750
Detailed Drawing work, Very detailed Mechanical Works	1500-2000

Table1: Illumination Requirements

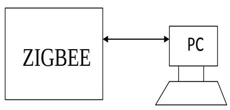
The presence sensor detects arrival of pedestrian or vehicle towards a specific lamp post .If there is no signal from RFID sensor it is assumed as pedestrian.

After signal from presence sensor if signal is here from RFID also it will be considered as vehicular traffic.The level of brightness is sensed by Light sensor. The signals from these sensors will be transferred to the controller of lamp station an ARM7 controller (LPC2103).Based on the data the controller sets appropriate course of action to provide required illumination of 500lux. After the vehicle passes the lamp station the brightness will be reduced to 50lux.

This light intensity can be varied by using relay. Relay can acts as a electrically operated switch to open and close the contacts. When the pedestrian passes through the presence sensor the relay switches to the low intensity bulb giving 50lux whereas the vehicle passes through the RFID reader the relay switches to the high intensity bulb giving 500lux.After sunrise the lamps will be automatically OFF when light sensor records intensity of 50lux or more.



Lamp- Station



Base-Station

Fig 1 components in present system

The scheme also can be extended to track vehicles by providing communication between base stations[5]

IV. RESULTS

To test the proposed scheme a scaled down prototype is built. The prototype is shown in figure 2. The prototype has been tested to verify the functionality.

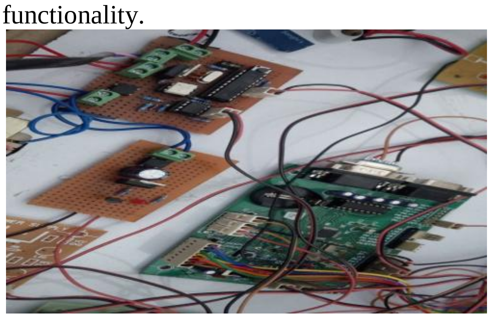


Fig 2 system prototype

It has two lamps one of 9watts providing 500lux and second 2watts provide 50lux.The testing done was to verify the change of illumination levels on the road as per the requirements. The intensity levels are shown in figure3 and figure 4.

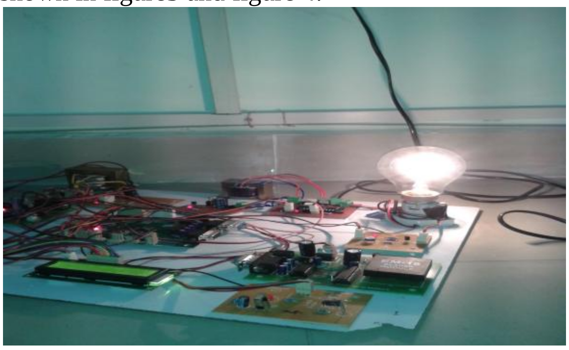


Fig 3 illumination level 50 lux

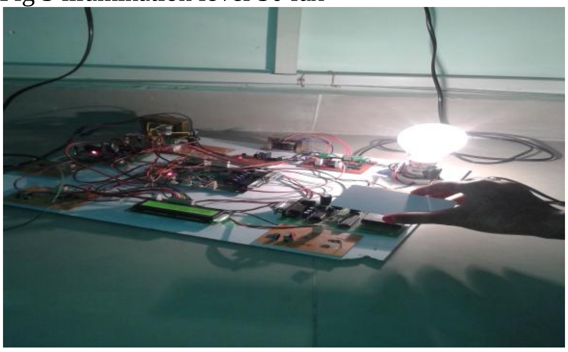


Fig 4 illumination level 500lux

Assuming that there is no traffic for 10minutes per hour between 6P.M to 10P.M ,for 20minutes per hour between 10P.M to 12 midnight, 30minutes per hour between 12 midnight to 4 A.M and 10minutes per hour between 4 A.M to 6 A.M the savings per day will be 154Wh and 4.62 KWh monthly. Further Sodium vapor lamp consumes 42watts to provide 500lumens/m^2.An LED lamp consume 9watts to provide 500lumens/$m^{2.}$ Thus using LED in place of sodium vapor lamp there will be savings of 33 Wh per day or nearly 1KWh per month. In addition there will be further savings of {(42-9=33watts)x number of hours }traffic is present per day.

V. CONCLUSIONS

This paper describes a energy savings in street lighting system. The main advantage obtained by the control system is the adjustment of light intensity as per need. The lamp station maintenance can be easily and efficiently planned from the base station allowing additional savings. The proposed system is particularly suitable for implementation in remote areas where the classical installations are prohibitively expensive. The power consumption of

LED lamp is much less than others for same level of illumination. Thus in place of conventional halogen lamps LED lights can be used which offer further energy savings The system is always flexible, and fully.

REFERENCES

[1.] "Energy Efficient Street Lighting Guidelines"- Bureau of Energy Efficiency India

[2.] Illuminance Recommended light levels http/ www. EngineeringToolBox.com/light-level-rooms-d_707.

[3.] *Fabio Leccese*, "Remote- control system of high efficiency and intelligent street lighting using a Zigbee network of devices and sensors", IEEE transactions on power delivery, VOL.28, NO.1, January 2013.

[4.] D.Liu,S.Qi,T.Liu,S.-Z.Yu,andF.Sun,"The design and realization of communication technology for Street lamps control system," in *Proc4th Int. Conf. Comput. Sci. Educ.*, Jul. 25–28, 2009, pp. 259–262

[5.] P.MounicaBhavani "Intelligentstreetlighting system" International Journal of Scientific EngineeringandTechnologyResearchVolume .03,IssueNo.38, November-2014, Pages: 7608-7610