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Smart Led Lighting System for Street Lights

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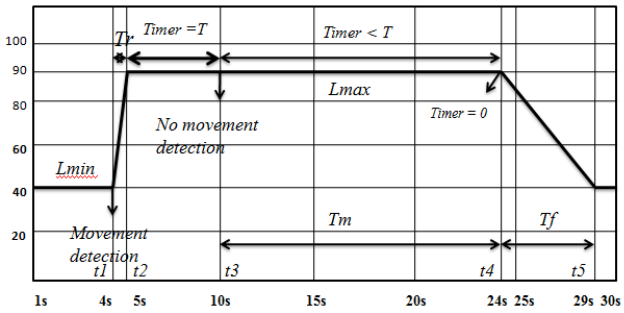
----------**ABSTRACT**----------

An intelligent household LED lighting system considering energy efficiency and user satisfaction is proposed here. The proposed system utilises multi sensors and wireless communication technology in order to control LED light according to the user state and surrounding. The proposed LED lighting system can automatically adjust the light intensity values by sensing the intensity of sunlight to enhance energy efficiency. Here the PIR sensor and LDR sensors are used to control the brightness of the LEDs. Also a PC is used to monitor the whole operation using zigbee transceivers. In addition to that an android application is installed in smart phones to adjust the brightness of the light for user satisfaction.

I. INTRODUCTION:

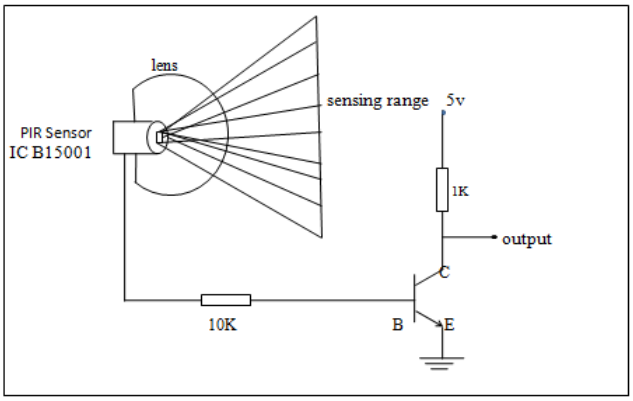
Saving energy has become one of the most important issues these days. The most waste of energy is caused by the inefficient use of the consumer electronics. Various light control systems are introduced in current markets, However, due to architectural limitations, the existing light control systems cannot be successfully applied to home and office buildings.

Therefore, this paper proposes an intelligent household LED lighting system considering energy efficiency and user satisfaction. The proposed system utilizes multi sensors [2] and wireless[1] communication technology in order to control an LED light according to the user's state and the surroundings.



II. INTELLIGENT HOUSEHOLD LIGHTING SYSTEM:

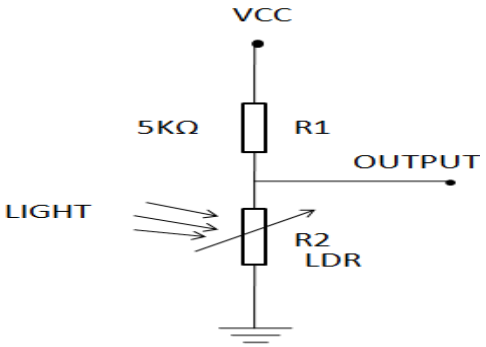
We design the intelligent household LED lighting system with a motion detection sensor, illumination sensor, and wireless communication interface. A PIR sensor is used to sense presence of human in a room and gives a digital output. The digital data is converted back to analog using a interfacing circuit. A LDR sensor is used to detect the brightness of sunlight and gives out an analog output. Inbuilt ADC of PIC microcontroller converts it to digital. Based on the output of these sensors duty cycle is changed. According to that the PWM module varies the brightness of the LED through an mosfet. According to that the PWM module varies the brightness of the LED through an mosfet. A signal of inconvenience is received from residents through a smart phone when they feel the brightness of the lighting with inconvenience [8]. This signal can interrupt the system and the interrupt can illuminate the required light. Thus we can save energy as well as provide user satisfaction.

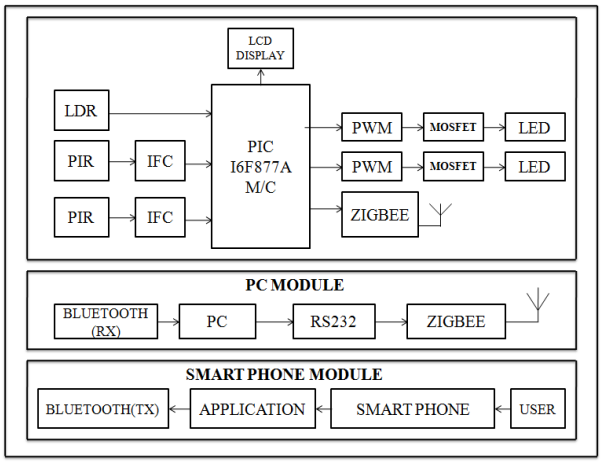


The proposed system basically controls illumination intensity of a lighting device according to user movement and brightness of surroundings [4]. That is, when the maximum value of illumination intensity of a lighting device is Lmax and the minimum value is Lmin, the illumination intensity becomes Lmax, if user movement is detected and becomes Lmin, if user movement is not detected for certain period time[8][9].

III. MODULES IN LIGHTING SYSTEM:

A) *LIGHT SENSOR*





An LDR is made of a high-resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance. The analog output of the light sensor is calculated using the following formula:

$$Vout = Vin\ (R2 / (R1+R2))$$

The light sensor module a voltage divider circuit is used. There is a fixed resistor R1 and variable resistor R2 which is a Light Dependent Resistor. The resistance of LDR varies according to the incident light. The difference between R1 and R2 is generated as output.

B) ***PRESENCE SENSOR***

The presence sensor module senses the presence of humans and generates a digital output accordingly[2][10][11]. With the help of a switching circuit (transistor) the digital data is converted to analog and it is given to the PIC microcontroller.

When the sensing area is cut by any human interruption then current enters the 10K resistor and the transistor short-circuits so output is 1.

When the sensing area is not cut by any human interruption then no current enters the 10K resistor and the transistor do not short-circuits so output is 0.

C) ***PULSE WIDTH MODULATION (PWM)***

Pulse width modulation (PWM) is a technique of controlling the amount of power delivered to an electronic load using an on-off digital signal [8][10]. The fraction of the period for which the signal is on is known as the duty cycle. Using this brightness of light can be controlled.

D) ***PC MODULE***

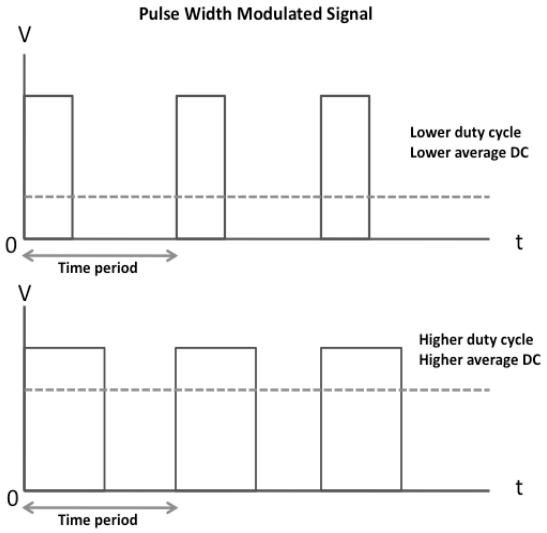
A personal computer is connected to the main set up wireless [1]. This is achieved by using a zigbee transceiver connection [3][13][12]. The zigbee is connected to the PC using a RS232 cable.

User can be obtained and connected to the PC either by using Bluetooth or GPRS.
For controlling the PC module smart phone is used.

IV. CONCLUSION AND FUTURE WORK:

This smart LED lighting system can reduce the power consumption by using LED lights. The brightness of the LEDs can be increased according to the user's state and the surrounding sunlight illumination. Also according to the user's wish the brightness can be varied by using an android application.

In future this work will be extended to all the household appliances and electronic appliances.



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A) *SMART PHONE MODULE*

A smart phone with a dedicated android application is present in this module. Bluetooth [14][15] or a GPRS connection is used to send the user's signal to the PC. The PC module will perform the overall controlling and monitoring of the session.

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