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INTRODUCTION ON EFFICIENT LED LIGHTING SYSTEM

PALLAVI S. GHARATAKAR[1], SNEHAL M. GAJBHIYE[2]

1. Electronics Engineering Department, M. Tech. in Electronics System and Communication, Government College of Engineering Amravati.
2. Electronics Engineering Department, Assistant Professor, Government College of Engineering Amravati.

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Abstract: Recently, all the electronics devices are having the main goal of energy conservation. Conservation of energy refers to the saving the waste of the energy which is cause by the inefficient use of electronic devices. Now a days, lighting energy consume most of the energy. Hence instead of using the cheap incandescent bulbs which having higher energy cost and lower life span, LED bulbs are used having long life span and low energy use. Hence the LED lighting system is used. The proposed LED lighting system can detect the presence of person using wed-cam and automatically adjust the minimum light intensity to enhance both energy efficiency and user satisfaction.

Keywords: LED lighting system, WSN, CAN, ZigBee network, object detection

Corresponding Author: MS. PALLAVI S. GHARATAKAR

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INTRODUCTION

Due to the environmental issue such as global warming and climate change, energy saving solution are essential. Energy efficiency is a goal to reduce the amount of energy required to provide products and services. Now a days we are using the fluorescent lights to reduce the amount of energy required rather than traditional incandescent light bulbs. Improvement in energy efficiency is generally achieved by adopting a more efficient technology or production process or by application of commonly accepted methods to reduce energy losses[4].

Lighting was the first service offered by electric utilities and continues to be a major source of electricity consumption. Globally, almost 50% of total amount of electricity generated is consumed by lighting sector. Almost half of the global lighting electricity (48%) is consumed by the service sector and rest is distributed between residential sector, industrial sector and street and other lighting. Lighting is one of the biggest causes of energy related greenhouse gas emission. The total lighting related CO_2 emission is 7% of total global CO_2 emission from the consumption and flaring of fossil fuels. Energy efficient lighting reduces the lighting energy consumption and thus a mean to reduce CO_2 emission. Reducing fuel based lightning with energy efficient electric lighting will provide means to reduce greenhouse gas emission associated with lighting energy consumption. Hence energy efficient lighting system is studied. During the past few years, LED lighting receives more alteration than any other lighting technology because it consumes 50% of energy consumption to the florescent lighting device[3]. There are many technologies are developed for the intelligent lighting control system. This system can reduce energy consumption due to situation awareness. That mean it controls the intensity of light according to user movement or brightness of surroundings.

RELATED WORK

There are many researches occur in lighting control system. The intelligent lighting system proposed is WSN based, CAN based, ZigBee based and Sensor based as follows:

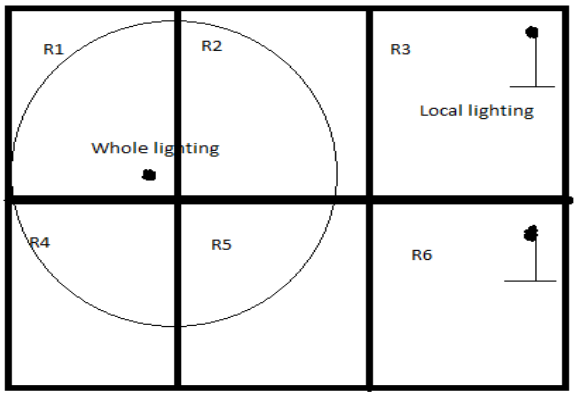

Fig. 1

A WSN Based Intelligent Lighting Control System:-

Wireless sensor network WSN is used for the indoor environmental lighting control system. Specially WSN used for the navigation, habitat or living monitoring and wildfire monitoring. Here WSN monitor the activity and status of user and depending on it decides the value of current illumination. It helps for saving sufficient amount of energy. This system considered two lighting devices, whole lighting device and local lighting device which represented in a grid network field as shown in fig.1.

A whole lighting device provides illumination for multiple grids for e.g. Bulb or fluorescent light and a local lighting device having concentrated illumination for e.g. table lamp. Here an illumination is depends on the users movement in which coverage range and interval of illumination is considered. First of all the sensor node indicate the current activity of user by clicking the button on the sensor board. Then the collected value from the photo sensor is reported to the sink which having aggregated light intensity information. All this collected information is transfer to the control host. Control host is implemented by Java. It updates the user status and report the light intensity. Using this information it tracks the users latest location and activities and control the illumination level of light control system [5].

Zigbee based street lighting system:-

Controlling the street lighting, save the sufficient amount of energy. For optimizing the management and efficiency of street light system, the zigbee based remote control system is developed as shown in fig.2. The main aim of the system is to generate an intelligent lamp post which users the LED light source. The relevant information related to the maintenance and management of the system is transferred via wireless using zigbee protocols.

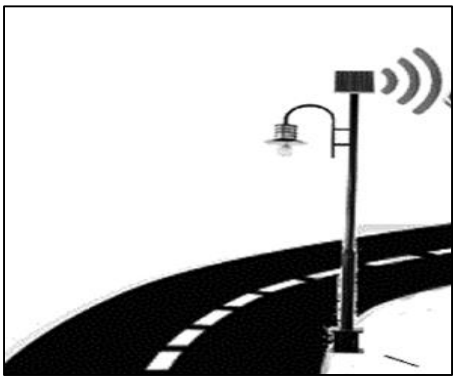

Fig. 2

The renewable energy is one of the efficient sources of energy. It replaces the conventional power source with positive effect on the environment. Rapid development of renewable energy and energy efficiency and technological diversification of energy sources would result in significant energy security and economic benefits.

Procedure and devices:-

The fig.3 shows the lighting system using the zigbee network. It consists of two parts, monitoring station and base station. Monitoring stations consists of some sensor which is used to collect the information such as intensity of sunlight and street conditions as follows:

Light sensor: - This sensor is measure the current brightness of the sunlight and this information is the given to the control unit.

Presence sensor: - It helps to detect the presence of any vehicle or pedestrian, so that to turn on the lamp.

Emergency sensor: - It has the emergency button which immediately turns on the lamp in case of emergency.

Base station: - It collects all the information from the sensor and it allows the visualization of entire lighting system. Here the information is received with the help of zigbee device.

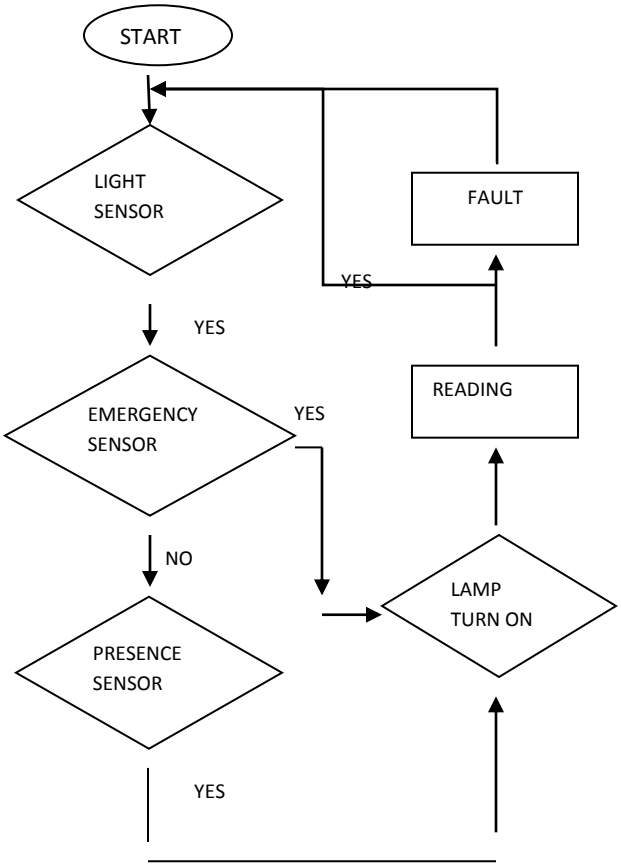

Fig.3

Zigbee network :- Zigbee is IEEE 802.15.4 standard based wireless communication technology used for communication among multiple devices in wireless personal area network (WPAN). Zigbee is typically used in low data rate applications that require long battery life and secure networking. In this system the information is transferred from lamp post to base station control, all this done in point by point transformation, that means information transfer from one lamp post to another where each lamp post having unique address in system[2].

CAN based lighting system:-

In this system the light intensity of the lighting system is controlled for the energy saving. A low cost design is introduced for the electrical energy conservation taking daylight illumination into consideration by using a controller area network (CAN) bus as the communication media[1].

Sensor based Lighting system:-

This system uses some specific sensor which are energy efficient such as motion sensor , illumination sensor etc. and perform wireless communication interface. System utilizes multi sensor and wireless communication technology so that LED lighting system is controlled according to user movement and surrounding. In this system illumination of the lighting device is according to person's movement and brightness of the surroundings. As shown in following fig.4 two steps are involved such as user movement is detected and user movement is not detected.

For this some parameters are defined as follows:-

t_r - rise time period when user movement is detected;

t_f - fall time period of light intensity;

t - time between the rise time and fall time when no movement is detected;

I - light intensity;

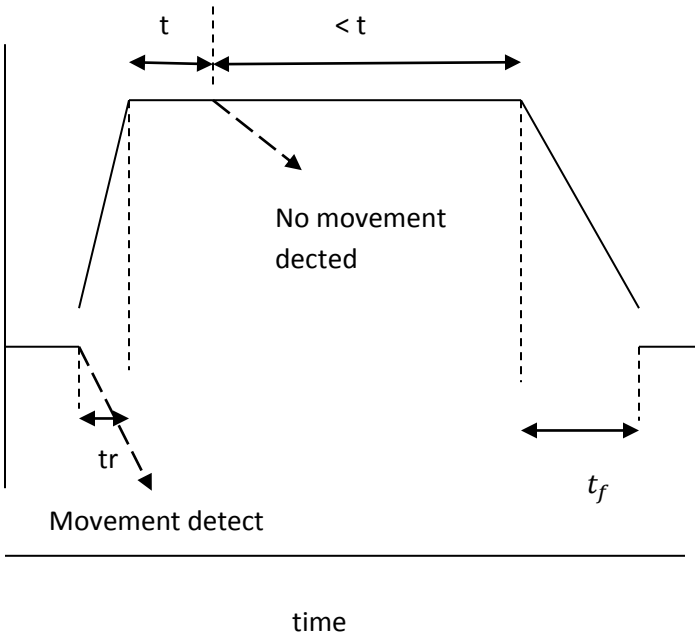

Fig.4

In this system, if the object is detected using the sensor then the light intensity I goes to the maximum value at time t_r. After time t_r if no movement is detected until the time t then the intensity of light is start to fall down to minimum value and takes a time t_f fall time period. Here the energy saving is occurred when the time t and t_f are shorter due to which maximum and minimum value of the light intensity is also smaller. Hence prevent the user's inconvenience of frequently on/off the light. Hence it required to properly set the threshold value of the light intensity according to the surrounding environment[1].

OBJECT DETECTION

This system detects the moving objects from a static background scene that contains shading and shadows using color images using webcam. The background subtraction technique has been used for years in many systems as a initial step for tracking and object detection. It generates a robust and efficiently computed background subtraction algorithm related with local illumination change problems, such as shadows, highlights and global illumination changes. A fundamental and pivotal problem of many vision system require capability of extracting moving objects from a video sequence which include traffic monitoring, video surveillance and human detection etc. Hence, the common approach for discriminating moving object from the background scene is background subtraction.

In a object monitoring a video processing is used. In which initially video is taken from a video camera which is then fed to MATLAB and for hardware it fed to ARM7.Then that video is now converted to frames. Now the frames we got need to processed further by image segmentation and feature extraction so that the body parts are identified from frame. After this conversion, a previous frame and the present frame from that instant is used calculated the difference between two frames. Difference is calculated using back- ground subtraction technique.

_ Video Input

_ Video to Frame

_ Segmentation

_ Background subtraction

Video input:-

The video input is taken from a Video camera with frame rate of 30 fps and the resolution of the frame is 240*320. As the resolution of frame increases the computing speed decreases.

Moderate resolution which will not harm the speed and the data need to required for the computation must be chosen.

Video to frame:-

Video is then converted to a frames by since a digital video camera takes 25 to 30 fps. Separate algorithm is used to derive frame from video.

Segmentation:-

The segmentation is process used to differentiate the body parts and only the region of interest is identified.

Background subtraction:-

Background subtraction is to subtract the image from a reference image that models the background scene. A fundamental and crucial problem of extracting moving objects from a video in many vision systems that include video surveillance, traffic monitoring, human detection and tracking for video teleconferencing or human-machine interface etc. and having its other applications. Here, the idea is to subtract the current image from a reference image, which is acquired from a static background during a period of time. It leaves only non-stationary objects, which include the object's entire silhouette region[6].

The results of the existing algorithms are fairly good; in addition, many of them run in real-time. Hence system must be develop a robust and efficiently computed background subtraction algorithm that is able to cope with the local illumination change problems, such as shadows and highlights, as well as the global illumination changes.

CONCLUSION

Energy saving has become one of the most important issues these days. All over the world, various researchers done a lot of studies and development related to energy saving of a light, considering both energy efficiency and user satisfaction. Now a days a existing systems cannot be successfully applied to home and office buildings. Therefore, an intelligent LED lighting system is developed,

This system utilizes web cam and wireless communication technology in order to control an LED light according to the user’s state and the surroundings. It detects the presence and movement of person using webcam and autonomously adjust the minimum light intensity value to

enhance both energy efficiency and user satisfaction. The proposed lighting system reduces total power consumption of the test bed.

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REFERENCES

1. Jinsung Byun, Insung Hong, Byoungjoo Lee, and Sehyun Park**, "**Intelligent House-hold LED Lighting System Considering Energy Efficiency and User Satisfaction, "IEEE Transactions on Consumer Electronics, Vol. 59, No. 1, February 2013.

2. 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.

3. Mohseen Sulthana, N. Umamaheshwar Rao, "An Energy Efficient LED Lighting System for Domestic Applications," International Journal of Science, Engineering and Technology Research, Vol. 3, Issue 9, September 2014.

4. S. Matta and S. M. Mahmud, and TulayaLimpiti, "An intelligent light control system for power saving," In Proceedings of the Annual Conference of the IEEE Industrial Electronics Society, pp. 3316-3321, 2010.

5. Meng-Shiuan Pan, Lun-Wu Yeh, Yen-Ann Chen, Yu-Hsuan Lin, and Yu-Chee Tseng, "A WSN-Based Intelligent Light Control System Considering User Activities and Profiles," IEEE sensors journal, Vol. 8, no. 10, October 2008.

6. Thanarat Horprasert David Harwood Larry S. Davis, "A Robust Background Subtraction and Shadow Detection", Computer Vision Laboratory University of Mary- land College Park, MD 20742.