An Intelligent Lightening System for Power Saving Applications

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***Abstract*— Nowadays, human has become too busy and is unable to find time even to switch off the lights wherever not necessary. To save the electrical energy there is some idea.This can be seen more often in the case of street lights. The present system is in such a way that the lights will be switched on in the evening before the sun sets and they are switched off the next day morning after there is sufficient light on the roads. But the actual timings for these lights to be switched ON are when there is absolute darkness. With this, the power will be wasted up to some extent. This project gives the best solution for electrical power wastage. Also the manual operation of the lighting system is completely eliminated.**

The main aim of this project is to save energy. This project presents the design and the implementation of a lighting system which is able to detect the approach of the visitors and then turn the lighting onto the normal intensity to let the large scale sectors be bright enough. All lights are equipped with the energy-saving function which will turn itself to the dimming level automatically after the visitors' leaving. PIR (Passive Infrared) sensors are utilized in the system instead of a video camera for the purpose of both cost-down and privacy issue.

The project is developed with similar equipment but the concept is different. The project is developed in such a way saving is easy than to generate energy. The Project is Embedded Street light control system using 8052 Microcontroller. This project is very useful for commercial sign boards, advertising boards, street lights for automation lighting system. This system switches on the lights only in darkness. As it works with PIR sensor, no programming of timings and battery back-up is required. When the light focuses on PIR it sends signal to microcontroller, depending on that signal the lights will be turned off through relays and when PIR detects darkness the street lights will be automatically turned on. There is no need for manual controlling system. This is a simple and very useful system.

I. INTRODUCTION

Today in all public areas the Lighting system is one of most important element in exhibition space, ex. museum or art gallery. How to protect photosensitivity exhibits to make the higher exhibition quality is a key subject in light environment design research. It can make use of artificial illumination more efficient and higher comfort degree. Artwork normally need be view at the center by track light system which typical lighting is 3000 K at200 lux. Besides, there are other lighting systems that are used for increase lightness or as movement guide sign in the same space. All lighting systems become complicated and influence the view of seeing.

By using some sensors to save the power energy.Therefore, the exhibition space managers are faced with the constant demanding of gaining greater control of the indoor environment, under increasing budgetary constraints. Furthermore, the conservation of artwork in exhibition space is also a very well known problem, either in exhibition rooms or in archival collections. Monitoring the environment is one of the most important tasks and concerns of all exhibition space. Nowadays, video camera application systems can be seen in exhibition, but most of them are expensive and without personal privacy. A Passive Infrared sensor (PIR sensor) are utilized in the system instead of a video camera for the purposes of both cost-down and privacy issue.

A PIR sensor is a device that measures infrared (IR) light radiating from objects in its field of view. PIR sensors are often used in the construction of human motion detectors. It is usually infrared radiation that is invisible to the human eye but can be detected by electronic devices designed for such a purpose. In order to properly conserve the artwork it is critical to continuously measure and control some parameters, such as radiation and lighting. It is also crucial to consider that the desire values of these parameters depend on the type of materials that constitute the artwork. That is, depending on the type of works that are in exhibition or in storage rooms, different rooms may have different requirements regarding environmental conditions. Hence, it will be necessary to design the lightings to have network interface to let them be able to be connected together to form an intelligent lighting system. In this Paper, we proposed a low cost and intelligent lighting system in exhibition space which is able to detect the approach of the visitors and then turn the lighting onto the normal intensity to let the exhibition be bright enough. All lightings are equipped with the energy-saving function which will turn itself to the dimming level automatically after the visitors' leaving. The follows will describe system architecture, experimental results and then give a brief conclusion..

II. OVERVIEW

There are a more lightings in the exhibition space. Each lighting consumes 50 -120 watts in most cases. For example, if there are 100 lightings in the exhibition space, the total power for illumination purpose will up to 5-12 KW. It really spent lots of energy. Actually, when there is no visitor in front of the exhibition, it is not necessary to illuminate in

the brightest mode. Hence this work is going to improve the energy efficiency of the illumination in the exhibition space by turning lighting into energy saving mode while there is no visitors appearing in front of the lighting. Fig shows the system architecture of the proposed lighting system. There are lighting-modules connected together through the lighting network. Each module consists of a PIR (Passive Infrared) sensor, at least one lighting and a lighting controller.

The PIR sensor can detect the approach of the visitor. The lighting controller is designed to receive the information of the visitor's approach and then turn the lighting or lightings into the normal working mode to illuminate the exhibition to the expected brightness. Meanwhile, the information of the visitor's approach in front of the lighting is sent up to the lighting network with an ID of the lighting controller attached. This information will be collected by the master computer connected with the lighting network through the network interface circuit. It is useful in the assistance of the exhibition security. All the lighting controllers in the lighting modules are equipped with the energy-saving function. It will automatically turn the lighting into dimming level to save electric power in few seconds after the visitor leaving the lighting.

Figure 2.1 Lightings are in the exhibition space

III. CASE STUDY

- Average power consumption per day :6600MW
- Thermal power generation per day:2283MW
- Hydral power generation per day:2542MW
- Total 1775MW power lag in our state per day
- By using our project we can save power 100MW per day.

IV.BLOCK DIAGRAM OF LIGHTINING CONTROLLER

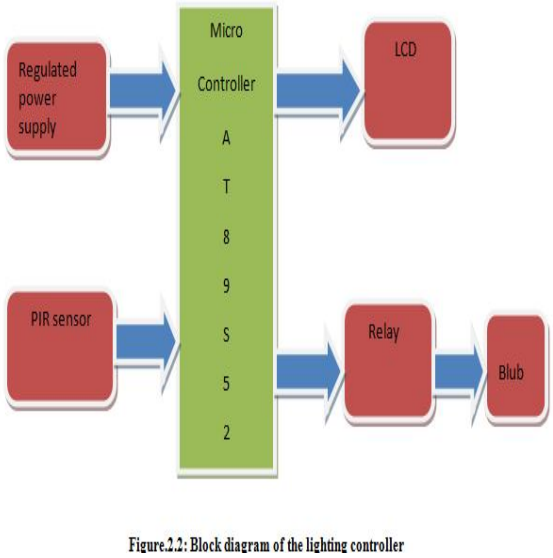

Figure.2.2: Block diagram of the lighting controller

Figure2.2 Block Diagram of the Lightning controller

Figure shows the block diagram of the proposed lighting controller. It consists of a PIR amplifier, a micro-processor, an ID circuit, a TRIAC dimmer, a relay circuit and a network interface circuit. The PIR amplifier is designed to work with the PIR sensor to detect the approach of the visitor. The information of the visitor's approach is then sent to both the relay circuit and the micro-processor. The relay circuit will turns to ON state and the lighting will be powered during full cycle of the AC line input wave. In this situation, the lighting works in the maximum intensity mode and the exhibition has the best illumination. On the contrary, when the visitor leaves the lighting, the PIR amplifier will output the relative information to both the relay circuit and the micro-processor.

The relay circuit will turn to OFF state and the lighting will be controlled by the TRIAC dimmer circuit. The user can adjust the conduct angle of TRIAC to dim the brightness of the lighting. On the other hand, after the micro-processor received the information of the approach or the absence of the visitor, the ID number of the controller will be attached on the information and then be sent to the lighting network through the network interface circuit.

V.EXPERIMENTAL RESULTS

The lighting module is implemented as shown in Figure. It is modified from the product of PIR security lamp. The PIR sensor is covered by a white plastic and also a black cover to block the light from the lamp. The inner circuit is modified to have the micro-processor, the relay circuit and the

network interface circuit. The TRIAC circuit is implemented in a metal case which is separated from the housing of the module. Here a potential meter with a knob is installed in the TRIAC circuit to let the user adjust the dimming level of the light.

The PIR sensor detects the approach of the visitor and then the relay circuit turns to the ON state. The lighting works in the maximum intensity mode which consumes over 300 mA of current

Figure5.1. Lighting module implemented with the PIR sensor and the lamp

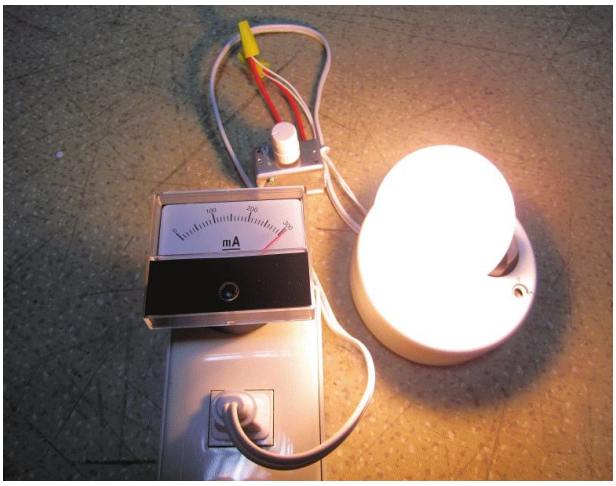

Figure5.2: The lighting works in the maximum intensity mode when the visitor approached. The measured current consumption is over 300 mA.

The test of the lighting module after the visitor leaves. The PIR sensor is covered by a box to simulate the leave of the visitor. The relay circuit turns to the OFF state.

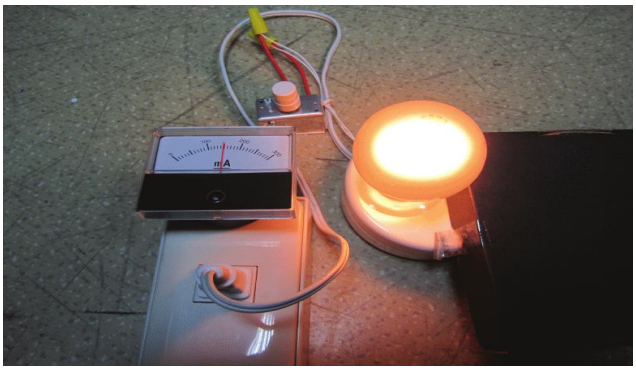

Figure5.3: The lighting works in the energy saving mode and the current consumption is around 150mA.

The lighting is controlled by the TRIAC circuit. The current consumption is reduced to 150 mA. It is then verified that the energy-saving mode is functional work.

VII. CONCLUSION

This project designed and implemented a lighting module. It can detect the approach of the visitor and then let the relay circuit actuate the lighting to work in the maximum intensity mode to let the lighting be bright enough. It can also turn to energy-saving mode automatically after the visitors leave in few minutes. The current consumption measurements show that over 300 mA is consumed in maximum intensity mode and only around 150 mA is measured in energy-saving mode.

The results show that the implemented module is functional work and the proposed module is useful for the energy saving purpose in the lighting space. In the future, few units of the designed lighting modules will be realized and connected together to form a lighting network. The collection of the visitation data and the security assistance of large scale.

Using this project we can save lot of power in large scale industries. In large scale industries there will be more lights use for lighting in that time by using this project we can save the power. For example by using this project we can save power nearly 100MW per a day.

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