LIGHTING CONTROL SYSTEM FOR ENERGY SAVING APPLICATION

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ABSTRACT

Lighting Control System for Energy Saving Application is a system that is using to reduce electricity by means of sensors & timer that will operate as demand. The energy consumption will reduced which is the main benefit of application of this system. Actually, this project development is specially design in which is to be applied in office's meeting room. Beyond of this project, a lighting control system needs the input of other devices on which to base its commands. Ultra Sonic Motion Detector is typically incorporated into this system, which is operates to detect any movement in the typically human. From there, automatically the light will turn on and when the room is unoccupied or no motion is detected, the lights will turn off. Timer also is used in this project to retain the bulb lighting for a few minutes in case there is no any movement. Standby battery is added in this project as an emergency power source in event the power failure.

ABSTRAK

Lighting Control System for Energy Saving Application merupakan satu sistem yang digunakan untuk mengurangkan kadar penggunaan tenaga elektrik iaitu Pengesan(sensor) dan Pemasa (Timer) akan beroperasi apabila diperlukan. Penggunaan tenaga elektrik akan berkurangan dimana ia merupakan faedah utama bagi projek ini. Penghasilan projek ini akan diaplikasikan di bilik mesyuarat pejabat. Disebalik projek ini, *Lighting Control System* ini memerlukan sokongan masukan (input) daripada peralatan yang lain. *Pengesan Pergerakan @ Ultra Sonic Motion Detector* ini digabungkan dalam system ini dimana ia berfungsi sebagai mengesan pergerakan seseorang. Daripada itu, lampu akan hidup secara automatik dan lampu akan dimatikan sebaik sahaja bilik itu kosong. Pemasa juga digunakan di dalam projek ini untuk menahan cahaya dalam beberapa minit yang ditetapkan sekiranya tiada sebarang pergerakan. Standby Battery adalah bertujuan untuk bersedia memberi sumber bekalan sekiranya sumber bekalan kuasa terputus.

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ABREVIATION

LED -	Light Emitter Diode
AC	Alternating current
DC	Direct current
RF -	Radio Frequency
IC	Integrated circuit
CMOS	Complimentary metal–oxide–semiconductor
LS	Low power shottky

LIST OF APPENDIX

CHAPTER 1

INTRODUCTION

2.0 Introduction of the project

This project is about the designing and development of the lighting control system for energy saving application. Using electronic lighting control systems to save energy is increasingly a mandatory part of commercial lighting design, and it can be a big energy-saver at meeting room as well. In addition, a lighting control system is no longer exclusively a luxury item, but has become more of a lifestyle item due to declining costs and complexity. The aim of this project is to reduce the electricity consumption. This system is to control the lamp automatically when somebody enter to the room and sensed by an Ultra Sonic Motion detector circuit. Ultra Sonic sensor works by measuring the time it takes a sound wave to propagate from the sensor, to an object and back to the sensor. Ultra Sonic waves generated by a transmitter are reflected by the target and the returning waves are detected by a receiver. In this case, timer circuit is also used to retain lighting for a particular time. The standby battery is added in this project development in case of main supply is cut-off.

1.1 Objectives

The main objective of this project is to reduce the electricity consumption by means of automatically turning light off in meeting rooms. In this project, it is identified of 4 major objectives that must be met in the development of this system:

- To built, test and use the lighting control system;
- To reduce the electricity consumption if there is nobody in the room;
- To detect a movement when somebody enter to the meeting room by using Ultra Sonic detector;
- Facilitate user to use this system;

1.2 Problem Statement

Many building owners and facility managers want to reduce operating costs by minimizing energy expenses as much as possible while ensuring the comfort and safety of others. In this case, this project is used in meeting room appliances. Sometimes, users forget to turn off the light after use and it is a waste. So, by this project development, it'll solve the problem .Through this project, the cost will be reduced, saving the energy and it'll give more profit for us as a user.

1.3 Scopes of project

The scope of this project is started with the research about the related information via books and internet before project development. In completing of this project, the main areas being identified that need to be worked out are:

- Literature review to find out a smart sensor among the many sensors available and the switching system for this project.
- The related components and circuits must be find out and do a research;
- sketches the project based on the gathered information;
- The circuit will be constructed, simulated, testing and analyzed on the outcome of the project.
- Troubleshooting will be done if it produced an error during the simulation.

Other scopes of work include:

- Correlation of theoretical engineering principles with the proposed project;
- Design and production of the required circuit board for the project;
- Keep up a good log book records;
- A complete preparation of the necessary documents and project equipment requirements;
- Prepare for project presentation;
- Publish a final report;

1.4 Project Methodology

In completing of this project, the complete step of methodology must be considered. The entire of list below should be completed from the beginning until the final step of project implementation.

The following methods of this project as below:

- **Gathering Information**

Effective information gathering is the most basic perspective-widening tool that is required in completing the tasks. Firstly, I've find out a suitable title to do as my final project and figure out the scope, expediency and try to understand the project purpose.

- **Literature review**

  Research and literature review on the components needed to develop the system;
  -Source for the related and relevant ideas and projects.

- **System Analysis**

  Analysis will be done to determine how current existing project works and the problems inside it. The main problems encountered in previous work are also determined to make sure a vital improvement for my project. Information from the reference book and internet surfing are gathered to support the validity of the analysis process. Besides that, try to understand the function of the whole system and study the implementation of the project.

- **Studying and Review**

Lots of time will be spent in practicing to use Multisim 2001® and Eagle software. In Multisim 2001, it is used to draw the circuit and the simulation also will be done. Meanwhile, the Eagle software is used to design the circuit. Refresh the electronic general knowledge and understand it to make sure this project will be constructing perfectly.

Besides that, make an appointment with my supervisor whenever the need arises. An interview is also involved to senior or master students that have much knowledge about the information needed.

- **Design & Development**

Emphasis is placed on design formation, project identification, and production of a feasibility study. I've focused on the development of task specifications in light of the norms for design and preliminary validation of the design by means of basic analysis and appropriate prototyping.

- **Verification & Testing**
-

The circuit simulation part must be verified by using Multisim 2001. After the projects' development, it must be examined as well whether the result is in a good condition or vice versa. Troubleshooting will be done if any error in implementation is detected.

1.5 Thesis Outline

This thesis represent by five chapters. The following outline below is contents of this project:

Chapter I:

The first chapter of this thesis is describe about the background of the project, objective, problem statements, scope of works regarding the project and methodology of the project in implementation of the project.

Chapter II:

This chapter describes about the literature review which is focus to the research and information about the project. Every facts and information which is found through journals or other references will be compared and the better methods have been chosen for this project.

Chapter III:

This chapter explained about the project methodology approach taken and a closer look on how the project is implemented. Each achievement and selection taken when the project is implemented will be explained in detail for each stage until the project is success. This chapter will briefly describe on history, materials that were used and how to operate it.

Chapter IV:

This chapter describes about the project findings such as result, analysis and discussion. The result is presented by simulation, waveforms and figures.

Chapter V:

This final chapter is described about the Conclusion and suggestion for this project.

CHAPTER 2

LITERATURE REVIEW

4.0 Introduction

The following discussion mainly focuses on the adaptability of project functionality and development. This chapter will provide details and discuss about the source that are related to this project. It consists of the products that are already in the market nowadays and also contains the theory of the components and equipments that will be used in the project.

2.1 Lighting Control System

In Lighting control system consists of a device, typically an embedded processor or industrial computer, which is controls electric lights for a building or residence. Lighting control systems usually include one or more keypads or touch panel interfaces. These interfaces allow users the ability to toggle power to lights and fans, dim lights, and program lighting levels. A major advantage of a lighting control system over conventional lighting is the ability to control any device from any interface. For example,

a master touch panel might allow the user the ability to control all lights in a building, not just a single room.

In fact, any light might be controlled from any location. In addition, lighting control systems provide the ability to automatically power a device based on programming events such as:

- Chronological time (time of day)
- Astronomical time (sunrise/sunset)
- Room occupancy
- Events
- Alarm conditions
- Program logic (any combination of events)

Chronological time is a time of day or offset from a time. Astronomical times includes sunrise, sunset, a day, or specific days in a month or year. Room occupancy might be determined with motion detectors or RFID tags. Events might include holidays or birthdays. Alarm conditions might include a door opening or motion detected in a protected area. Program logic can tie all of the above elements together using constructs such as if-then-else statements and logical operators.

Mode Lighting is one such manufacturer. Installs on projects such as the Millennium dome to smaller residential situations, Mode lighting systems are fully scalable for all situations. This demonstrated how all of the above categories can work seamlessly together to create a complete solution. Lighting control offers nice effects and helps to save energy by dimming lights where it would previously be 100% or 0%. [10].

2.2 Sensing Units

A sensor is a device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument. For example, a mercury thermometer converts the measured temperature into expansion and contraction of a liquid which can be read on a calibrated glass tube.

A thermocouple converts temperature to an output voltage which can be read by a voltmeter. For accuracy, all sensors need to be calibrated against known standards.

Sensors are used in everyday objects such as touch-sensitive elevator buttons and lamps which dim or brighten by touching the base. There are also innumerable applications for sensor on most common products and equipments. Applications include cars, machines, aerospace, medicine, manufacturing and robotics.

A sensor's sensitivity indicates how much the sensor's output changes when the measured quantity changes. For instance, if the mercury in a thermometer moves 1 cm when the temperature changes by 1 °C, the sensitivity is 1 cm/°C. Sensors that measure very small changes must have very high sensitivities.

In addition to that, sensors do have their advantages and disadvantages whereas; different sensor technologies are better suited for certain applications. Table 2.2 shows the advantages, disadvantages and application on some of the most common sensors that are available in the market today.