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SMART MONITORING LIGHTING CONTROL SYSTEM

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This report is submitted in partial fulfillment of the requirements for the award of
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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : SMART MONITORING LIGHTING CONTROL SYSTEM

Sesi Pengajian : 2008/2009

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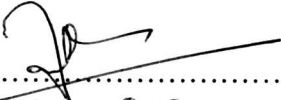
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ABSTRACT

This project is about designing a smart monitoring lighting controlling system. This system is designed to controlling the light of a room automatically. The objectives of the project are to achieve the energy saving purpose where it will automatically turn off the light when there is no one in the room. This project consists of two major components, which are infrared sensor part and signal counting part. This project will implement a system where it will monitor whether there is anyone who is still present in the room by using infrared detector with counter. The counter, with the assistance of infrared sensor and LDR, can count the people going in and out of the room accurately. The advantages of this project are low power consumption, relatively low hardware requirements, and low cost.

ABSTRAK

Projek ini adalah berkenaan merekacipta sebuah sistem kawalan lampu bilik. Sistem ini direka bertujuan untuk mengawal lampu dalam suatu bilik secara automatik. Objektif projek ini adalah untuk penjimatan tenaga elektrik di mana ia dapat menutup lampu dalam bilik apabila didapati tiada orang dalam bilik tersebut. Projek ini mempunyai dua komponen yang penting, iaitu pengesan infrared dan bahagian pingiraan isyarat. Projek ini boleh mengesan kehadiran seseorang dalam bilik tersebut dengan menggunakan pengesan infrared. Dengan bantuan LDR, ia membolehkan sistem ini untuk mengira bilangan orang yang berada dalam bilik itu. Kebaikan projek ini termasuk kadar penggunaan tenaga yang rendah, kurang penggunaan perkakasan, dan murah harganya.

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LIST OF ABBREVIATION

LDR	-	Light Dependence Resistor
PCB	-	Printed Circuit Board
USB	-	Universal Serial Bus
CMOS	-	Complementary Metal Oxide Semiconductor
CCD	-	Charge Coupled Device
DC	-	Direct Current
IR	-	Infrared
LED	-	Light Emitting Diode
Hz	-	Hertz
PIR	-	Passive Infrared
CIE	-	International Commission on Illumination
NIR	-	Near Infrared
MWIR	-	Mid-wavelength Infrared
LWIR	-	Long Wavelength Infrared
VLWIR	-	Very Long Wavelength Infrared
FIR	-	Far Infrared
LTE	-	Local Thermal Equilibrium
IRED	-	Infrared Emitting Diode
BCD	-	Binary Code Decimal
IC	-	Integrated Circuit
AC	-	Alternate Current

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CHAPTER 1

INTRODUCTION

1.1 Introduction to The Project

The world is finding a new kind of renewable energy to overcome the shortage on current energy resources. Wind, solar and wave are some of the possible energy resources to replace it. However, petroleum still remains as the biggest resource in producing the electrical energy. A research had showed that the petroleum on Earth will finish within 41 years. This is a sign for us to take action on energy saving before scientist has found a new energy resources to replace petroleum. As the cost of producing electrical energy is constantly on the rise nowadays, any electricity wastage must be avoided. Very often, the light in the rooms or offices are left on even when there is no one inside. This will cause a lot of electricity wastage.

The title of the project is Smart Monitoring Light Control System. This project will implement a system where it will monitor whether there is anyone who is still present in the room by using passive infrared detector with counter. The counter, with the assistance of infrared sensor and LDR, can count the people going in and out of the room accurately. As long as there is someone in the room, the light will be switched ON unless

toggled. Once the system detects that there is no one in the room, the system will shut down and switch off the light in the room.

1.2 Project Objectives

The main objective of this smart monitoring light control system is to achieve the energy saving purpose where it will automatically turn off the light when there is no one in the room. The wastage of electricity happened very often as most people when leaving the room do not have the habit of switching off the lights especially in common and government offices. This is wastage very often unintentional but will increase the electricity bill of the premises.

Besides, this project will create a more user friendly system which do not require user to switch on or switch off the light in a room manually. Usually when we enter our room when it is dark, we find that it is difficult to locate the switches mounted on the wall to switch on the light. For a new comer, it is even harder as he has no knowledge of the correct switch to be turned on or off.

The typical room design often has switches mounted on a position which is not suitable for those disable person. This project also showing the concern on those disable person.

1.3 Problem Statement

By using typical manually control lighting system; there are some inconveniences and problems that will be faced by the user. Firstly, a lot of energy is waste where most of the people will leave the room without switching off the light. This will increase the electricity bill of the premises. Secondly, when we enter a room when it is dark, we find it difficult to locate the switches mounted on the wall to switch on or switch off the light. For

a new comer, it is even harder as he has no knowledge of the correct switch to be turned on and off. Lastly, the location of the wall mount switch is too high for those disable people and too low for the safety of the children. This will cause a lot of inconvenience to them.

1.4 Scope of works

The scopes of work for the project include the following areas:

1. The study and understanding of the human sensing technology.
2. Identification of the parameters and limiting errors to be considered in this project.
3. The understanding of the circuit operation (transmitter and receiver) of the project.
4. The development of a prototype for the project.
5. The analysis of the output data from the project circuit.
6. Finally to conduct and verify the functionality of the system.

Other scopes of work include:

1. Design and production of the required circuit board for the project
2. Maintain good log book record
3. Prepare the necessary documents
4. Publishing final report
5. Project Presentation

1.5 Project's Methodology

Project Planning

- Understanding the concept and theory of the project
- Prepare Gantt Chart for guidelines and progress of the project

Literature Review

- Background reading and references
- Search for suitable and practical circuits
- List down and identify the suitable components using in the circuits
- Design the prototype circuit boards and assembling
- Test and do analysis to the circuits

Finishing

- Testing of final assembly circuit in operation; application record the results
- Presentation of the project
- Finishing the technical report of the project

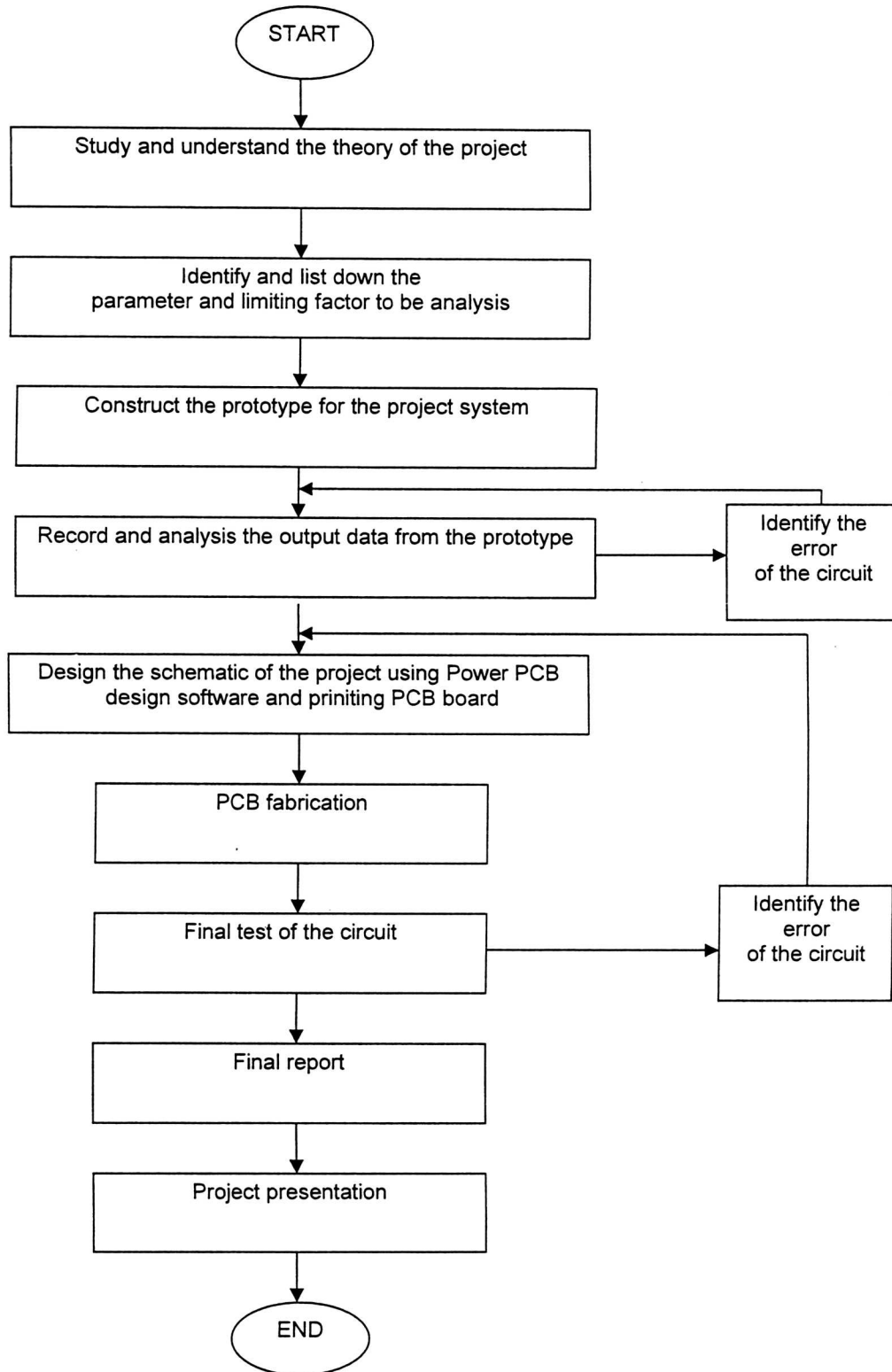


Figure 1.1: Project Flowchart

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter the various aspects and the methods on research methodology on the proposed project will be studied and analyzed one by one. Past projects and thesis which were related to the proposed project would be referred. Existing related projects will be referred to make the proposed project fulfill the project objectives and outcomes. Besides, this chapter will show the actual concept of light controlling system and the various related analysis. Several technologies on human detection will be studied by analyzing the pros and cons on each technology.

2.2 Human Sensing Technologies

The sensor part is the most important aspect in this project. It plays an important role to detect the existence of human in a room. The effectiveness of the sensor, the maximum distance that the sensor can sense the presence of human, the relative error during sensing, the construction price of the sensor and all the aspect need to be considered by achieving the objective that had been planned.

The physical parameter of a human that we can detect using different kinds of sensors is:

- Voice
- Temperature
- Clothing texture
- Motion
- Scent
- Skin type
- Shape

The following are the sensor type which may be suitable to be use as the human sensor in this project.

2.2.1 Vision

Vision is the most widely used sense for detection of human presence. It has made its proof with humans, so it is one of the most effective. There exist different kinds of vision sensors:

a) Linear camera

Linear camera is the cheapest vision sensor, but it is not very effective to detect the presence of a human. We need more than one line of pixels to detect a human being.

b) Color camera

Color camera exists in many different versions, like low cost USB cameras with CMOS sensors (for example a webcam used on a personal computer) or more