MUSIC SYNCHRONIZED LIGHTING

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UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : MUSIC SYNCHRONIZED LIGHTING

Sesi Pengajian : 2008/2009

Saya SITI HAWA BINTI MAT ISA

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Supervisor's Name   : Mr Mazran Bin Esro

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For my beloved mum and dad

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ABSTRACT

The purpose of this project is to develop the music synchronized lighting system to be used at Malacca buildings. The music synchronized lighting is project which is when music is played, the lighting on and off pattern will change according to the music. This project involves analog amplifiers and filters to distinguish the sound of different frequencies. The signal will trigger different type of lighting pattern as if the light pattern is dancing all along with the music. It also would be able to show the light pattern according with the various type of music. normally the light and music is used when there are celebrations like Christmas Day, launch ceremony, concert light or any other function. In other case usually, music and light used separately. This means, music and light are used together, but light does not lighting synchronized with the music. The objective of this project is to take an audio signal and transform it to a light show. Besides, it is also to filter audio signal within unique frequency ranges to power individual LED's using band pass filter. In this project, the light pattern is developed can be controlled by software using PIC 16F877A program. Other than that, the band pass filter will be designed to pass the frequencies within a certain range and rejects (attenuates) frequencies outside that range. It is expected that this project is successfully developed to be used at Malacca buildings. By implementing this product, it will be an attraction for tourist to come to Malacca. Other than that, this product can also make a not so interesting audio signal and transform it into an exciting, visually stimulating light show.

ABSTRAK

Projek ini adalah untuk menghasilkan satu sistem lampu yang bergerak mengikut muzik untuk diaplikasikan pada bangunan di Melaka. Sistem yang menggerakkan lampu ini adalah satu projek yang mana bila muzik dimainkan, penyalaan corak lampu akan berubah mengikut rentak muzik. Projek ini melibatkan penapis untuk membezakan bunyi pada frekuensi yang berlainan. Isyarat akan memicu corak lampu yang berlainan di mana corak lampu akan menyala-nyala mengikut muzik dan mampu untuk mempersembahkan corak lampu berdasarkan pelbagai jenis muzik. Namun, sistem ini tidaklah digunakan secara meluas di mana ia hanya digunakan apabila terdapat sesuatu perayaan seperti Hari Krismas, upacara pelancaran, lampu konsert, atau sebarang majlis lain. Dalam hal yang lain, biasanya, muzik dan lampu digunakan secara berasingan. Ini bermaksud, muzik dan lampu digunakan bersama, tetapi lampu tidak menyala segerak dengan muzik. Objektif projek ini ialah untuk mengambil satu isyarat audio dan mengubahnya kepada pergerakkan lampu, menapis isyarat audio kepada julat-julat frekuensi yang unik untuk menyalakan setiap LED dengan menggunakan *'band pass filter'* . Dalam projek ini, corak lampu terhasil boleh dikawal dengan perisian menggunakan pengaturcaraan PIC 8F877A. Selain daripada itu, *'band pass filter'* akan direka bentuk untuk melepaskan frekuensi-frekuensi di dalam sesuatu julat dan membuang frekuensi-frekuensi luaran julat isyarat itu.. Di harapkan projek ini berjaya dihasilkan untuk digunakan pada bangunan-bangunan diMelaka. Dengan mengaplikasikan produk ini, ia akan menjadi daya tarikan kepada pelancong yang datang ke bandaraya Melaka. Selain itu, produk ini juga boleh membuatkan satu isyarat audio yang membosankan dan mengubah ia kepada satu yang menghiburkan dengan persembahan lampu yang menarik.

CONTENTS

I   **INTRODUCTION**

LIST OF TABLES

NO	TITLE	PAGE
2.1	Types of Microcontroller	11
2.2	Comparison between Two Types of PIC	16

LIST OF FIGURES

LIST OF ABBREVIATION

LED   -   Light Emitting Diode

CD   -   Compact Disc

CPU   -   Central Processing Unit

PC   -   Personal Computer

RAM -   Random–Access Memory

I/O   -   Input / Output

ROM -   Read-Only Memory

ADC   -   Analog to Digital Converter

EEPROM -   Electrically Erasable Programmable Read-Only Memory

EPROM   -   Erasable Programmable Read-Only Memory

A/D   -   Analog to Digital

D/A   -   Digital to Analog

ICD   -   In-Circuit Debugger

CCP   -   Capture – Compare

PSP   -   Parallel Slave Port

LCD   -   Liquid Crystal Display

PCB   -   Printed Circuit Board

PIC   -   Programmable Interface Chip

PWM -   Pulse Width Modulation

UART -   Universal Asynchronous Receiver/ Transmitter

LIST OF APPENDIXS

CHAPTER I

INTRODUCTION

1.1   Introduction

The synchronized lightning show will incorporate several aspects of electrical engineering. The project's interesting in its design and overall visual effects. The system can synchronize the light movement pattern on a building to the sound of music being played. The purpose of designing the system is to create a tourist attraction spot in Malacca.

The project will focus on building a prototype (small scale model) using small light (LED) decorated around the building. When music is being played, the lighting pattern will change according to the music. The project involved filters to distinguish the sound of different frequencies. The signal will trigger different type of lighting pattern as if the light pattern is dancing along with the music.

1.2 Objectives

The objectives of this project are:

1. To take an audio signal and transform it to a light show
2. To filter audio signal into unique frequency ranges to power individual LED's.
3. To present the beat of the song to a lighting pattern
4. To apply this product to building in Malacca.
5. To be able to learn and use the PIC 16F877A programming

At the end of this project, all of the objectives must be achieved. It is to make sure that the project operates smoothly and follow the main concept of the project by using the suitable components, software and equipments.

In order, to make the beat of the music synchronized with the lights, it needs a filter to distinguish the frequency and the light pattern will be controlled by the software. So, the source code must be developed in the software using *'PIC C COMPILER'*. After that, the program will be installed into the PIC 16F877A chip to control the movement and operation of the light to synchronize with the music.

1.3 Problem Statement

Nowadays, this product, music and light doesn't use widely. It is only used when there is a celebration like Christmas Day, launch ceremony, concert light or any other function. So, the main objective of this project is to produce music synchronized lighting to be use at Malacca building. This is because; Malacca is the one of historical city in Malaysia which is having the most tourist visits. Meanwhile, this system can make the whole building in Malacca much more interesting, and at the same time the environment will be more cheerful.

1.4   Scope of Project

The goal of this project is to build a two stage circuit which will convert an audio signal from a CD to a light show. The first stage will filter the audio signal into high and low frequencies. The second stage will amplify these signals in order to power the corresponding light show.

The prototype is a small scale model using small light (LED) decorated around the building. When the music is being played, the light pattern will change according to music. PIC used to control the pattern of the LED. C programming language is used to write program to the PIC by using CCS C Compiler. Proteus software will be used to design the layout of PCB. Input for this system is come from the laptop speaker where the music is played whereas the output at light (LED). The combinations from all equipment make this music synchronized lighting more interesting.

Below is the block diagram that shows the concept of the operation for this music synchronized lighting.
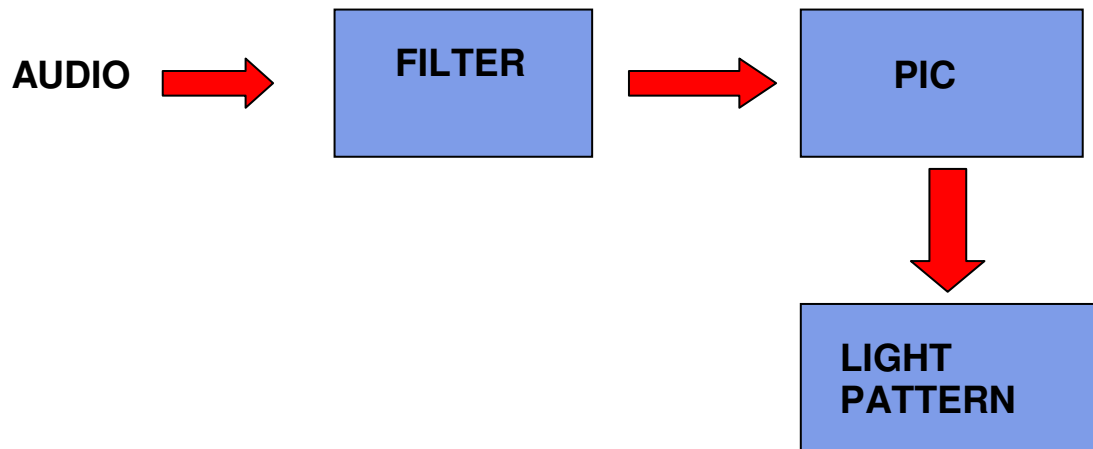
Figure 1.1 Block diagram of music synchronized lighting

Audio Signal: The output of a laptop

Band Pass Filter: use op-amp filters to extract the mid-range frequencies from the audio signal. Then use this signal to determine when to have the high frequency light on or off according to the signal. It will also determine the brightness of the light based on t**he frequency.**

PIC: PIC used to control the pattern of the LED.

Light (LED): This will be the main visual component of the light show. It will light up when the power amplifiers tells it to.

1.5 Methodology

Figure 1.2 shows the process flow throughout the project. The project is conducted according to the processes shown below:
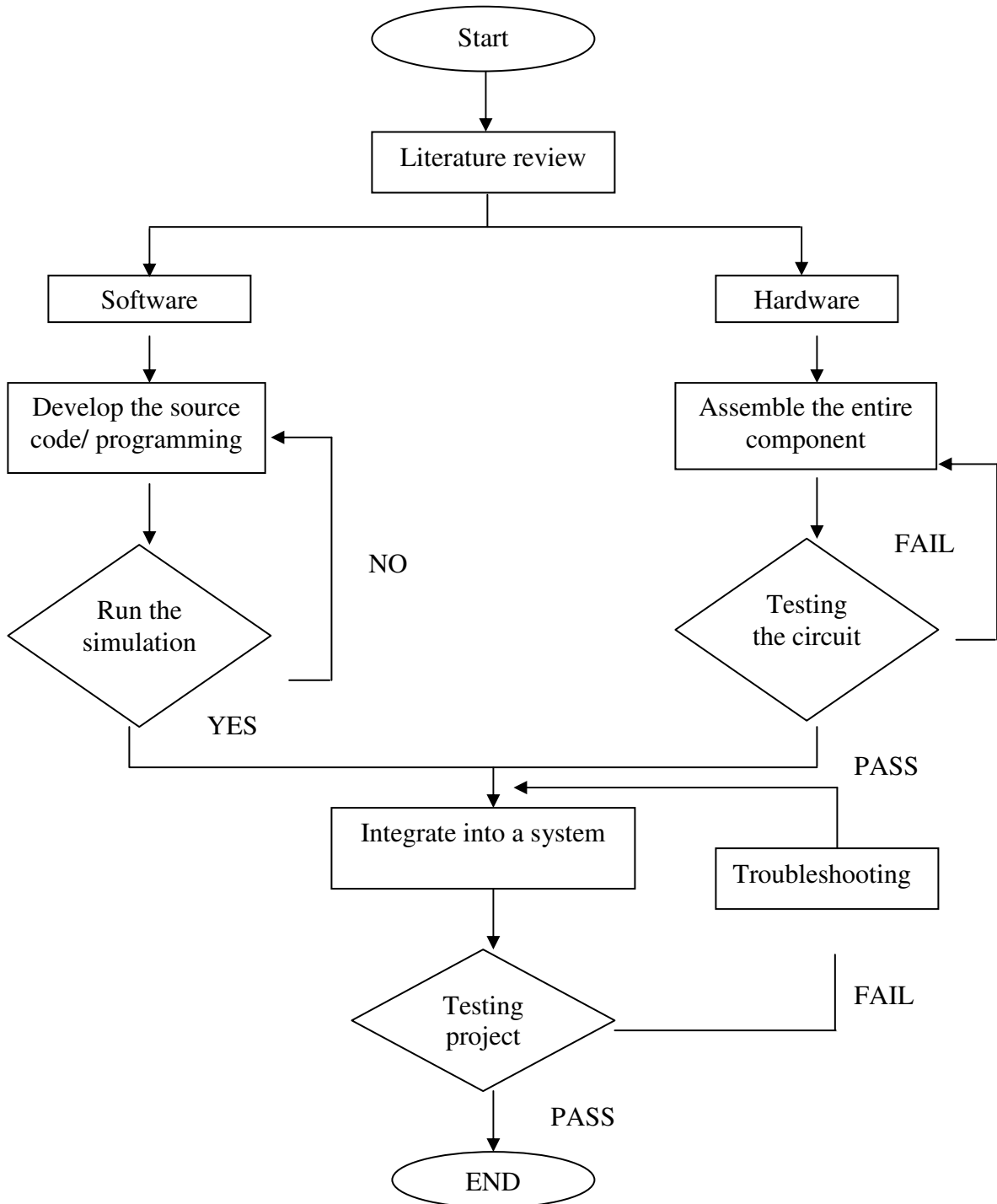

Figure 1.2 Overall project flows

Figure 1.2 shows the overall project flow. The project started with background study or literature review. Research is done in order to know the requirement of the music synchronized lighting which covers the required components, the circuit, the source code and the prototype design. After completing the literature review, this task is divided into two parts. First part is development of hardware which the design of the circuit and component assembly are carried out before then testing the circuit. The project continues with PIC 16F877A programming which is the crucial part of the process. Finally, the program is tested into the circuit and modified in some parts in order to improve the system functionality.

1.6 Thesis Structure

The structure of this report is about the flow of the project. This report is consists of five chapter that cover the introduction, literature review, research methodology, result, discussion, conclusion and recommendation.

Chapter I, will discuss about brief introduction of the project, the objectives, the problem statement, the scope of project and methodology are briefly discussed to provide the reader an understanding about the project.

Chapter II is about literature review which includes the concept, theory and perspective the project. This is useful in order to solve the problem encountered and any hypothesis that is related to the research of methodology.

Chapter III is describes the research methodology of the project. This chapter will discuss the method or approach that used in project development including the hardware and software aspect.

Chapter IV is discusses briefly on the observations, results and the analysis of the project methods acquired during the development of the project. This chapter also consists of recorded data analysis and the result of the project.

Chapter V is covers the discussion of whole contents of the report. There will be suggestion for improvement process in the future research. This chapter emphasizes on advantages and disadvantages of this project.