



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MULTIMODE STAGE LIGHT

This report is submitted in accordance with requirement of the Universiti Teknikal
Malaysia Melaka (UTeM) for the Bachelor Degree in Electrical Engineering
Technology (Industrial Power) with Honours

By

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: : **Multimode Stage Light**

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I hereby, declared this report entitled “Multimode Stage Light” is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the Degree of Bachelor of Electrical Engineering Technology Industrial Power (Hons) The member of the supervisory is as follow:

.....
(En Mohd Razali Bin Mohamad Sapiee)

ABSTRAK

Sistem pencahayaan merupakan sesuatu perkara yang penting dalam mewujudkan keadaan dan suasana yang menarik. Pada masa kini, pementasan teater dan perfileman serta majlis-majlis keramaian amat memerlukan system pencahayaan yang pelbagai, selain itu , pengendalian sistem pencahayaan yang mana memerlukan seseorang yang mahir dari segi pemasangan sehinggalah penggunaan pencahayaan.

Kini, Sistem pencahayaan banyak diantaranya memerlukan pengawalan manusia sepenuhnya dan diawasi kendalian nya secara manual . Sehubungan dengan itu, projek “Lampu Pentas Pelbagai mod” ini direka khas dengan sistem automatik untuk melakukan gerakan dan cara pencahayaan yang telah diprogramkan mengikut pilihan. Sistem ini melibatkan penggunaan pengawal mikro untuk mengawal pergerakan dan pencahayaan yang diprogramkan. Disamping itu, cara pencahayaan akan disusuli dengan pergerakan lengan robot yang akan mewujudkan pergerakan yang kompleks dan menarik. Pada akhir penghasilan projek ini “Lampu Pentas Pelbagai mod” dapat mengurangkan tenaga kerja manusia dan memudahkan pengguna untuk menyusun kehendak mereka mengikut corak yang telah diprogramkan secara automatik.

ABSTRACT

The lighting system is an important issue in creating very attractive lighting, which requires creativity and affecting the movement of light and program description. Nowadays, theater and film as well as social gatherings in dire need of a variety of lighting systems, and in addition, the operation of the lighting system require someone skilled to manage the procedure of lighting up the installation. Today, many lighting systems require full human control and monitor the operations manually. Accordingly, the project Multimode Stage Light is designed with an automated system to perform the movement and the way the lighting is programmed by selecting. This system involves the use of a microcontroller to control the movement and lighting is programmed by few of selectable choices. In addition, the way the lighting will be followed by the movement of a robotic arm that will create a complex and interesting movement. At the end of the production of this project, Multimode Stage Light can reduce human labor and ease of use for users to organize their needs according to the pattern that has been programmed automatically.

DEDICATION

To my beloved parents

ACKNOWLEDGEMENT

First and foremost, thanks to Allah for giving me this healthy body that enables me to devote to the community as well as gaining new knowledge, experience and able to finish this report in the frame of time. Nothing can be done except with the permission of Allah.

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LIST OF ABBREVIATIONS

| | | |
|---------|---|-----------------------------------|
| PWM | - | Pulse Width Modulation |
| RGB LED | - | Red ,Green, Blue Led |
| SPST | - | Single Pole Single Throw (switch) |

CHAPTER 1

INTRODUCTION

1.1 Project Background

Nowadays, in staging and entertainment very attractive lighting requires creative and affecting the movement of light and program description, With increasing demands of performing arts, more and more types and numbers of lighting devices are adopted on stage. How to access and control these abundant devices become serious problems. Other than that, networked control system of the stage lighting device is a research focus in entertainment technology field which to try to build more intelligent and real-time automatic networking of stage lighting devices is expected. In order to construct a universal, feasible and compatible device's network automatically, the working, mechanism and motion are analyzed separately. The project "Multimode Stage Light" has been chosen which can be said to have similarity with manipulator robot. Its movements can be programmed to our desire. It can also be remotely programmed. The stage light should be portable and able to rotate and move so as to project multi-color light patterns using lasers or RGB bright LEDs.

1.2 Problem Statement

The problem statement for this project is to state many of stage lighting are still using manual operation which is needed, human operation or called by Human Machine Interface (HMI) to make movement of stage lighting. For example, many stage lights are not controllable variables intensity, colour and no program motion, so it will operate manually and must be handled by the professional lighting handler, but with the multimode stage light it is one of automation stage lighting that had been programmed and got the various selector mode which are more accurate movement and automatic. This problem will increase the cost of instructors and lighting equipment and need various instalment settings for nice lighting compare to multimode stage light which no need the professional setting to see it and easy to use and install. This multimedia stage lighting are platform to make people realize that the combination of automation and light will be useful in a stage lighting and will produce the new idea for a new invention for future of automated lighting.

1.3 Objective

The objectives of this project are:

- i. To design a stage light which portable and able to move so as to project multi-colored lights.
- ii. To design the system of lighting movement can be selected and program to be our desire.
- iii. To program many concept motion for stage light.
- iv. To develop mini size of programmable stage light.

1.4 Scope

The scopes of the project are:

- i. This project using the servo/DC motor as a robot manipulator joint arm.
- ii. This project uses 3 push buttons as a sequence selector to be a mode selector of the program.
- iii. The component use in lighting to form various light patterns using lasers or RGB bright LEDs.
- iv. This mini project uses a combination of lighting system and robot movement.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The literature review is a preliminary study to create a project characteristic. This study should be ensuring that projects are being developed to run efficiently while achieving the desired objectives. Before starting to do simulation and construction, many aspects need to be reviewed carefully to ensure all the planning of the project follow the flow of the chart that has been made and go smoothly. The studies include the Internet, reference books and observation. Once all the information, then the design, construction can be easily run based on information obtained. This method is simple and effective to compile and simulate all the information obtained which can be used as a tool to create a design. The data that conducted with all information that actually can be applied. It aims to ensure that the entire project outcome will give benefit to users.

2.2 Theory and Basic Principles

Study the basic of concept light pattern and how the process of the network lighting device and control system.

2.2.1 Purpose Multimode Stage Light

Programmable stage light is known as an intelligent lighting refers to stage lighting that has automated or mechanical abilities beyond those of traditional, stationary illumination. Today, people have increased demand for the lighting control, such a real time and portable which can although the most advanced intelligent lights can produce extraordinarily complex effects, the intelligence lies with the programmer of the show rather than the instruments or the lighting operator.

For this reason, Hui Ren (2010) state that stage intelligent light can make exceptional light impacts, and is very important intelligent lamp of modern stage and theatre which consist of mechanical framework and intelligent control framework .Contingent upon the venue and application, automated luminaries could be a flexible and prudent expansion to a supply of conventional lights on the grounds that, with fitting programming, they can quickly change numerous parts of their optics, evolving the "identity" of the light rapidly. Lighting is typically pre-programmed and played back using only simple commands, although moving heads can be controlled “live” if the operator is sufficiently experienced.

The lighting device of performing art order to manage and control types of lighting device flexibly and effectively. Illustration is utilizing LED as a light example, more LED lamps are used for stage lighting more various pattern of lighting will produced by the development of stage lighting technique, there are more demands for lighting performance (H. Marais, 2009). Mobility and portability are the developing trends of stage lighting control equipments. However the current extensive measured LED dimming always hard to move and their functions are too complicated to operate by manual setting. Considering different situations have different requirements, people start to give careful consideration to compact LED

stage lighting control gears. Therefore, this paper proposed an exploration venture in compact LED stage lighting control framework.

2.2.2 Method of Illumination

The way of illumination are forms of lighting pattern, (Jiang, 2011) state that kind of lighting like dimmers, blinking and sequence, one on one that can be monitored will be produce an artistic performance. Stage lighting with high intensity discharge lamp is always regarded as an important method to present artistic scenery, stage lighting changed with rhythm or theatricality and voice would bring about more visual convulsion to the audiences. A novel flicking idea for stage lighting is proposed in this paper, the operation principle for light flicking with high pressure sodium lamp is analyzed, the flicking power is deduced, the design diagram and its basic functions are discussed in detail, with these basic functions combined, many dream effects can be gotten, a sample is also made for experiment test, and the local test shows that many combined effects can be realized with remote program to make the stage more splendid and evoke the audience's feelings, it is really a new selection for design of stage lighting.

(Steven.L.S, 2009) state that automated lighting, moving lights or moving heads. An automated light, properly called a luminaire, fixture (or sometimes moving head), is a versatile and multi-functional instrument designed to replace multiple conventional, non-moving lights. This show that the increasing of the lighting pattern need to performing arts, more effect apparatuses and dimmer console are used. Normally in lighting control system, when a new device adds into the network, user need coordinate control signal like in the figure, set address code and shift control mode manually. These techniques will incredibly build the many-sided quality of control. These processes will greatly increase the complexity of control. To improve to the needs of modern large-scale performances, the idea of promoting lighting control of lighting management is necessary, which aims to meet all the demands of the automatic networking of entertainment lighting need various of equipment device

if do it manually consist of console, dimmer ,many of cable and various type of lamp.
The Figure 2.1 shows the networking form of controlling method intelligent control.

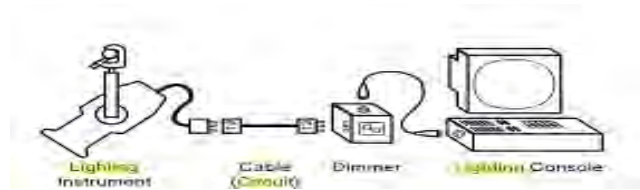


Figure 2.1: The basic lighting system.

2.3 System Construction and Software Design

In system lighting control system, clients need to know the system address and the vital properties of devices. Design parameters are required by system control terminals. In now existent lighting control systems, device disclosure is essentially depended on upon manual arrangement. For illustrations, DMX512 based lighting devices are generally utilized which have a manual location switch on it on, the client is manually to situate the system address physically and regularly stresses over joining the off base. For programming as a keen control processor which is controller of stage lighting will be vital part in construction design with integrated with human interface (HMI). The Table 2.2 shows the selection of Microcontroller control based on construction and software design.

Table 2.1: Summary of literature view

| | | | |
|---|--|---|---|
| Title | The physical electrical interface is specified by EIA/TIA -485 | Essences of C language programming examples For AVR Microcontroller | Research on device description technology for networked lighting control System of next generation |
| Author | (H. Marais,2009) | (J. Zhang ,2009) | (Meng Li , 2010) |
| Microcontroller/ intelligent control | ATMEGA (Arduino) | PIC | DMX-512 |
| Description | As a microcontroller unit can be program to dimmer or automatic and it's just a program mind that control whole of project. More PWM and more advanced than PIC as a microcontroller | As a microcontroller unit can be program to dimmer or automatic and it's just a program mind that control whole of project. Less PWM and need many adding part to upgrade | DMX-512 as an intelligent control which must connected with procedure like dimmer cable and goes to lighting and need fully human interface to program. |

The software design of the system includes two parts: one is a software design of the stage lighting manipulator and the other is design of LED dimming control circuit. The software flowchart of the stage lighting manipulator is shown in Figure 2.3. ATmega16 Collects the analog voltage from a potentiometer, translates them into digital signals and sends them in the standard form of DMX512 to LED dimming control circuit through RS-485 serial data communication interface.