UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SMART LIGHTING SYSTEM FOR DOLBY CINEMA USING BLUETOOTH APPLICATION

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Industrial Electronics) with Honours.

by

LEE MAN CHING

B071410327

941224055030

FACULTY OF ENGINEERING TECHNOLOGY

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Signature   :   _Ching._

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Electronic) (Hons.). The member of supervisory is as follow:

Signature:

Supervisor name: Encik Saifullah Bin Salam

SAIFULLAH BIN SALAM
Jurutera Pengajar
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
Fakulti Teknologi Kejuruteraan
Universiti Teknikal Malaysia Melaka

Date: 18 / 01 / 2018

ABSTRAK

Industri pawagam masa kini semakin popular di Malaysia. Sekumpulan filem bernaik pada skrin pawagam setiap bulan dan diikuti oleh kumpulan yang seterusnya, jadual filem yang ketat merupakan satu cara untuk mengahadapi tuntutan yang tinggi ini dalam industri pawagam. Akibatnya, jadual filem yang ketat menyebabkan kekurangan masa untuk mengawal sistem cahaya kerana sistem kawalan lampu yang tradisional di mana pengawalan lampu untuk setiap auditorium perlu dibuat di dalam bilik kawalan. Pekerja pawagam perlu tergesa-gesa ke bilik kawalan di mana kecederaan mungkin berlaku disebabkan jurang antara jadual acara yang ketat. Berdasarkan perspektif itu, sistem kawalan lampu untuk auditorium pawagam dengan menggunakan telefon android melalui Bluetooth dengan mikrokontroler Arduino Uno akan dihasilkan. Pekerja pawagam perlu mengalihkan Bluetooth ON untuk telefon android dan buka aplikasi android yang telah dicipta. Satu senarai yang mengandungi pelbagai peristiwn seperti saringan filem, tugas janitor, kemasukan penonton dan sebagainya akan ditunjukkan. Bedasarkan senarai tersebut, hanya satu acara yang dibenarkan untuk dipilih pada satu masa di mana acara terpilih akan disambungkan ke mikrokontroler melalui Bluetooth. Ketika ini, lampu akan dikendalikan seperti yang diarahkan oleh mikrokontroler. Tujuan dokumen ini adalah untuk melaporkan siasatan dan prestasi hasil prototaip binaan yang berususan dengan pengawal, Bluetooth dan aplikasi Android.

ABSTRACT

Cinema industry is getting wider and more popular in Malaysia. Batch of movies goes on screen per month then follow by another batch, pack movie schedules is the only way to face these high demands in movie industry. Consequently, tight movie schedule causes insufficient time in light-controlling due to traditional light-control system where cinema usher need to control the lights of each auditorium inside the control room. In relation with tight gap between scheduled events, cinema workers have to rush over to the control room where injuries might happen in tripping over obstacles. In perspective of that, a light control system for a particular auditorium by using android phone via Bluetooth as the medium through microcontroller Arduino Uno will be produced. The light-control system will be worked by; cinema worker has to turn on Bluetooth in the android phone and launch the created android application. A list of multiple events such as movie screening, janitor duties, viewer's entry and so on will be shown. Based on the list, only one event is allowed to be chosen at a time where the chosen respective event will be transferred via Bluetooth connection to the microcontroller. At this point, respective pair of lights will be operated as instructed by the microcontroller. The purpose of this document is to report investigation and performance results of the build-up prototype associating with controller, Bluetooth and Android application.

DEDICATION

I would like to dedicate this project to my supervisor, Mr Saifullah Bin Salam and Mr Wan Norhisyam Bin Abd Rashid whom had guided me in this project. I would also like to thank my parents, friends and lecturer whom had helped and supported me.

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LIST OF ABBREVATIONS, SYMBOLS AND NOMENCLATURE

%	-	Percentage
°C	-	Degree Celcius
App	-	Application
ATMOS	-	Advanced Technology Multiple Operating System
BLE	-	Bluetooth Low Energy
CCTV	-	Closed Circuit Television
CGI	-	Computer Generated Imagery
dBM	-	Decibels Below 1 Milliwatt
DC	-	Direct Current
etc	-	Et Cetera
GFSK	-	Gaussian Frequency Shit Key
GHz	-	Gigahertz
GUI	-	Graphical User Interface
I/O	-	Input / Output
ICSP	-	In-Circuit Serial Programming
IDE	-	Integrated Development Environment
IP	-	Internet Protocol
LED	-	Light-Emitting Diode
mA	-	Milliampere
MHz	-	Megahertz
mm	-	Millimetre
PC	-	Personal Computer
PCB	-	Printed Circuit Board
PIC	-	Programmable Integrated Circuit
PIR	-	Passive Infrared Sensor
PWM	-	Pulse Width Modulation
SPP	-	Serial Port Protocol
USB	-	Universal Serial Bus

| VDC | - | Volts Direct Current |
| Wi-Fi | - | Wireless Fidelity |

CHAPTER 1

INTRODUCTION

1.0   Introduction

In this chapter, introduction of the "Development of Smart Lighting System for Dolby Cinema using Bluetooth Application", the project backgrounds, the project objectives, project statement, project scope and the report outline is presented.

1.1   Project background

The project is about developing a smart lighting control system for cinema using Bluetooth application. The cinema industry in Malaysia nowadays is still applying on the old traditional light-control system. Influences from other Asian countries even Western countries causes various type of movies flow into the cinema in Malaysia. Batch of movies goes on screen per month then follow by another batch, pack movie schedules is the only way to face these high demands in movie industry.

Tight gap between two on screen movies with respect to the pack movie schedules causes the time for theatre-cleaning and light-control does not seem to be enough. Besides, cinema usher has to rush over to the control room to control the lights with respect to the situation like advertisement screening, audience's entry, movie on screen and even when audiences/viewers is leaving the theatre. This causes a huge inconvenience for the cinema workers as they need to rush here and there and it is like time-chasing. In addition, the janitors have to wait for the lights to be fully on before

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entering to the theatre for cleaning purpose. This causes part of times got wasted and the theatre will never be fully clean.

This project intends to develop a smart lighting-control system in order to reduce the problems. The system will be using Arduino Uno controller to control the action of different sets of LEDs based on different situations. The signals from the controller will be transmitted and transferred to the LEDs through Bluetooth with Android smartphone. By using Android-based smartphones, it forms a controlling platform that can ease the job for cinema usher. Cinema usher can control the lights of a movie theatre by just choosing the situation on the smartphone in connection with Bluetooth.

1.2   Project Objectives

The main objectives of this project are presented as follows:

i.   To study the controller for smart lighting system.
ii.   To develop a smart lighting system for cinema using Bluetooth application.
iii. To evaluate the performance of the lighting system.

1.3   Problem Statement

Cinema employee especially janitors confessed that "movie often start late but end pretty on time" where it is actually part of the schedule that allowing the cleaners to clean the theatre before the next movie starts. However, cinema employee also confesses that they don't have enough time to clean the theatre properly when there is more than two movie screenings end at the same time. Right nearby with the back office where it mainly operates for the house control for lights, this means cinema workers need to on or off the lights in the operation house before heading to the next duty such as cleaning the theatre. Instead of using walkie-talkie to inform nearby colleagues to help in switching on/off the lights, control the lights using Android by just turn on the Bluetooth connection seems much easier. In addition, there will not be

a worker who just responsible on controlling the lights since every employee has their own duties. On the other hand, using flashlight in the dark theatre is pretty troublesome, employees might trip themselves over the seats, walkway or even the carpet itself. In order to prevent this, switching on the lights before even entering the theatre by just sending signals to the lights using Android specifically in connection with Bluetooth.

1.4   Project Scope

The scope of this project is limited to electronic parts and the construction of miniature prototype for the smart lighting control system. For the electronic section, this project will focus on designing an electronic circuit that included LEDs which can be controlled by using microcontroller Arduino Uno via Bluetooth application. The system is being operated by controlling different sets of LEDs with respective to the ongoing scene in the cinema theatre. The project will be designed in such a way that Bluetooth act as the medium transmitter when it transfers the signals in and out from the controller to the LEDs or vice versa. A prototype of the light control system for Dolby cinema will be designed.

1.5   Report Outline

This report is outlined as follow:

Chapter 1 explains the introduction that includes concept of light-controlling system based on Arduino Uno and Bluetooth application for cinema. The objectives, problem statement and scopes of this system was also outlined.

Chapter 2 expounds the literature review of recent records, circuitries and problem statement with regard to the project.

Chapter 3 provides description on the methodology in order to implement this project from the beginning until the end. The methodology is illustrated using the flow chart and each of the contents of the flow chart is described in this part.

1.6 Conclusion

This chapter provides an overview of the project such as project background that outlines the project objectives, problem statements and project scope. The investigation of the traditional troublesome light controlling system that is used as the references in order to generate the idea to implement this project. Problem statement is then gives affection in improving the system that will be created which will be even more effective than the current lighting control system. In addition, the project scope set a limit in order to keep the focus within the desired outcome instead of a messy outcome that is out of range.

CHAPTER 2

LITERATURE REVIEW

2.0   Introduction

This section will examine about the historical backdrop of cinema theatre, the hypothesis of the project and furthermore the general point of view. The techniques and viewpoint that has been utilized will be explicated and will be linked with our project. In this section, thoughts will be carried out on how the light control system functions with Bluetooth application.

2.1   Cinema Theatre

A cinema theatre is basically a construction that consists of theatres for movie screening. Rows of seats for viewers to watch movies while with a walkway in between for them to have a space to move around. The movie will be played onto a projection screen after the movie is being projected by a projector.

The historical backdrop of cinema theatre can be trailed back to the 18th century in Germany as shown in Figure 2.1 where it is firstly used to play silent movies. After that, an idea of joining audios with scenes came out around 19th century.

Figure 2.1: First Cinema Theatre at Wintergarten, Berlin in 1800s

Lately at 20th century, the quality of visualisation and information that present on movies is getting more attention by the public. Thus, the quality of visualisation information has been considered and being improved by the cinema industry. In addition, there is a crucial factor when considering among the methods of visualisation information is that the outcome of looking at some diagrams, images or even data resources (Laing, 2008). One of the common problems that being encountered by the cinema industry is the sound system which is the stereo sounds system that has been used in the earlier days. Stereo sounds were first being used as an audio system that being separated with visual system. That sometimes caused the lagging when sound tracks does not in pace with the screening scenes (Cross, 1976). The solution to this problem is overcome by implementing Dolby audio system. Cinema with Dolby sound system as in Figure 2.2 used the 'Single Inventory' approach where it is a remarkable advantage for the cinema industry. Dissimilar from the past sound system, the sound track can now be mixed-once and will best-match it while playback in the cinema (Page, Schmidt and Driessen, 2013). The development of cinema industry can be clearly seen that is being emphasized more and more.

Figure 2.2: Cinema with Dolby Sound System

2.2 Home Automation System

Home automation system literally means the automatic-function for lights, securities and even home appliances will be start functioning without manually pressing buttons on the machine itself as specimen shown in Figure 2.3. The smart home system often uses microcontroller like Arduino, PIC or Raspberry Pi with certain transmitters such as Bluetooth, Wi-Fi or ZigBee in order to monitor and control the home appliances. In addition, the devices to control the system can be laptop, tabs or even mobile phones. For controlling devices like mobile phone, the operating system that have been commonly used is Android system. This means users can just control home appliances by using smart phone applications without going near to the switches. Development of smart home automation technology has showed a very far jump in the recent years where not only control switch ON/OFF but including multiple types of sensors like temperature and humidity sensors. Come to this technology era, home automation systems are giving advantages such as user comfort, higher security and effective cost. Users can stay fully comfort by just giving commands to the equipment via smartphone without physically moving towards it. A home can be more secure with automation system when the videos from CCTV cameras that can be accessed anywhere anytime. As for effective cost; the worries about appliances' left on when

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