

“I hereby declare that I have read through this report entitle “*Develop A Graphical User Interface For Home Lighting System Using Android SDK*” and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Control, Instrumentation and Automation)”

Signature :

Supervisor’s Name : MR. AHMAD FAIRUZ BIN MUHAMMAD AMIN

Date : 24th JUNE 2015

**DEVELOP A GRAPHICAL USER INTERFACE FOR HOME LIGHTING SYSTEM
USING ANDROID SDK**

SITI NORSUHAILA BT MOHAMED YUSOFF

**A report submitted in partial fulfillment of the requirements for the degree of
Bachelor of Electrical Engineering (Control, Instrumentation and Automation) with
Honours**

Faculty of Electrical Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2015

I declare that this report entitle “*Develop A Graphical User Interface For Home Lighting System Using Android SDK*” is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :

Name : SITI NORSUHAILA BT MOHAMED YUSOFF

Date : 24th JUNE 2015

To my beloved parents and family

ACKNOWLEDGEMENT

This research project is not the work of one individual. The successful completion of this assignment is the result of the contribution of ideas and the help of many people who come from different educational backgrounds and have different ways. I would like to take this opportunity to express my thanks and gratitude especially to the following individuals who have helped and encouraged me to complete this project.

First of all I would like to thank my supervisor, Mr. Ahmad Fairuz Bin Muhammad Amin continuous support given by him until the project was completed successfully. Armed with the knowledge of his high, he did not counter to constantly encourage and motivate me to continue the research project. Guidance given by him really helped me throughout the research and project. I never imagined to have a supervisor, mentor and counselor was very good as he is in getting my final year project at the University of Technical Malaysia Melaka.

Next, I would like to thank all the teachers who have helped me throughout this project and always willing to help and give the best advice. Without their support and guidance, this project will not be completed successfully. Thanks and appreciation are higher to parents and my family. They always give support and encouragement to me to give the best performance. This study could not have done it without the help of them.

Finally, I would like to thank all the friends who are always there beside me to help either directly or indirectly. they always encouraged when I almost gave up this project. In addition, I want to thank the panel that has a lot to give input and tips for improvement in the completion of this project. This project will not be completed successfully without the help and support of all the above.

ABSTRACT

The purpose of this project is to create an android application system which works to control home automation systems such as fans, lights, air conditioners and other devices in the house. Automation system is one of the best systems which can save time and provide energy efficiency. It also can reduce human energy. Today, Smartphone are becoming the most popular phones among the community especially teenagers. Look into the matter, the concept of this project is deeply compatible with the current world situation. Android has a complete software package and it is the most popular because of the technology. This project design for home automation system using Android SDK (System Development Kit). This project will be focusing on controlling home lighting system using the android application. The flow of this project is when the switches on the android Smartphone is pressed, the data will be send to the arduino board using router. It presents a design for automation system that can controls lighting system at home using a Smartphone. At last of this project, it will achieve the stated objectives which is to control home lighting system using android application and also to improve the home lighting system using android application for energy saving. Besides, it cause use to facilitate handicapped people, patient's poeple and an elder people who are not able to control home devices manually. Hopefully that this project will give a little contribution to the community, in particular to reduce wastage of electricity and help their users.

ABSTRAK

Tujuan projek ini adalah untuk mewujudkan satu sistem aplikasi android yang berfungsi untuk mengawal sistem automasi rumah seperti kipas, lampu, penghawa dingin dan alat-alat lain di dalam rumah. Sistem automasi adalah salah satu sistem yang terbaik yang boleh menjimatkan masa dan memberikan kecekapan tenaga. Ia juga dapat mengurangkan tenaga manusia. Hari ini, telefon pintar menjadi telefon yang paling popular di kalangan masyarakat terutama remaja. Melihat kepada perkara tersebut, konsep projek ini adalah sangat bersesuaian dengan keadaan semasa dunia. Android mempunyai pakej perisian yang lengkap dan ia adalah yang paling popular kerana teknologinya. Reka bentuk projek untuk sistem automasi rumah menggunakan Android SDK (System Development Kit). Projek ini akan memberi tumpuan kepada kawalan sistem pencahayaan rumah menggunakan aplikasi android. Aliran projek ini ialah apabila suis pada telefon android ditekan, ia akan menghantar data kepada papan arduino melalui router. Ia menunjukkan satu reka bentuk untuk sistem automasi yang dapat mengawal sistem pencahayaan di rumah dengan menggunakan telefon pintar. Di akhir projek ini, ia akan mencapai tujuan yang dinyatakan iaitu untuk mengawal sistem pencahayaan rumah menggunakan aplikasi android dan juga untuk meningkatkan sistem pencahayaan rumah menggunakan aplikasi android untuk penjimatan tenaga. Selain itu, ia juga bagi memudahkan mereka yang kurang upaya, orang sakit dan golongan tua yang tidak mampu untuk mengawal peralatan rumah secara manual. Diharapkan agar projek ini dapat memberikan sedikit manfaat kepada masyarakat, khususnya untuk mengurangkan pembaziran tenaga elektrik dan membantu semua pengguna.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	ACKNOWLEDGEMENT	V
	ABSTRACT	VI
	TABLE OF CONTENTS	VIII
	LIST OF TABLES	XII
	LIST OF FIGURES	XIV
	LIST OF ABBREVIATIONS	XVI
	LIST OF APPENDICES	XVII
1	INTRODUCTION	1
	1.0 Overview	1
	1.1 Introduction	1
	1.2 Research Background	2
	1.3 Home Lighting System (HLS)	3
	1.4 Motivation	4

1.5	Problem Statements	5
1.6	Objectives	5
1.7	Scopes	5
1.8	Report Outlines	6
2	LITERATUE REVIEW	7
2.0	Overview	7
2.1	Introduction	7
2.2	Theory and Basis Principle	7
2.3	Review of Previous Related Work	8
2.3.1	Home Automation System (HAS)	8
2.3.2	Android	9
2.3.3	Android SDK and Android ADK	12
2.3.4	Types of Wireless Connection	12
2.3.4.1	Bluetooth	12
2.3.4.2	Wireless Sensor Network (WSN)	13
2.3.5	Graphical User Interface (GUI)	14
2.3.6	Summary from the Previous Research	14
2.4	Conclusions	20

3	METHODOLOGY	21
	3.0 Overview	21
	3.1 Project Flow Chart	21
	3.2 Principles of the Methods or Technique Used In Previous Work	23
	3.3 Detail Discussion on the Selected Technique Used	24
	3.4 Android Software Development Kit (SDK)	25
	3.4.1 Process of developing an Android Application	26
	3.5 Software Development	31
	3.6 System Specification	32
	3.7 Connection between Android Applications with Wi-Fi	33
	3.8 Project Gantt chart and Key Milestones	35
4	RESULTS AND DISCUSSIONS	37
	4.0 Overview	37
	4.1 Requirement of Android Interface Development	37
	4.2 Graphical User Interface (GUI) Development	38
	4.2.1 Create a Graphical Layout	38

4.2.2	Write a Coding For Application	39
4.2.3	Coding data from Android	40
4.3	Emulator Display	40
4.4	Android Application on Android Smartphone	42
4.5	Comparison Between Communication Technology	44
5	CONCLUSION AND RECOMMENDATION	46
5.0	Overview	46
5.1	Conclusions	46
5.2	Recommendation and Future Work	46
	REFERENCES	48
	APPENDICES	51

LIST OF TABLES

TABLE	TITLE	PAGE
2.1	Important information of home automation and security system using Android ADK	15
2.2	Important information of home appliances control system based on Android Smartphone	15
2.3	Important information of the research of Android system architecture and application programming	16
2.4	Important information of energy efficient lighting system design for building	16
2.5	Important information of smart living using Bluetooth-based Android Smartphone	17
2.6	Important information of Bluetooth based home automation and security system using ARM9	17
2.7	Important information of smart home using Android application	18

2.8	Important information of mobile phone controlling home appliances	19
2.9	Important information of GSM based electrical control system for smart Home application	19
3.1	Project Gantt chart	35
4.1	Comparison between the original program and the program with the additional coding	39
4.2	wireless communication technology	44

LIST OF FIGURES

FIGURE	TITLE	PAGE
1.1	Type of lighting system	2
1.2	Example of home lighting system	3
1.3	Handicapped person and elder age people	4
2.1	Home automation system	9
2.2	Types of Android Smartphone	10
3.1	Project workflow	22
3.2	Process of developing an android application	26
3.2 (a)	Process while creating an Android application	28
3.2 (b)	Process while setting Android SDK Manager	28
3.2 (c)	Process while developing a graphical layout	29
3.2 (d)	Process while create, manage and run configuration	29
3.2 (e)	Process while emulator display the result	30

3.3	The example of message display	31
3.4	The process of sending data	33
3.5	Flowchart for Wi-Fi Module and android Smartphone	34
3.6	Key Milestones of the Project	36
4.1	Graphical layout using Eclipse's software	38
4.2	The data from Android	40
4.3	The display on emulator	41
4.4	Main menu on emulator	41
4.5	Lighting application on emulator	41
4.6 (a) and (b)	GUI on android Smartphone	42
4.7	Control devices	43

LIST OF ABBREVIATIONS

HAS	-	Home Automation System
HLS	-	Home Lighting System
GUI	-	Graphical User Interface
ADK	-	Accessorry Development Kit
SDK	-	Software Development Kit
WSN	-	Wireless Sensor Network

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Coding	51

CHAPTER 1

INTRODUCTION

1.0 Overview

This section will give a brief introduction about the project. A few explanations about Home Lighting System (HLS) will be considered to acknowledge the performance to control system. The research background, problem statement, objectives, scope of work, and expected project outcome are explained in this chapter.

1.1 Introduction

Lighting system is an important thing that used by human to help us move or do something in the dark place. It must be have in any places including houses, offices, factories, playgrounds, roads or public places. Although the main purpose of lighting system is to provide a good lighting, it also serves to increase the attractiveness of a place and will enhance the safety.

Before lighting system was introduced, users need to control every appliance in the home manually to the purpose of electrical energy cost savings. Nowadays, the cost of the lighting system wastage can be avoided or reduce by applying the lighting system at home.

There are many types of lighting which is developed by following the latest technology. Each of the type has a different function or has its own specialty depends on the place that user need to apply it. For example, there are differences between the light that installed in the toilet with the light in an entertainment room. Figure 1.1 shows type of lighting system that normally used.

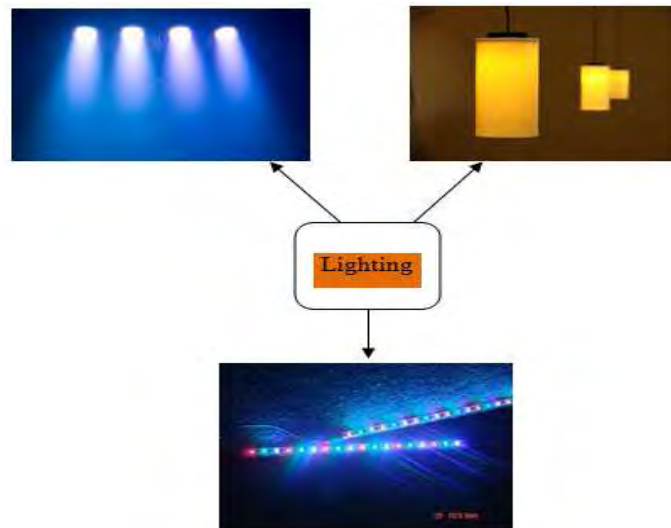


Figure 1.1: Type of lighting system

1.2 Research Background

Home automation is an interconnected device's that can be controlled automatically. Home automation includes many appliances such as light control, air conditioning, heating, ventilation, locks, security and home entertainment. Apart from to control straight forward function such as to turn on and off the lamps, the system also provides other functions such as energy efficiency, provide better facilities and comfort. It's also known as "Intelligent Home" or "Smart Home" [7].

HLS was designed to be user friendly and provides an appropriate level of light for users. A home lighting system can reduce human efforts, provides energy saving, manage time efficiency and also will help the users who are far away from the switches. It also will be help handicapped people, patient people and old aged people who are not able to control home appliances physically. This system is suitable for effectively reducing power consumption by the appropriate use of natural light and energy conservation.

Nowadays, Smartphone was become an exciting technology because it has a larger storage capacity, functioning like entertainment and communication methods. Android is a mobile operating system (OS) designed with touch screen mobile device. Android has a complete software package consists of an operating system, middleware and key application layer. This technology brought an easier way of life to many people around the world.

This system will produce a programming code to control the hardware which is shown in a simulation system. There are several different of popular wireless connection used like Bluetooth, GSM, ZIGBEE and WIFI. Each of this connection has their own specification and applications. For this system, a wireless network will be the ways to control the home devices by develop a graphical user interface (GUI). The wireless sensor network (WSN) technology can be a better solution to control application and function of the system automation. This system also can reduce the implementation costs compared to ordinary wired networking.

1.3 Home Lighting System (HLS)

HLS is an application of the technology that has been designed to assist human in controlling the switches of electrical devices. This application has been develop regarding to the ability of human to control the switches in their house especially for them who live in a big house. This application was designed to be user friendly and provides an appropriate level of light for users.

By having this HLS application, it can help human in term of reducing their efforts. It also can provide energy saving which are all people can take the responsibility to turn OFF the switch by using their Smartphone. Besides that, it will help users to manage time efficiency especially if they are very busy with their work. It also can help handicapped people patient people and old aged people who are not able to control home devices.



Figure 1.2: Example of home lighting system

Figure 1.2 above shows the example of home lighting system. Based on observation, there are many positive feedbacks that given by the customers who are using

the HLS application. Other than to help the users to enjoy their easy life, it indirectly will be a burner spirit to the inventors to produce a better product.

1.4 Motivation

The main motivation to develop this project is to facilitate handicapped person, elder age people and also patient who has a difficulties in their daily life compared to other healthy people. For example, person who sits on wheelchair can't press the device's switch manually. If we are not going to propose the solution for them, they maybe will let the waste of electrical energy while waiting for other people to come and help them. Other than that, it also can help disable users to access the home device's switch physically from far area.



Figure 1.3: Handicapped person and elder aged people

Figure 1.3 shows the handicapped person and elder aged people who are not able to control home automation system physically. Besides that, safety issues are a priority in this project because many criminal cases happened in a dark places. Lighting system is one of the crucial and important thing in daily life. For sure users can't do their work in a dark situation which is without a lamp.

However, dark place is the best place for the thugs to do their illegal activities such as theft, robbery and more. Therefore, the lighting system will help to reduce these activities. Users can turn ON the lights in any part of the house immediately for the purpose of frightening villain before contacting the authorities. At the same time, criminals are likely to be surprised that the lamp was lights suddenly. With the help of technology,

related project can be developing in order to overcome their difficulties. The system can allow the user to control many devices.

1.5 Problem Statements

There are several problem statements as listed below:

- i. Users are not able to access the home devices physically from a far distance.
- ii. Handicapped and elder age people not able to control home devices manually.
- iii. Waste electrical energy will be happened if left it always ON without using it.
- iv. Patients cannot control the home devices manually when they are not feeling well.

1.6 Objectives

Following are the objectives on this project, which are:

- i. To design a graphical user interface to control home lighting system by using android application via SDK.
- ii. To facilitate the users and assist handicapped people, elder age people and also patients who are not able to control home devices manually.
- iii. To improve home lighting system using android application for energy saving.

1.7 Scopes

The scopes on this project stated as below:

- i. Use Eclipse software to develop Android application for Smartphone.
- ii. Control home devices remotely via android application.
- iii. Control devices at anytime and anywhere when users are not able to access them physically.
- iv. Using android application to control home lighting system through wireless router.

1.8 Report Outlines

The report outlines are as listed below:

Chapter 1 is a brief introduction regarding the application of HLS in daily life. The motivation, problem statements, objectives and scopes of the project are clearly states in report.

Chapter 2 is an explanation about HLS which consists of discussion of several papers about HLS and HAS approach. Other than that, the discussion on the wireless connection also stated in this chapter.

Chapter 3 is about the methodology of the whole project. In this chapter, the process of transferring data was explained. The software development also stated in this chapter.

Chapter 4 States the result and discussion which consists of design and execution of the project. Results are divided into GUI development, Emulator display and android application on Smartphone.

Chapter 5 consists of conclusion of the overall work and recommendation for future works.

CHAPTER 2

LITERATURE REVIEW

2.0 Overview

This chapter will discuss about the research on the revolution of the HLS such as the field of study and the types of wireless connection which has been implemented in HLS. In order to develop a graphical user interface for HLS, the method of communication within users and home devices also has been researched.

2.1 Introduction

There are various types of wireless connection that have been developed in communication between HLS with the users which is GSM, WIFI, ZIGBEE and Bluetooth. One of the famous connections that often implement is by using Bluetooth technology. Regarding to this connection, it can link a digital devices within a range of 10m to 100m with up to 3Mbps's speed at frequency of 2.4GHz. But, it also is depending on the Bluetooth devices itself.

2.2 Theory and Basic Principle

Automation was used for much equipment such as machinery, switching in telephone network, processes in factories and other applications with minimal human intervention. It is a mechanism which depends on machines to execute manual functions. It can reduce the numbers of labor and operator by doing an observation for machine operations and provide a troubleshooting.