UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF PROGRAMMABLE WALL SWITCH PANEL WITH IOT SYSTEM

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

by

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This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Industrial Automation & Robotics) with Honours. The member of the supervisory is as follow:

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ABSTRACT

Electricity is the mightiest gift of science to humanity. It makes a magical change in our lives as a result of human contrivance. With the frequent consumption of electricity, it become a necessary in our daily life, but it may lead to an unexpected disaster if we did not use it carefully. According to the U.S. Fire Administration, in 2014, electrical fires accounted for 6.3 percent, nearly 24,000 fires, of all residential fires, 11 percent of the fires where someone died and 7 percent of the fires where someone was injured. With the advancement of mobile technology, most of the mobile users addicted to use their mobile phone and easily to forgot switch off the electric appliances. This may lead to a fire happen such as electric stove, oven, clothes iron and etc. Smart wall switch panel is a new technology of home automation and energy conservation. It is flexible home control and monitoring system using an embedded micro-web server, with IP connectivity for accessing and controlling devices and appliances remotely using smart phone. The proposed system does not require a dedicated server PC with respect to similar systems and offers a novel communication protocol to monitor and control the home environment with more than just the switching functionality.

ABSTRAK

Elektrik adalah hadiah sains yang paling hebat kepada manusia. Ia membuat perubahan ajaib dalam kehidupan kita selepas transformasi oleh manusia. Dengan penggunaan elektrik yang kerap, ia menjadi keperluan dalam kehidupan harian kita, tetapi ia boleh membawa kepada bencana yang tidak dijangka jika kita tidak menggunakannya dengan berhati-hati. Menurut Pentadbiran Kebakaran Amerika, pada tahun 2014, kebakaran elektrik menyumbang 6.3 peratus, hampir 24,000 kebakaran dari semua kebakaran kediaman, 11 peratus kebakaran membawa kematian dan 7 peratus kebakaran membawa kecederaan. Dengan kemajuan teknologi telefon bimbit, kebanyakan pengguna telefon bimbit ketagih menggunakan telefon bimbit mereka dan mudah lupa untuk menutup peralatan elektrik. Ini akan menyebabkan kebakaran berlaku seperti dapur elektrik, ketuhar, seterika dan sebagainya. Panel suis dinding pintar adalah teknologi baru dalam automasi rumah dan pemuliharaan tenaga. Ia adalah sistem kawalan dan pemantauan rumah yang fleksibel dengan menggunakan pelayan web mikro tertanam dan sambungan IP untuk mengakses dan mengawal peranti dan peralatan dari jauh menggunakan telefon pintar. Sistem yang dicadangkan tidak memerlukan PC pelayan khusus berkaitan dengan sistem yang serupa dan menawarkan protokol komunikasi baru untuk memantau dan mengawal persekitaran rumah dengan lebih dari sekadar fungsi penukaran.

DEDICATION

Thank you for your support for my beloved dad and mother.

Thank you for guiding me and helping to solve my research problems,

SIR MUHAMMAD SALIHIN BIN SAEALAL.

Thank you for your assistance and support for my friends.

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Finally, I want to thank my beloved friends who always support and assist my university studies. Thank you for the information and knowledge exchange during the course of my studies.

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I2C – Inter-integrated Circuit

IDE – Integrated Development Environment

IoT – Internet of Things

IP – Internet Protocol

LCD – Liquid Crystal Display

RAM – Random Access Memory

ROM – Read-Only Memory

RTC – Real Time Clock

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Smart Home is a new technology and services that using a network for better quality living. A smart home enables the home appliances to be automated, thus making human ease and convenience for everyday in home. This technology able to change all electronic devices to react 'smart'. Sooner, all the electronic devices will be taking advantage of this technology through networks and the internet in future. Most people will consider this technology as pure networking. Some others believe that this innovation will reduce their remaining tasks at hand, yet smart home innovation is a blend of both and substantially more. Smart home innovation is currently being implemented for the entire house, particularly in kitchens and family rooms. This technology may sound new; however, it only uses the technologies that already exist. A smart device is an appliance with a computer installed to provide it more functionality. Internet, Bluetooth and wireless technologies can use as a medium for home devices to communicate with each other. These technologies classify into two type of connection, which is the wired type or the wireless type for the smart home system. Generally, smart home encourages clients with security, comfortable living and energy conservation and advantages for disabled individuals.

The ability to perform tasks automatically and monitor or change status remotely is a simple definition for smart home system. Popular activities involve switching off lights while no one is in the house, locking doors through a mobile, automating air conditioning systems capable of sensing and memorizing Temperature levels and devices that help reduce the amount of time you spend in your kitchen.

1.2 Problem statement

In this era with advanced electronic technology, 'convenience' is one of the living key hold by people nowadays. People will prefer an ease and easy life. This concept had indirectly influence on their concern in many aspects including purchasing, usage, transportation, accommodation and so on. These days, this 'convenient' idea had even start implement into residence. One of the examples is the Smart Home Technology. It furnishes the user with convenient, comfort, energy efficiency and home security.

In general, a traditional wall switches brought less convenient for older and disabled individuals as they need to reach the place of switch control to switch on or off manually. On the other hand, people also facing the problem of energy wastage with traditional wall switches as they will forget to switch off the home appliances if in rush or emergency. With the evolve of Smart Home Technology, user can now control their home system & appliance with just a simply click on their smart devices. A good monitor of the home system not only make the user life easier, but also raise the environmental awareness in the mind of people.

However, a Smart Home Technology will normally come with its own application. User will need to download & use the specific software provided. Sometimes, user will also face the incompatible problems between the software & their smart device. Further, it also brings about privacy issue for the user such as leakage of personal information. Besides that, most of the smart home system required users to replace their old home device with the smart device.

Hence, these problem leads to a development of a modified switch controller that can be used to replace old switch to control all the current appliances.

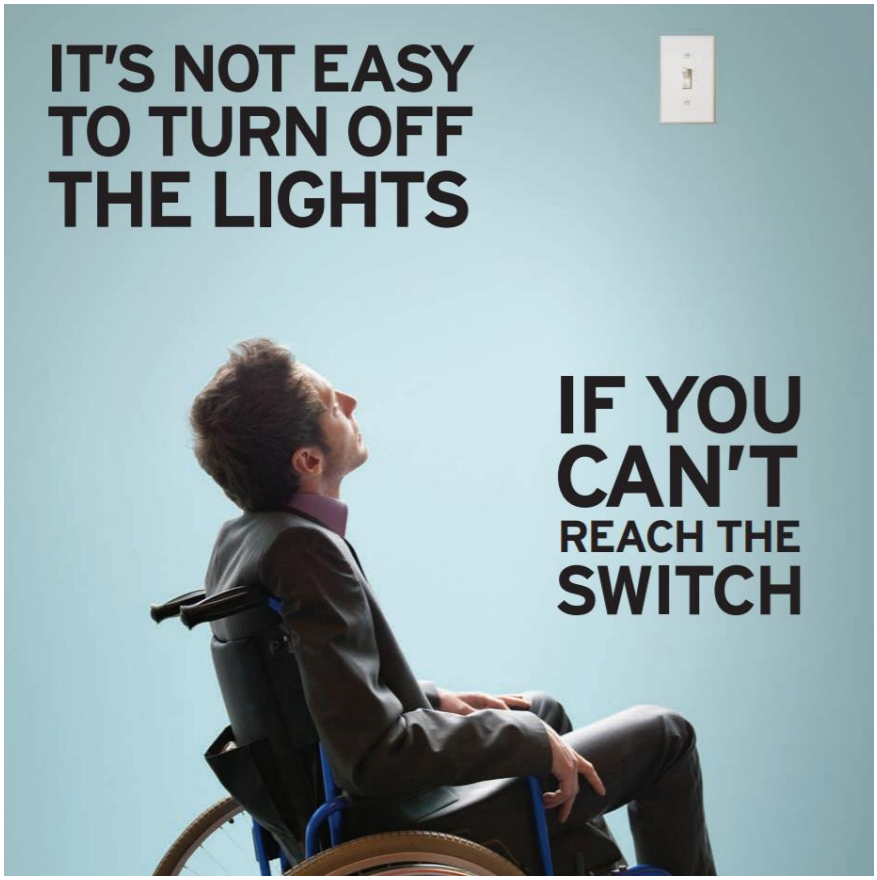

Figure 1.1 Disability people can't reach the switch.

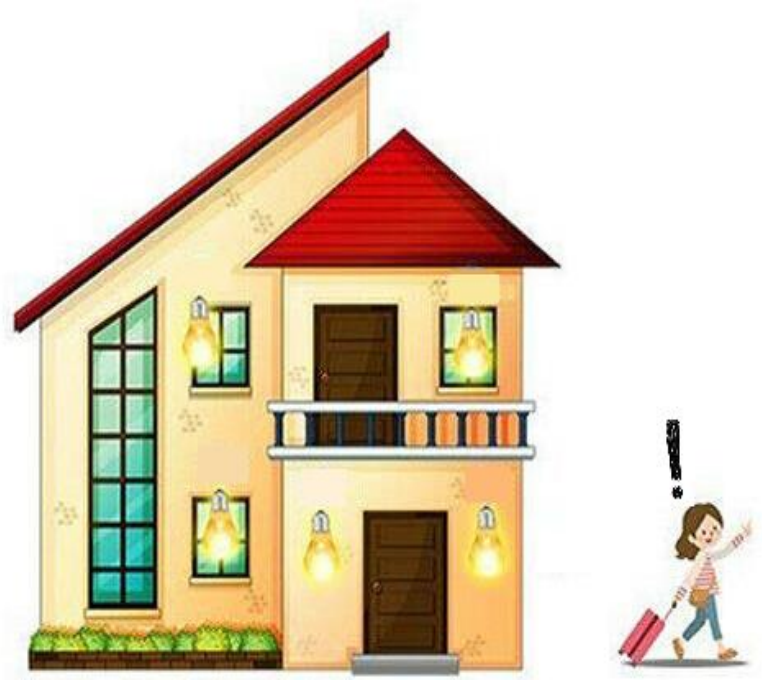

Figure 1.2 Forgot to Switch Off Light When You Go Away for A Vacation.

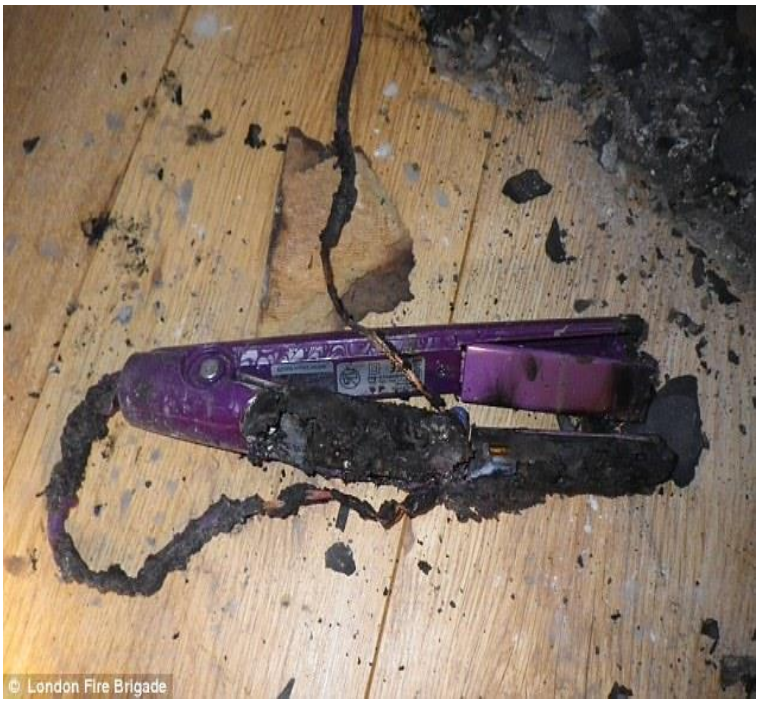

Figure 1.3 A woman had to be rescued from her burning home after a pair of hair straighteners were left switched on.

1.3 Project Objectives

The goals of the project are as follows:

i) To design and develop the programmable wall switch panel.

ii) To setup an experiment platform using an Arduino system.

iii) To monitor the status and control of house appliances by using internet from a smartphone.

1.4 Project Scope

The scopes of this project is illustrated as follows:

i) Manual mode: The user can use the smart device to make a control with home appliance through the internet. However, the user still able to switch on and off for home appliance manually at the switch.

ii) Auto mode: The user can select auto mode; all sensor will be activated in this mode. The PIR sensor will sense the motion, temperature sensor will detect the room temperature and the light sensor will sense the light intensity in the house.

iii) The user able to monitor the status of house appliance everywhere with a smart device and internet access. The LCD panel display the time, date, and the current temperature.

iv) This project can fit with double switch socket in Malaysia only.

v) This project suitable for only one switch such as 2 gang switch, 3 gang switch or 4 gang switches.

vi) The devices that can be used in this project are such as lighting and fan.

vii) The master control panel must be installed inside the house only. It only can use for either single storey or double storey of a terrace house.

viii) The number of users that can access control through the internet is maximum 5 client at the same time.

CHAPTER 2

LITERATURE REVIEW

2.1 Motivation

The Literature Review is a comprehensive study and evaluation of past research. It is important to study the different types of Smart Home System and system development. This chapter outlines and summarizes the important aspect of the literature review of the Smart Home System.

2.2 Literature review on previous study of Smart Home System.

Electrical appliance is a necessary for a house. The ease to switch on or off the electrical appliance get the most attention in this advanced technological era. People who having a hectic life are always trying to get the most convenient way to switch on or off their home appliance in order to save their precious time. Thus, this brings up the creation of Smart Home system to fulfil the desire of human being. There are numerous researches done by researchers and these can be classified into three categories which are control by Bluetooth, Internet of Things and remote controller.