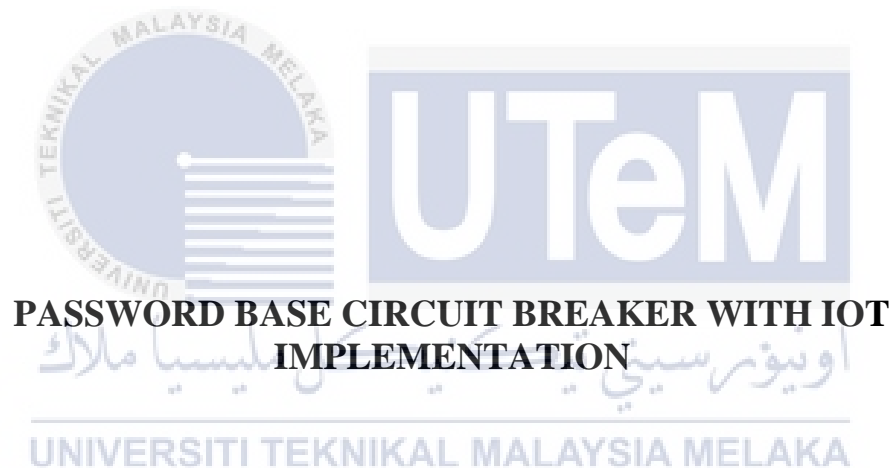




Faculty of Electrical and Electronic Engineering Technology



IKRAM HAMZAH BIN RAJ MOHAMED

Bachelor of Technology in Electronic Industrial Automation with Honours

2023

PASSWORD BASE CIRCUIT BREAKER WITH IOT IMPLEMENTATION

IKRAM HAMZAH BIN RAJ MOHAMED

**A project report submitted
in partial fulfilment of the requirements for the degree of
Bachelor of Technology in Electronic Industrial Automation with Honours**



Faculty of Electrical and Electronic Engineering Technology

اویورسیتی بیکنیکل ملیسیا ملاک

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Tajuk Projek: Password-Based Circuit Breaker with IoT Implementation

Sesi Pengajian: 2023

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I declare that this project report entitled “Password Base Circuit Breaker With IOT Implementation” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in the candidature of any other degree.

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I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electrical Engineering Technology with Honours.

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Date : 13 JANUARY 2023

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Co-Supervisor :

Name (if any)

Date :

DEDICATION

First and foremost, I would like to express my gratitude to my supervisor, Puan Nur Bahirah and my second supervisor, Puan Emy Zairah Binti Ahmad for their precious guidance, words of wisdom and patient throughout this project.

I am also indebted to Universiti Teknikal Malaysia Melaka (UTeM) and my family for the financial support throughout the whole semester which enables me to accomplish the project. Not forgetting my colleague, Mr Jaiswaraan and Mr Thinesh for their willingness of sharing their thoughts and ideas regarding the project.

My highest appreciation goes to my parents and family members for their love and prayer during the period of my study. An honourable mention also goes to Puan Emy Zairah Binti Ahmad for all the motivation and understanding. And to my friends, thanks for the ideas and support given to me.

Finally, I would like to thank all the staff at the FTKEE, fellow colleagues and classmates, the faculty members, as well as other individuals who are not listed here for being cooperative and helpful.

ABSTRACT

This project is developed with the main purpose of avoiding power wastage and accidents that mainly happens in the household due to power outlets. This device also can help in case of fire or an emergency, the user could easily turn off the power flow to the household and save the damage that has been done from being worse. What can be done by users when they have forgotten to turn on or off the switches before leaving the house? How can a user determine and double-check the conditions of the power supply in the house while being away from home? The proposed project helps users to determine the conditions of the power supply in their household and if there is anything wrong it could also help them to easily turn on or off their switch. This may help users to save their energy consumption in the household while avoiding serious injuries and accidents. This project also may help users to turn on or off any power outlets in their household while being in an entirely different place. This project is built as a prototype for household usage, the plan for the project is so that it could be used in every industrial area, which is far more important because some of them are working in a high voltage area which causes many accidents due to communication problems. This accident can be avoided when users can monitor and control the condition of the switch while being away by only tapping on their phones. For further recommendations, this project can be improvised for security purposes and monitoring applications.

ABSTRAK

Projek ini dibangunkan dengan tujuan utama untuk mengelakkan pembaziran kuasa dan kemalangan yang kebanyakannya berlaku dalam isi rumah akibat saluran keluar elektrik. Peranti ini juga boleh membantu sekiranya berlaku kebakaran atau kecemasan, pengguna boleh mematikan aliran kuasa ke isi rumah dengan mudah dan menyelamatkan kerosakan yang telah berlaku daripada menjadi lebih teruk. Apakah yang boleh dilakukan oleh pengguna apabila mereka terlupa untuk menghidupkan atau mematikan suis sebelum meninggalkan rumah? Bagaimanakah pengguna boleh menentukan dan menyemak semula keadaan bekalan kuasa di dalam rumah semasa berada jauh dari rumah? Projek yang dicadangkan membantu pengguna untuk menentukan keadaan bekalan kuasa dalam rumah mereka dan jika terdapat apa-apa yang salah ia juga boleh membantu mereka menghidupkan atau mematikan suis mereka dengan mudah. Ini boleh membantu pengguna menjimatkan penggunaan tenaga mereka dalam isi rumah sambil mengelakkan kecederaan serius dan kemalangan. Projek ini juga boleh membantu pengguna untuk menghidupkan atau mematikan mana-mana soket kuasa dalam rumah mereka semasa berada di tempat yang sama sekali berbeza. Projek ini dibina sebagai prototaip untuk kegunaan isi rumah, perancangan projek adalah supaya ia dapat digunakan di setiap kawasan perindustrian, yang jauh lebih penting kerana ada di antara mereka yang bekerja di kawasan voltan tinggi yang menyebabkan banyak kemalangan akibat masalah komunikasi. Kemalangan ini boleh dielakkan apabila pengguna boleh memantau dan mengawal keadaan suis semasa berada jauh dengan hanya mengetik telefon mereka. Untuk cadangan lanjut, projek ini boleh ditambah baik untuk tujuan keselamatan dan aplikasi pemantauan.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Puan Nur Bahirah and my second supervisor, Puan Emy Zairah Binti Ahmad for their precious guidance, words of wisdom and patient throughout this project.

I am also indebted to Universiti Teknikal Malaysia Melaka (UTeM) and my family for the financial support throughout the whole semester which enables me to accomplish the project. Not forgetting my colleague, Mr Jaiswaraan and Mr Thinesh for their willingness of sharing their thoughts and ideas regarding the project.

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LIST OF SYMBOLS



LIST OF ABBREVIATIONS

OCPD	Over Current Protective Device
TNB	Tenaga Nasional Berhad
CCTV	Closed-Circuit Television
ACB	Air circuit breaker
SF6	Sulphur hexafluoride
MCB	Miniature circuit breaker
MCCB	Moulded case circuit breaker
PCB	Printed circuit board
IDE	Integrated development environment



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CHAPTER 1

INTRODUCTION

1.1 Background

Electrical appliances are the most common and one of the most basic needs in a household or industry. Every electrical appliance is connected to the switches and plugs which are connected to the distribution board which is controlled by the circuit breaker. A circuit breaker is an electrical safety device that protects electrical appliances or apparatus from overcurrent or short-circuits damage [1]. The primary purpose is to block the current flow to protect and save the equipment while avoiding the risk of fire. Unlike the function of a fuse which can only be used once and has the need to change, a circuit breaker can be easily reset for it to return to its normal operation. Other than that, circuit breaker also comes in a variety of sizes which is identified by where it is being used. Small devices safeguard low current circuits such as single household appliances. Huge switch gears protect high-voltage circuits that can be used to feed the entire city. OCPD (Over Current Protective Device) is a common abbreviation for the generic function of a circuit breaker or fuse as an automatic mechanism for eliminating power from a defective system.

Unfortunately, the circuit breaker that is attached can't be plugged out by a normal person without the qualifications and the cert needed. Only TNB personnel is allowed to replace, plug out and plug in the circuit breaker as even if the circuit breaker is broken it would be replaced also by TNB personnel. Other than that, even if the user is away for a long period, they are still not allowed to plug out the circuit breaker as it will be encountered as going

against the law. However, the homeowners tend to forget about things at times. It is normal to forget about things but when it comes to appliances it also comes with a great risk and a terrible outcome. That is why users must always double-check before leaving the house but still, users do tend to forget, that is why a solution has come up with an idea on how to resolve the issues regarding leaving the house safely without the need to worry about whether have users have turned off the switches or not yet.

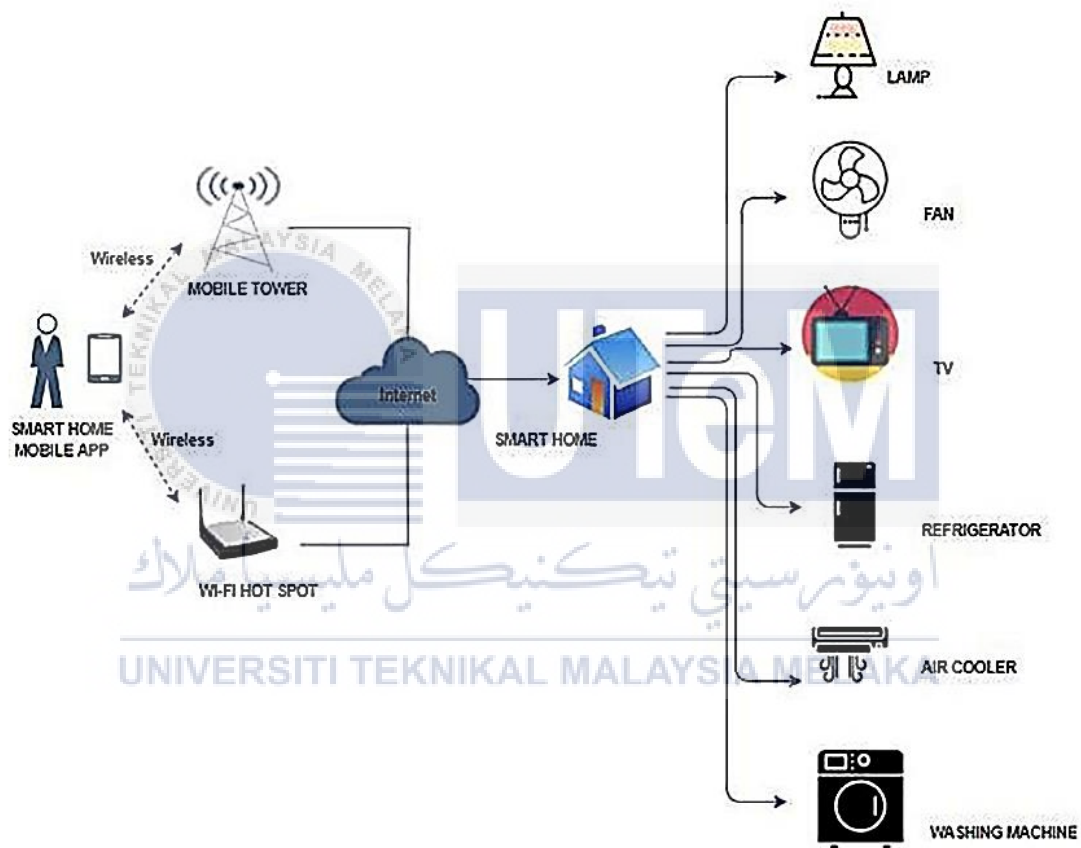
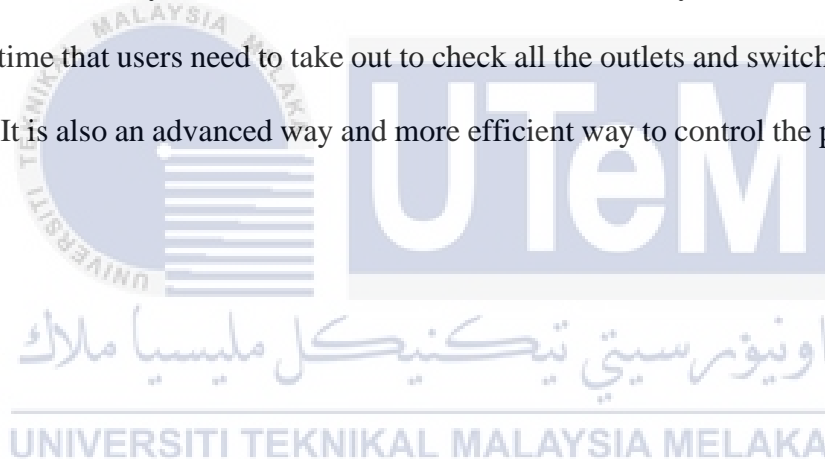


Figure 1.1 The principle layout of the developed project

The proposed project is illustrated in Figure 1.1. The main focus of this project is to help homeowners to overcome the problem discussed earlier. The system is developed by connecting the circuit breaker to the ESP 32 IoT device which will turn the electrical supply on or off through/via mobile phones. The device will be placed before the position of the circuit breaker. These devices are controlled through our mobile phones using the application

of Blynk. Blynk application software is an application that is installed in smartphones through Playstore or Appstore applications. Blynk application acts as the switch control for the device installed in a household. All of the controlling is done through the Blynk application which includes turning on, turning off and password insertion for the device that is installed [2].

The proposed device is called a password-based circuit breaker, which has the main function of controlling the current flow to the circuit with the aid of a keypad in the Blynk application. It can help users to turn on and turn off the current flow without the need to turn off the circuit breaker manually. It is much easier and more trustworthy to see for ourselves and reduces the time that users need to take out to check all the outlets and switches in the house one by one. It is also an advanced way and more efficient way to control the power flow [3].



1.2 Problem Statement

One of the most important issues that users have been facing nowadays in daily life is whether they have unplugged all of the electrical appliances when users leave home. Sometimes users tend to leave the house in a hurry which makes them worry about that have they turned off all the switches before leaving the house or did they miss any. These worries can get carried away and distract users from working mainly if it involves main switches such as the iron or the induction stove or other big equipment which not only will cost users their bills it also may cost them serious accidents such as fires and explosions.

How do users confirm the condition of the switches for whether it is turned on or off? Users often double-check their household situations when they leave the house, but in case they were out stationed or not returning to their houses users might have second thoughts on the conditions of their house conditions, so how do they check and make sure that they are in safe conditions?

Some equipment in the household is only turned on when necessary and on important occasions, such as the CCTV and the alarm system. Although it is mainly fixed to be on at all times, some of the users do not on it at all times. It is because alarm systems are very sensitive, even a little movement will trigger its sensors and trigger the alarm. Often time, it makes the system to be a little bit tiring to reset it every time the alarm triggers. On the other hand, the recording from the CCTV is stored in a hard drive which needs to be cleared every month because if the storage is full then the recording will not be stored and making the CCTV to be functionless even when we have the device installed. So how do users make sure that they have turned their important switches on before leaving their houses?

1.3 Project Objective

The main goal of this project is to offer an organized and operative methodology on how to maintain a good electrical supply to users' households with the implementation of an IoT system which enables the users to control them by using their smartphones. The objectives are as follows:

- I. To design and simulate a password-based circuit breaker system using Proteus Simulation Software.
- II. To develop the prototype for the designed circuit breaker.
- III. To analyze the developed system under various operating conditions.

1.4 Scope of Project

The scope of this project are as follows:

- I. To achieve objective 1, the proposed circuit was simulated using Proteus Simulation software. The software was chosen due to its versatility of having almost all of the animated components and microprocessors to facilitate a complete microcontroller-based design.
- II. Next is to achieve objective 2, a prototype design was built to perform the testing of the idea that was simulated into hardware design. This is to ensure that the idea was reliable as well as the hardware components are working exactly as planned and producing the desired output.
- III. Lastly for achieving objective 3, the system was developed to be widely used and used anytime or anywhere. To achieve this, the system is tested in multiple locations to find out the effectiveness and reliability of the system despite the time and location where it will be used.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this modern era, energy proficiency is branded as a key stratagem to address rising issues in climate change and the energy crisis [4]. Circuit breakers remain some of the main components in a household that needs to be put greater emphasis on to find ways to reduce electrical accidents and wastage. For premeditated planning and development of an energy efficiency distribution network, technologist needs to come up with an operative methodology that works correctly and efficiently to produce a circuit breaker which has safety measurements that vary in many steps and counts [5]. It should also be properly planned and executed in an effective and timely manner.

Password-based circuit breaker aims to provide safety measures for energy flow in a household. A traditional circuit breaker is usually operated in manual mode configurations which turns on when the circuit breaker switch is pulled up and turns off when the circuit breaker switch is pulled down. The circuit breakers are typically categorized by their: (i) voltage level and (ii) the number of phases. Circuit breakers are distributed all over different supply zones. therefore, they are extensive in numbers [6].

2.2 Circuit Breakers

A circuit breaker is one of the most essential parts of an electrical distribution system, it is used everywhere in every electrical system that is created. It is because each of the circuit breakers that are fixed has its current ratings and sizes which determines where would the