



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

TO STUDY AND DEVELOP INTELLIGENT ELECTRONIC POWER SAVING SYSTEM TO REDUCE POWER CONSUMPTION

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

by

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This report is submitted to the Faculty of Electrical and Electronic Engineering Technology (FTKEE) of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Projek ini adalah untuk mengkaji dan membangunkan sistem penjimatan kuasa elektronik pintar untuk mengurangkan penggunaan kuasa. Oleh kerana kenaikan besar dalam penggunaan tenaga dan kos, terdapat keperluan segera sistem penjimatan tenaga yang betul untuk dibangunkan untuk menyediakan penggunaan tenaga yang efisien dan murah. Dengan melaksanakan Sistem Penjimatan Kuasa Elektronik Pintar, kita bukan sahaja boleh mengurangkan semua pembaziran yang tidak perlu dilakukan oleh peralatan elektrik apabila ia tidak dihidupkan 'OFF' tetapi juga, kita boleh memantau peralatan yang sedang digunakan. Sistem ini mempunyai dua tujuan utama iaitu memantau dan mengawal peralatan elektrik. Sistem kawalan dilakukan dengan menggunakan dua kaedah yang merupakan kaedah sensor yang dicetuskan dan mengawal kaedah IoT (Internet of Things). Kaedah manual menggunakan sensor ultrasonik untuk mengesan kehadiran manusia memasuki suatu kawasan dengan itu menghidupkan dan mematikan peralatan elektrik, sementara kaedah IoT (Internet of Things) dilakukan dengan membangun platform aplikasi Blynk untuk menghidupkan dan mematikan peralatan elektrik pada telefon pintar. Selain itu, pelaksanaan projek ini membantu pengguna memantau peralatan elektrik mana yang perlu dihidupkan 'ON' atau 'OFF' lebih jauh dengan bantuan aplikasi Blynk. Secara keseluruhannya, projek ini memudahkan kerja manusia mengenai usaha yang diambil untuk menghidup dan mematikan peralatan elektrik justeru dapat menjejaki penggunaan elektrik mereka yang dibuat di samping membantu negara menjadi lebih berkesan dalam membazirkan tenaga.

ABSTRACT

This project is to study and develop Intelligent Electronic Power Saving System to reduce the power consumption. Due to the enormous hike in the energy use and costs, there is an immediate need for proper energy saving system to be developed in order to provide efficient and cheap energy consumption. By implementing Intelligent Electronic Power Saving System, we can not only cut down all the unnecessary wastage done by electrical appliances when it is not switched OFF but also, we can monitor which appliances that are being used. This system has two main objectives which are to monitor and control the electrical appliances. The control system is done by using 2 methods which is sensor triggered method and control over IoT (Internet of Things) method. The manual method uses ultrasonic sensor to detect the presence of human entering an area hence turn ON and OFF electrical appliances, while IoT (Internet of Things) method is done by developing Blynk application platform to turn ON and OFF electrical appliances on smart phones. Besides, implementation of this project helps the user to monitor which electrical appliances needed to be switched ON or OFF over a distance by the help of Blynk application. Overall, this project ease the human work on the effort made to switch electrical equipment ON and OFF hence keep track their electricity consumption made beside helps the nation to be more effective in not waste energy.

DEDICATION

To my beloved parents Mr & Mrs. Renganadan Ragavan

My supportive supervisor Mr. Saifullah Bin Salam

In remembrance of Mr.Ir.Nik Azran Bin AB Hadi

My faithful panels, lectures, and staffs of FTK

My BEEE Cohort 5 classmates

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LIST OF SYMBOLS

P	-	Power
I	-	Current
Φ	-	Luminosity
m	-	Metre
l	-	Length
m	-	Mass
N	-	Rotational velocity
P	-	Pressure
Q	-	Volumetric flow-rate
r	-	Radius
T	-	Torque
Re	-	Reynold number
V	-	Velocity
w	-	Angular velocity
x	-	Displacement
z	-	Height
q	-	Angle

LIST OF ABBREVIATIONS

DC	Direct Current
AC	Alternating Current
pf	Power Factor
HID	High Intensity Discharge
ZVS	Zero Voltage Switching
RMS	Root Mean Square
LED	Light Emitting Diode
IoT	Internet of Things
WSN	Wireless Sensor Network
SDG	Sustainable Development Goals
LQE	Linear Quadratic Estimator
PIR	Passive Infrared Sensor
AAL	Anterior Axillary Line
HVAC	Heating, Ventilation, and Air-conditioning
WSAN	Wireless Sensor and Actuator Network
I/O	Input / Output
RX	Receiver
TX	Transmitter
GND	Ground
WiFi	Wireless Fidelity

CHAPTER 1

INTRODUCTION

1.1 Introduction

In electrical utilisation, power saving system plays a crucial role in observing the power variation in each electrical appliance and to provide a proper solution for better savings. Due to enormous hike in the energy use and costs, there is an immediate need of a proper energy saving system to be developed in order to provide efficient and cheap energy consumption based on the electrical loads used. Based on the observation done from Malaysian content, electrical appliances play a major role in the usage of electricity and approximately 17% of the total national electricity usage (Ahmad Farid Sapar, 2014). Thus, an efficient way must be found to reduce the wastage and use resources wisely.

1.2 Project Background

The main idea of this project is to study and develop an intelligent electronic power saving system to reduce power consumption. Analysis and studies have been carried out in order to find an alternative solution on how to improve existing technology to make it use less power and only when needed. This not only reduces our electricity bills, but it also cuts down the total national usage of power consumption.

A case study is done by referring to the effect of not turning OFF electrical appliances after been used. Upon case studies, the relation between the power consumed by electrical appliances when it is unnecessary is determined and known. To solve the problem from the case study, an intelligent electronic power saving system is developed by using Arduino which controls the system with the help of Ultrasonic sensor (to detect the presence of human). This intelligent electronic power saving system is programmed to detect the presence of people entering a dedicated area, hence turning ON and OFF electrical appliances according to the duration needed. Simply we can conclude that this is a system where it eliminates the use of conventional electrical switch to turn ON and OFF electrical appliances, hence use Ultrasonic sensor instead by the help of Arduino to turn ON and OFF electrical appliances. Also included in the system android application where we can monitor and control which switch to be turned ON or OFF at a time being. These not only optimise the usage of electrical appliances, but it also brings down the average wastage done on the consumption of electricity

1.3 Problem Statement

Problem statement gives an overview of what kind problems faced by users which results on the hike of the usage of electricity. There are several problems faced based on finding ways to reduce power consumption and produce an efficient solution. This problem arises as many questions which the solution is needed to be found.

First problems arise when many users tend to forget to switch OFF household or workplace electrical appliances such as fluorescent light and ceiling fan after use. As we all know, without switching off electrical appliances, the power consumption tends to get increasing proportionally with time. An intelligent system needed to be developed to fix this problem. The intelligent system needs to detect the presence of people entering a dedicated area, hence turning ON and OFF accordingly. This system also needs to be intelligent enough to detect the number of people in the area to control the electrical appliances used. These not only optimize the usage of the lamps but also reduce the overall energy consumption.

Secondly, the problem with the usage of conventional electrical switch which requires us to be exactly at the position where the switch is mounted at the wall to turn ON and OFF the electrical appliances. Elimination of the boundary where we need to be exactly in front of electrical switch turn ON and OFF will ease the use of electrical appliances. An effective system needs to be developed as a mobile application where it can not only monitor which electricity appliances is turned ON or OFF at a time, it must also be able to control the system from a certain distance.

Lastly, studies done requires a lot of research and lab works to prove that developed intelligent electronic power saving can alternately reduce and more power effective then the previously used methods.

1.4 Objectives

The key objective of this project is to study and develop Intelligent Electronic Power Saving System to reduce the consumption of electricity hence eliminate the wastage done by users. In order to make this project successful, the objectives which are the guidance of the project has been declared where it must be achieved in completing this project.

- i. To develop an intelligent power saving system by using Arduino to turn ON and OFF electrical appliances.
- ii. To eliminate the use of conventional electrical switch and replace it by mobile application system.
- iii. To develop a portable monitoring system by using mobile application to monitor electrical appliances from a distance.
- iv. To develop a portable control system by using mobile application to turn ON and OFF electrical appliances from a distance.

1.5 Scope

The scope of the project is to create a system which will function based on the objective and to solve problems faced as much as relevance. On scope, the emphasis on reducing consumption of electricity parallel to the title on studying and develop intelligent electronic power saving system.

The developments of intelligent power saving system by the help of Arduino UNO. This system detects the movement of human entering and leaving an area by using Ultrasonic sensor, hence converts the signal to turn ON and OFF lamp and another household electrical appliance at that area. To be noted that power saving is the most effective when it is turned OFF when it is not being used. Wastage can be avoided with the help of this intelligent system.

The study is done based on research done on how effective the intelligent electronic power saving system performs in reducing the consumption of electricity. The research done includes research, testing and observing data obtained on different product using different electrical appliances.

1.6 Thesis Outline

The reports consist of the few chapters as below:

Chapter 1: Introduction

This chapter will simply introduce about the project. This chapter covers the introduction, problem statement, objective and scope of the project.

Chapter 2: Literature Review

This chapter emphasis on the research and studies made relevant to the project title.

Chapter 3: Methodology

This part includes the method used in which area of research and studies made based on the project objective.

Chapter 4: Results and Discussion

This chapter discusses the output of the project from the result obtained to the hardware being made.

Chapter 5: Conclusion and Recommendation

This chapter will discuss the summary of the overall project and conclude based on the output obtained from the project and improvements can be made to make the project better for future purpose.