



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**AUTOMATIC LIGHTING CONTROL WITH TOTAL NUMBER
OF VISITOR VIA SMS**

This report submitted in accordance with requirement of the Universiti Teknikal
Malaysia Melaka (UTeM) for the Bachelor Degree of Electronic Engineering
Technology (Telecommunication) (Hons.)

by

NURUL FARAHIN BINTI OMAR

B071310094

900601085956

FACULTY OF ENGINEERING TECHNOLOGY

2016

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: Automatic Lighting Control With Total Number Of Visitor Via SMS

SESI PENGAJIAN: 2016/17 Semester 1

Saya **NURUL FARAHIN BINTI OMAR**

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan ()

SULIT

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972)

TERHAD

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD

Disahkan oleh:

Alamat Tetap:

Cop Rasmi:

No 57, Lorong Intan Mutiara 1

Taman Intan Mutiara

36000 Teluk Intan, Perak

Tarikh: _____

Tarikh: _____

** Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I hereby, declared this report entitled “Automatic Lighting Control With Total Number Of Visitor Via SMS” is the results of my own research except as cited in references.

Signature :

Author's Name : NURUL FARAHIN BINTI OMAR

Date :

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor Degree of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

.....
(Siti Asma Binti Che Aziz)

ABSTRAK

Lampu merupakan elemen penting dalam kehidupan harian terutamanya dalam institusi pengajian, perkilangan, pejabat dan kediaman. Dengan adanya lampu, kerja-kerja dapat dilakukan dengan mudah. Namun demikian penggunaan lampu yang tidak teratur boleh menyebabkan pembaziran berlaku dan penggunaan kuasa semakin meningkat. Seringkali dapat dilihat di institusi pengajian terutamanya di dewan kuliah dimana lampu yang dinyalakan tidak sesuai dengan bilangan orang didalamnya. Adakalanya juga mereka keluar tnpa menutup lampu dan ini menjurus kepada pembaziran elektrik. Jadi, projek “Automatic Lighting Control Base on Number of Visitor Via SMS” ini dihasilkan. Selain itu, objektif ini juga dapat menjimatkan penggunaan tenaga elektrik. Perkakasan sistem ini termasuk arduino uno, PIR sensor, LCD, LED, GSM dan buzzer. Projek ini menggunakan PIR sensor untuk mengesan pergerakan yg masuk dan keluar. Arduino digunakan sebagai pengawalan setiap perjalanan projek ini. Paparan LCD menunjukkan bilangan orang yang terdapat didalam dewan kuliah. Kemudian LED akan menyala mengikut bilangan orang yang terdapat didalam dewan kuliah. Apabila bilangan orang yang masuk ke dalam dewan kuliah melebihi kapasiti yang ditetapkan, buzzer akan berbunyi. SMS dihantar kepada pihak pengurusan dewan kuliah untuk memberitahu keadaan lampu samada menyala atau padam. Dengan adanya sistem ini, pembaziran dapat dielakkan dimana lampu dikawal secara automatik melalui bilangan orang yang masuk dan keluar dewan kuliah.

ABSTRACT

Lighting is an important element in daily life, especially in educational institutions, manufacturing, office and residential. With the lights, the work can be done easily. However, the use of irregular light can cause wastage and increasing the power consumption. Often can be seen in institutions especially in the lecture hall where the lights are turned on are not in accordance with the number of people in it. Sometimes they also not to turn off the lights and this leads to a waste of electricity. So, this project will provide automatic lighting control based on total number of visitor. Besides that it will develop energy saving of lighting control system. The hardware of the system includes arduino uno, two PIR sensor, LCD, LED, GSM and buzzer. The PIR sensor can be detect the movement of incoming and outgoing to the lecture hall. Then arduino uno as a main control of this project. LCD display shows the number in and out to the hall. LED will be on and off base on number of visitor in hall. When visitor in lecture hall exceed the specified capacity, buzzer will active. SMS will sent to management lecture hall to tell whether the lighting on or off. With this project, the wastage can be avoided where the light is automatically controlled by the number of people coming in and out of the lecture hall.

DEDICATION

This report is dedicated to my beloved parents, who always stay by my side and taught me that to have the best knowledge is learned from my own experience life.

ACKNOWLEDGEMENT

First, I would like to thank God for His blessing so that I am able to finish my bachelor degree project. I am using this opportunity to express my special appreciation and gratitude to everyone who supported me throughout the process of completing my final year project. I am thankful for their aspiring guidance and advice during this project.

I also want to express my warm thanks to my supervisor Puan Siti Asma Binti Che Aziz for the support and encourage me toward my research. I would like to thank UTeM for allowed me to use the facilities in order to complete the research and also faculty lecture for advice and help.

TABLE OF CONTENT

Abstrak	i
Abstract	ii
Dedication	iii
Acknowledgement	iv
Table of Content	v
List of Tables	vi
List of Figures	vii
List Abbreviations, Symbols and Nomenclatures	viii

CHAPTER 1: INTRODUCTION

1.1	Introduction	1
1.2	Problem Statement	1
1.3	Objective	2
1.4	Scope of work	2

CHAPTER 2: LITERATURE REVIEW

2.1	Introduction	3
2.2	Previous Project Research	
2.2.1	Microcontroller And It's Application For Energy Conversation And Visitor Counter	3
2.2.2	Design of An Intelligent and Efficient Light Control System	4
2.2.3	Development of Wireless Light Control System Based on Zigbee	5
2.2.4	Development of Automation System for Room Lighting Based on Fuzzy Logic Controller	6
2.2.5	Design of Energy Saving Lighting System in University Classroom Based on Wireless Sensor Network	7
2.2.6	Artificial Lighting Design at The Lecture Theatre of The Faculty of Engineering	8
2.3	Arduino	9

2.4	Global System for Mobile Communication (GSM)	11
2.5	IP Sensor	12
2.6	Liquid Crystal Display (LCD)	14
2.7	PIR Sensor	15
2.8	Light Emitting Diode (LED)	16

CHAPTER 3: METHODOLOGY

3.1	Subtitle	17
3.2	Project Planning	17
3.3	Block Diagram	19
3.4	Flow chart of Project	19

CHAPTER 4: RESULT AND DISCUSSION

4.1	Result from Software Simulation	21
4.2	Result from Hardware	23
4.3	Discussion	26

CHAPTER 5: CONCLUSION AND RECOMMENDATION

5.1	Conclusion	28
5.2	Recommendation	29

REFERENCES **30**

APPENDICES **32**

A	Coding of this project	-
B	Project Planning (Gant Chart)	

LIST OF TABLES

2.1	Material and Lighting Installation of Lecture Theatre	9
2.2	Arduino Specification	10
2.3	Advantage of Arduino UNO	11
2.4	LCD Display pins description	14
4.1	Condition of LED and buzzer	25
4.2	Voltage when led is On	25
4.3	Formula to calculate usage power consumption in kwh	26
4.4	Power consumption for downlight 11W	26

LIST OF FIGURES

2.1	Flowchart of operation IR Sensor (Pai V. and Kokare A. et al., 2014)	4
2.2	Flowchart of operation system (Arun Radhakrishnan and Vuttaradi Anand. et al., 2013)	5
2.3	System scheme (Changfei Guo, Xiaoping Zou, Chaoting Ma, Rongrong Zhang, February 2013)	6
2.4	Block Diagram System (Aryanto Hartoyo and Seno Darmawan Panjaitan, et al., 2012)	7
2.5	System structure diagram (Yu Liang, Ruihua Zhang, Wei Wang, Caiqing Xiao, February 2013)	7
2.6	Arduino UNO (Uckelmann,et al., April 2011)	10
2.7	SIM 900A GSM/GPRS Module	12
2.8	IR light detected by sensor (Jaeseok Yun and Sang-Shin Lee, may 2014)	13
2.9	Reflected IR light detected by sensor (Jaeseok Yun and Sang-Shin Lee, may 2014)	13
2.10	Liquid Crystal Display (LCD)	14
2.11	PIR Sensor	15
2.12	Type of colour LED	16
3.1	Flow Chart of Project Planning	18
3.2	Block Diagram of The Project	19
3.3	Flow Chart of The Project	20
4.1	Nobody in room (0 condition)	21
4.2	Condition for buzzer and LED line one when one person in room	22
4.3	Condition for buzzer and LED line two when three person in room	22

4.4	Condition for buzzer and LED line three when seven person in room	22
4.5	Troubleshoot of hardware	23
4.6	Message Received from GSM	24

LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

SMS	-	Short Messaging Service
GSM	-	Global System for Mobile Communication
SIM	-	Subscriber Identity Module
Tx	-	Transmitter
Rx	-	Receiver
GPRS	-	GSM Packet Radio Service
I/O	-	Input / Output
LED	-	Light Emitting Diode
LCD	-	Liquid Crystal Display
V _{in}	-	Voltage in
V _{cc}	-	IC Power Supply pin
kWh	-	Kilowatt / Hour

CHAPTER 1

INTRODUCTION

1.1 Introduction

Nowaday, electricity is the most important element in an operating system of a residential, institution or commercial building. This is because the operating system in the building is based on the electricity supply. If there is no electricity, the system cannot be function and all activity will be affected. Power saving have become a necessary thing in our day to day life. One of the lighting energy efficiency researches is using lighting control method. By the use of an automatic controller then lighting energy consumption can be reduced.

This project will develop a lighting control based on total number of visitor in lecture hall. When visitor enter the lecture hall, the counter is incremented and the light will switched ON base on total number of visitor. If all visitor out from the lecture hall, the counter is decremented and the light will be switched OFF. While when visitor in lecture hall more than the specified capacity, buzzer will be activated. The total number of visitor will be displayed on LCD and also will be send via SMS to the management as a notice.

1.2 Problem Statement

Normally, when people enter the hall all the lights will be switched on even if there are only a few people in it. People will only sit on the front but the back light

still switched on. Sometimes people also forget to close the lights when leaving. This will cause electrical waste.

1.3 Objective

The main objective of this project is :

1. To provide automatic lighting control based on total number of visitor
2. To analyze the performance of lighting control with number of visitor for optimize electrical usage.
3. To develop energy saving of lighting control system.

1.3 Scope of Work

Project of Automatic Lighting Control with Total Number of Visitor Vis SMS is focusing for a lecturer hall in higher education institution to optimize electrical usage. The lecturer hall have three line of light and the capacity of the lecturer hall is 216 visitor. Buzzer will be activated when the number of visitor in lecturer hall more than specified capacity. In this project, IR sensor are placed at the door to detect incoming and outgoing visitor. Arduino will calculate the number incoming and outgoing from the lecturer hall then send data to LCD in lecturer hall for switch on or off the light. The GSM are used in this project to send the total number of visitor to the management lecturer hall for information

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will describe the study of previous projects related to this project. It provides a study of hardware, components and applications used in previous projects for use in this project. This section will discuss about the previous project research and will be followed by the hardware use for the project.

2.2 Previous Project Research

2.2.1 Microcontroller And It's Application For Energy Conversation And Visitor Counter

According to Pai V. and Kokare A. *et al.*, 2014, a sensor is built to detect the number of people going inside or coming outside. They use two parts of sensor transmitter and receiver. When Ath IR sensor is interrupted the microcontroller will look for the Bth IR sensor. That is if Ath sensor are interrupt first and then the Bth sensor will said that the person in going inside. And vice-versa as shown in Figure 2.1. Then the counter will send the pulse to the microcontroller. Then microcontroller will send the signal to the relay. The microcontroller acts like CPU of the whole system where it will be receive the signal from sensor, and signal is operated under

the control of software which is stored in ROM. Microcontroller AT89S52 continuously monitor the Infrared Receiver.

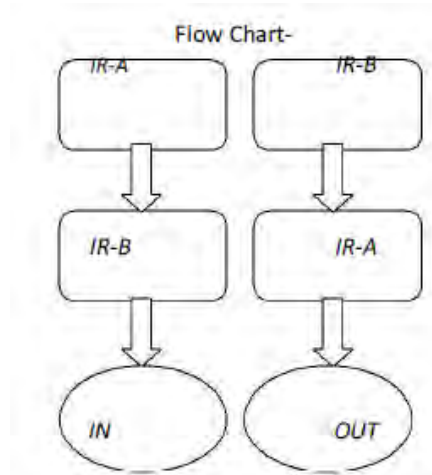


Figure 2.1: Flowchart of operation IR Sensor (Pai V. and Kokare A. *et al.*, 2014)

2.2.2 Design Of An Intelligent and Efficient Light Control System

Base on journal research by Arun Radhakrishnan and Vuttaradi Anand. *et al.*, 2013, they used PIR sensor and an LDR to control lighting efficiently. PIR sensor is used to detect whether any occupants are there in room while LDR is used to detect the intensity of light in room and the signal will send to the microcontroller (PIC16F877A). Both of this sensor will detect whether need to switch on the light or not. In their processes when anybody enters the room, the microcontroller will compares the sensed value of intensity in the room with the value already stored in it. The light will be switch on when the sensed value is less than value stored in microcontroller.

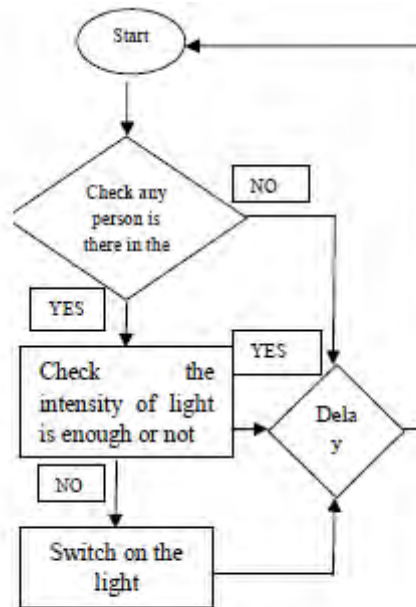


Figure 2.2: Flowchart of operation system (Arun Radhakrishnan and Vuttaradi Anand. et al., 2013)

2.2.3 Development of Wireless Light Control System Based on Zigbee

This wireless light control system based on zigbee used three types of sensor nodes to form a wireless network that is coordinator, router and end device. In that process, the coordinator is connected to computer as control centre via RS232 serial communication port means that it is similar to a switch where it controls light by wireless way in network. The router as a information transmission and be a full function device (FFD) that serve as sending and receiving data. The third sensor they use is end device which can be a Reduced Function Device (RFD). (Changfei Guo, Xiaoping Zou, Chaoting Ma, Rongrong Zhang, February 2013)

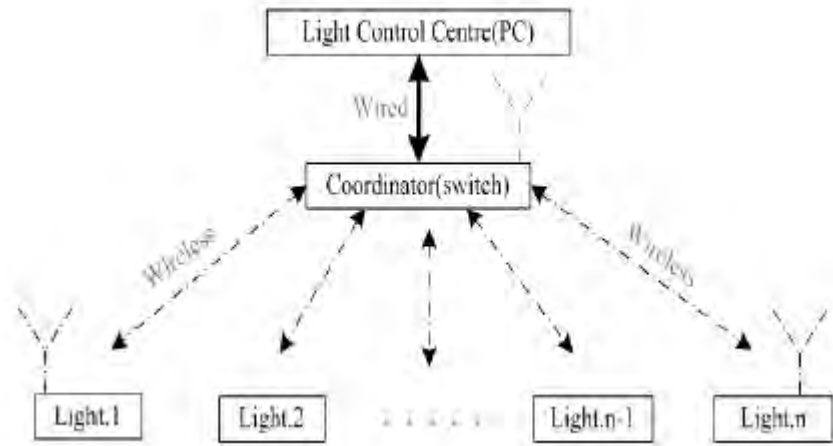


Figure 2.3 : System scheme (Changfei Guo, Xiaoping Zou, Chaoting Ma, Rongrong Zhang, February 2013)

2.2.4 Development of Automation System for Room Lighting Based on Fuzzy logic Controller

According to Aryanto Hartoyo and Seno Darmawan Panjaitan, *et al.*, 2012, they use fuzzy logic controller for room lighting system. By using fuzzy, there are some advantages acquired by them which are implementation of low-cost control hardware by using microcontroller and easy installation and expansion for a bigger system. In their journal, fuzzy logic system has two membership functions for light source as input and one membership function for output. The other input is from the occupation sensor. The output of the microcontroller system is used to determine the number of compact fluorescent lamp (CFL) that must be turn on. In this process, TRIACs is used as the switch for the CFL on or off. Based on the illuminance in the room the control system will switch on or off the CFL.

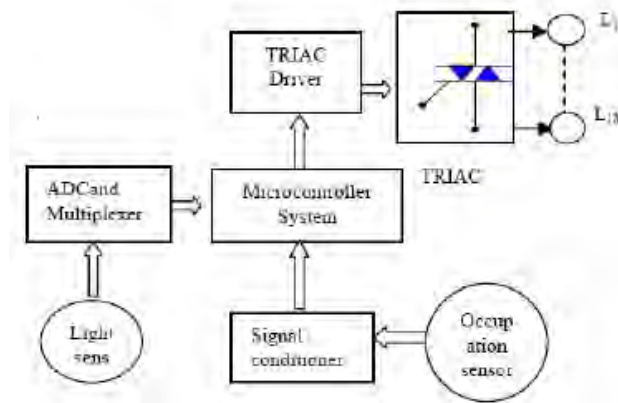


Figure 2.4: Block Diagram System (Aryanto Hartoyo and Seno Darmawan Panjaitan, et al., 2012)

2.2.5 Design of Energy Saving Lighting System in University Classroom Based on Wireless Sensor Network

According to the journal of Yu Liang, Ruihua Zhang, Wei Wang, Caiqing Xiao, February 2013, they set single-chip Ameg16 as control center, communication between nodes via nRF24L01 wireless transceiver module and communication between sink and upper computer via w5100 wireless internet module. Besides that, illumination intensity via photoconductor and infrared pyroelectric sensor as a detect the human body. They used one sink in each classroom where it is connected into internet via screen wire. So the director can lodge in Web server via any networking PC or mobile to control state of all nodes in the classroom.

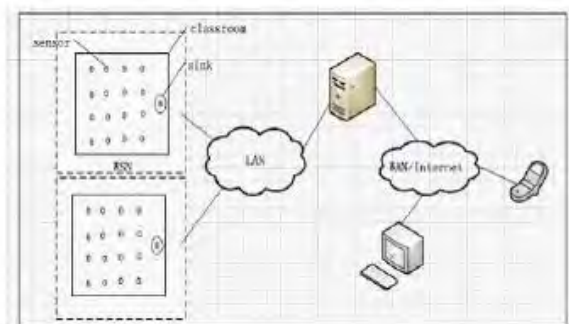


Figure 2.5: System structure diagram (Yu Liang, Ruihua Zhang, Wei Wang, Caiqing Xiao, February 2013)

In their proses, they used two condition where that is under the condition of insufficient light and the condition of sufficient light. For the process insufficient light, when people stay in a position, 1 lamp above will be turn on. When people are seat is tiny movement within 5 minutes, the light will keep on. The lamp will be turn off after 5 minutes people leave the position. For the condition of sufficient light, the light will not be turn on. The system can automatically detect damaged lamp node and sensor node and report to upper computer, asking for maintenance.

2.2.6 Artificial Lighting Design At The Lecture Theatre of The Faculty of Engineering.

According to Wasilah, Josef Projotomo amd Murni Rachmawati, July 2013, this journal are study aims to describe the factors affecting the lack of illumination at lecture theatre of the Faculty of Engineering. The artificial lighting were observed and measured with light meter indicates that the average illumination at the lecture theatre does not reach the minimal standard 500 lux for IES, CIBSE and DIN EN 12464. Then the data were analyzed by comparing the results of measurement with illumination and reflectance standards for lecture theatres, the luminary position with spacing criteria and the condition of lamps and luminaries.

Alternatives solution are used to improve the lighting condition is to calculate with lumen method then draw the design with computer simulation. From their research, this design are recommended to add the number of lamps, increase the surface reflectance, and change the type and power of lamp. By fulfilling the spacing criteria and placing the luminaries in the right position, the uniformity of illumination standard can be met.

Materials	Floor	40x40 cm ceramics, Color : cream
		40x40 cm ceramics, Color : pink
	Wall	Front wall and back wall , Color : white
		Acoustical wall Materials : white wood and pink busa
Ceiling	Mengikuti Roof shape dengan kemiringan 35° finished by white wood	
Lighting Instalations	General lighting (Installation II-VII)	42 luminaries TMS 011+GKH Philips TL-D 2x36 W/54 (2500 lumen) Philips daylight
	Demonstration area (Installation I)	3 flood lamps NP 50 + PAR 38 150 W
	Supplementary lighting	14 down lights + R-30 15 W

Table 2.1 : Material and Lighting Installation of Lecture Theatre (Wasilah, Josef Projotomo amd Murni Rachmawati, July 2013

2.3 Arduino

Arduino is a tool that makes the computer to sense and control the physical world. It is an open source physical computing platform based on a simple microcontroller board and a development environment for writing software for the board (Uckelmamn,et al., April 2011). It also has 14 digital I/O and 6 Analog I/O, 10 bit analog to digital converter and 14kb ROM. This arduino can be powered via the USB connection or with an external power supply. Furthermore, according to Devika *et al.*, if using more than 12V, the voltage regulator may overhead and damage the

board. The recommended range is 7volts to 12 volts. However, the 5volts pin may supply less than 5volts but the board may be unstable.

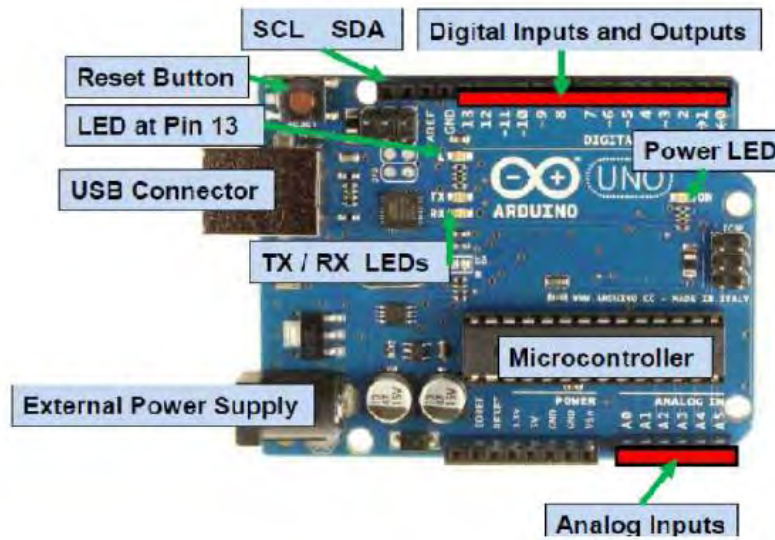


Figure 2.6: Arduino UNO (Uckelmamn,et al., April 2011)

Arduino	Specification
No. of digital I/O	14
No. of analog Input	06
PWM pins	03, 05, 06, 09, 10
Clock Frequency	16Mhz
Power Supply	5 to 12 volts
Flash Memory	32K
Microcontroller	Atmega 328
Board	Arduino UNO

Table 2.2: Arduino Specification