



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN AND DEVELOPMENT OF PORTABLE U-TURN
SIGNAL SYSTEM FOR MOTOR VEHICLE**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours

by

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

.....

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ABSTRAK

Sistem isyarat membolehkan pemandu untuk berkomunikasi secara pasif. Ini bermakna pemandu tidak perlu menggunakan suara mereka untuk berkomunikasi tetapi hanya menggunakan beberapa tindakan maka proses komunikasi berlaku. Tajuk projek ini adalah reka bentuk dan pembangunan mudah alih sistem isyarat pusingan U untuk kenderaan motor. Reka bentuk sistem isyarat pusingan U mudah alih telah direka mengikut saiz yang sesuai untuk pengguna jalan raya. Langkah-langkah projek ini adalah untuk mereka bentuk sistem isyarat untuk memberitahu pengguna jalan raya yang lain bahawa seseorang itu berniat untuk melakukan pusingan U dan untuk mengoptimumkan jangka hayat bekalan kuasa untuk sistem tersebut. Gambar rajah skematik sistem dilukis dengan menggunakan AutoCAD 2018 dan reka bentuk ini dijalankan di CATIA V5. Bateri saiz D menghasilkan jangka hayat terpanjang dalam projek ini. Pengoptimuman selesai kerana jangka hayat sumber terpanjang diperolehi dan litar isyarat pusingan U mudah alih berfungsi dengan baik tanpa masalah.

ABSTRACT

The signal system allows drivers to communicate passively. It means the drivers do not have to throw out their voice to communicate but just applying some action then the communication process occurs. This project title is design and development of portable U-turn signal system for motor vehicle. The design of the portable U-turn signal system was designed according to suitable size for road users. The steps of this project are to design the signal system in order to notify other road user that someone is intend to perform U-turn and to optimize the lifespan of the power supply for the system. The schematic diagram of the system is drawn by using AutoCAD 2018 and the design is conducted in CATIA V5. D size battery appeared to be the longest lifespan. The optimizatoin is complete since the longest lifespan of source is obtained and the circuit of portable U-turn signal is work well without problems.

DEDICATION

I would like to give a special thanks for
My beloved parents
Mazelan Bin Ahmad and Mariani Loh Soon Binti Abdullah

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Table of Content

Abstrak	i
Abstract	ii
Dedication	iii
Acknowledgement	iv
Table of Content	v
List of Figures	viii
List of Tables	x

CHAPTER 1: INTRODUCTION

1.0 Introduction	1
1.1 Background of Study	1
1.2 Problem Statement	4
1.3 Objectives	4
1.4 Scope	5

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction	6
2.1 History	6
2.1.1 History of Signal System	6
2.1.2 History of LEDs	9
2.2 Overview of Turn Signal Sytem	9
2.2.1 Type of Signal	10
2.3 Light Emitting Diode (LED)	11
2.3.1 Type of LEDs	11
2.3.1.1 Bi-Colour and Tri-Colour LEDs	12
2.3.1.2 Red, Green, Blue (RGB) LEDs	13
2.3.1.3 Various Sizes of LEDs	13
2.4 Flasher Relay	15
2.4.1 Type of Flasher Relays	15
2.4.1.1 Electro-mechanical Flasher Relays	15
2.4.1.2 Electronic Flasher Relays	17

2.4.1.3	Thermal Flasher Relays	21
2.4.1.4	LED Flasher Relays	22
2.5	Solar Panel	23
2.6	Rechargeable Alkaline Battery	25
2.7	Non-Rechargeable Battery	27
2.8	9 Volt Battery	30
2.9	Liquid Metal Battery	31

CHAPTER 3: METHODOLOGY

3.0	Introduction	33
3.1	Overall Process	33
3.2	Project Planning	34
3.3	Literature Review	37
3.4	Designing The System	37
3.4.1	AutoCad 2018 Software	37
3.4.2	Scilab Software	38
3.5	Developing The System	39
3.6	Optimizing Power Supply	40
3.7	Collecting Data	41

CHAPTER 4: RESULT AND DISCUSSION

4.0	Introduction	42
4.1	Components	42
4.2	Circuit Design	43
4.2.1	Source circuit	44
4.2.2	Output circuit	45
4.2.3	Action circuit	46
4.3	Prototype Design	48
4.4	Problems Faced	50
4.4.1	Scilab Software	50
4.4.2	Flasher relay	51
4.4.3	Solar panel	51

4.5	Tabulating Data	52
4.6	Plotting Data	53
4.7	Discussion	53
4.7.1	Comparison	53
4.7.2	Optimized Power Supply	54
 CHAPTER 5: CONCLUSION AND FUTURE WORK		
5.0	Introduction	55
5.1	Conclusion	55
5.2	Future Work	56
 REFERENCES		57

List of Figures

Figure 1.1: Accident Statistic	3
Figure 1.2: Death Statistic	3
Figure 2.1: 1885 Benz Patent Motorwagen	7
Figure 2.2: Oscar J. Simler's handmade turn signal	8
Figure 2.3: Type of Bulb	10
Figure 2.4: Bi-Colour and Tri-Colour LEDs	12
Figure 2.5: Red, Green, Blue (RGB) LEDs	13
Figure 2.6: 1.8mm LED	14
Figure 2.7: 3.0mm LED	14
Figure 2.8: 5.0mm LED	14
Figure 2.9: Schematic Diagram of Heat-Collecting Plate	23
Figure 2.10: Solar Panel	25
Figure 2.11: Rechargeable Alkaline Battery	27
Figure 2.12: Non Rechargeable Alkaline Batteries	27
Figure 2.13: Specific Energy Comparison of Secondary And Primary Batteries.	29
Figure 2.14: Energy Comparison Underload.	30
Figure 2.15: 9 Volt Battery	30
Figure 3.1: Gantt Chart	35
Figure 3.2: Flow Chart Process	36
Figure 3.3: AutoCAD 2018	38
Figure 3.4: Scilab Software	39
Figure 3.5: Solder Iron and Solde Wire	40
Figure 3.6: Example of Bar Chart	41
Figure 4.1: Power Source Circuit	44
Figure 4.2: Schematic Diagram for Output/LEDs	45
Figure 4.3: LEDs Arrangement Shows U-turn Sign	46
Figure 4.4: Initial Circuit Drawing.	47
Figure 4.5: Final Flasher Circuit.	48
Figure 4.6: LED Design	49
Figure 4.7: Board Design	49

Figure 4.8: Prototype of the U-turn Signal	50
Figure 4.9: Stopwatch	52

List of Tables

Table 2.1: Electro-Mechanical Flasher Relays.....	15
Table 2.2: Electronic Flasher Relays	17
Table 2.3: Thermal Flasher Relays	21
Table 2.4: LED Flasher Relays	22
Table 3.1: Example Table of Lifespan Data.	41
Table 4.1: List of Component for Action Circuit	43
Table 4.2: Data Tabulation.....	52

CHAPTER 1

INTRODUCTION

1.0 Introduction

In this chapter, overall study including the background, problem statements, objectives, scope and the result expectation of the study is discussed.

1.1 Background of Study

Travel by land vehicle is something that really exciting activities to do for. Long journey is definitely an awesome memory to have. In order to reach the destination, there are a lot of changing direction whether left or right or may be it can be a 180 degree of turn which known as a U-turn. Every single vehicle that existed was built with assist. Assistance that vehicle needed the most is signal system. There are many type of signal system in a vehicle. Signal that appeared to notify the owner or driver that are located on the panel or meter, and signal to give information to other road users. This signal actually let the driver communicate indirectly.

Signal system in vehicles is familiar to human being especially signal that are to notify other road users. Its function is to show an intended change of direction, whether turning left or right or moving out into traffic. This system was created blinking so that it can get human attention and get informed what the other vehicle going to do.

There is a lot variation of signal in aspect of design nowadays. These design were created by different companies. Some design were implemented based asthetic aspect. Furthermore, some design were based on safety, shape and etc. In implementing the signal, location of its installation is crucial. In addition there are

many type of light too. As examples, signal using common bulb, Light Emitting Diode (LED) - a lot sizes of LED and many other types more.

Besides, even the light of signal and design of signal were variously invented, accident among vehicles still occur. These accidents sometime happen due to drivers behavior and any other causes. As indicated by GB6441-86, unsafe behavior in China is divided into 13 categories. But in the actual research, few literatures use this classification standard (Zhang et al, 2011).

Accident still occurs, arise day by day. It happens no matter where and when, whether rural or inrural area, city, village, highspeed way, intersections and any other places more. Over 460,000 cases were reported to Road Transport Department (Jabatan Pengangkutan Jalan, JPJ) in 2012. It increases every year, in 2013 and 2014 near 480,000 cases were reported. But unfortunately in 2015, its become worst, over 480,000 accidents were reported to JPJ as shown in Figure 1.1 & Figure 1.2. In this paper, accident at intersection is the main focus, or more specific during vehicle makes a U-turn.

The rarely accidents occur are, accidents during U-turning. These action seldomly performed so number of incident occur is minor. As it is a minor incident, this project is developed as an alternatives to reduce the minor first. When an attempt action to U-turn common right-signal is used, it inflict a misunderstand to other drivers or road users. As no U-turn signal has been implemented yet, its the time to take action in inventing something that might help reducing the accidents from occurs.

If this device or system are established successfully, road users like common car driver, lorries' driver, motorcyclist and any other vehicle users can notify earlier if the U-turn signal is on. Henceforth, this device may help to reduce and will make less accident occur because vehicle users notified and pay more attention towards the signal.

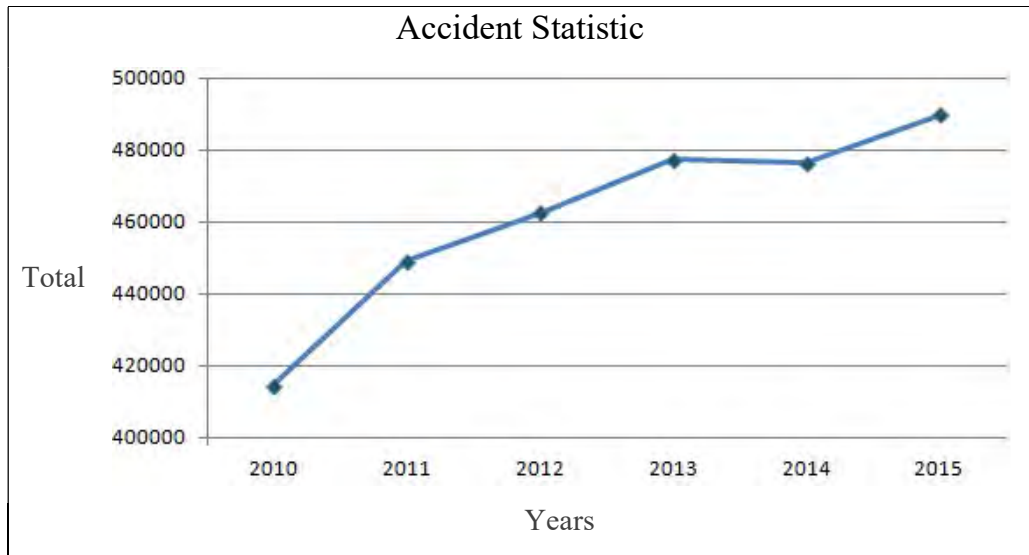


Figure 1.1: Accident Statistic

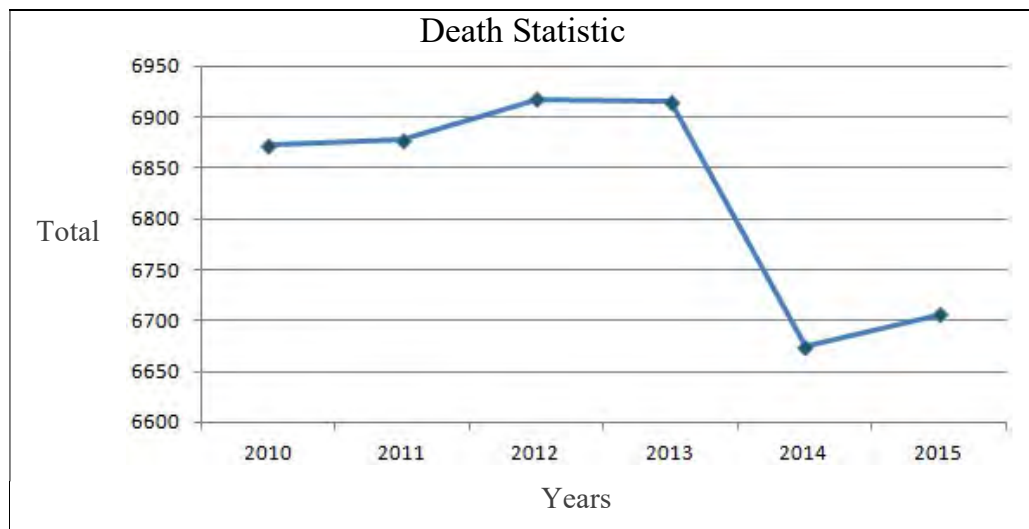


Figure 1.2: Death Statistic

1.2 Problem Statement

Nowadays, a lot of accidents occurred due to the misunderstanding between drivers and riders. Even when the signal is already applied, the vehicle accident still increasing day by day. An accident that caused by U-turn also increase slightly. U-turn accident or almost all accidents occurred due to misunderstanding between road users especially motorcyclists. In an interview from *Gulf News* that discussed about the accident happened at the U-turn, Brigadier Mohammad Saif Al Zafein, Director of Dubai Police's Traffic Department said that the heavy flow of traffic on the road seldom gives motorists a chance to make the U-turn safely. There is still accident occurred despite the U-turn traffic signal already exist at the intersection. The existing signal is good but still not enough to give information to others.

Henceforth, research findings suggested that in general, speeding behavior of the driver in the area of the U-turn not affected by the signboard and the speed limit. Even though all the drivers have been given warning by all the signboard, drivers were ignored all the signboard where the research found that drivers were drive up to 40.01% significantly faster than the speed limit. It shows that, drivers tend to speeding without notices the signboard and speed limit that may cause to an accident with the U-turn vehicles. Other than that, speeding behavior based on gender shows that male drivers tend to speeding where it is higher than a female driver when approaching the U-turn facility road segment (Nemmang et al, 2015).

1.3 Objectives

- i. To design a prototype that can give a notification of U-turn signal to road users.
- ii. To develop a portable U-turn signal for motor vehicles to inform other road users before performing U-turn.

1.4 Scope

Commonly, signal or indicator light is a type of device to notify others what someone or some drivers going to do. Unfortunately, there are some misunderstandings between the road users when it comes to U-turn issues. This project is tend to solve this problem and hopefully it will help to reduce the accidents to occur.

The aim of this project is about to design and develop a signal system for motor vehicle. This signal will be implemented so the other road user noticed that the driver is planning to make a U-turn. Later, the analysis of the power supply of the U-turn signal system will be conducted in order to get the most efficient life expectancy of the system.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this chapter, the literature review of this project has been studied, including the history of signal, history of LED, also every main component and source that has been used in this project.

2.1 History

Everythings that created by humans has the founder of the product or things. So, the past is the thing that we cannot change and what have happened back then is called history. History of car inventor and turn indicator were discussed.

2.1.1 History of Signal System

Exactly who invented the automobile is a matter of opinion. If we had to give credit to one inventor, it would probably be Karl Friedrich Benz from Germany. Many suggest that first car was invented by him around 1880s. His Benz Patent Motorcar from 1885 (shown in Figure 2.1) is considered the first practical motorcar. He received a patent for the Motorcar on 29 January 1886.

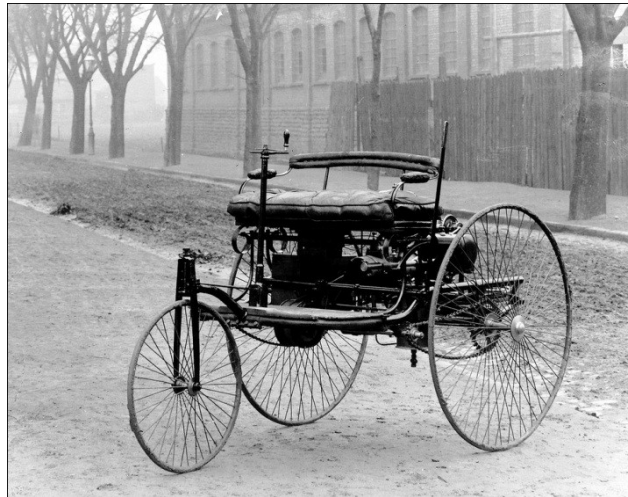


Figure 2.1: 1885 Benz Patent Motorwagen

After a while, issues of misunderstand between drivers increased. The idea of having a signal was pointed by an actor, (Paul, 2016) Florence Lawrence who was turned to be an inventor. She is the woman that devised a mechanism that served as a signaling arm for drivers wishing to turn. Through the simple push of a button, her simple innovation that is raised and lowered a flag on the rear bumper of the automobile to inform other drivers where the car was headed next. Along with this, she developed an equally simplistic and ingenious device to alert fellow motorists of an upcoming stop. Upon depressing the brake, a small sign reading “stop” would pop up in the rear of the car. Though rudimentary in design, her inventions would ultimately prove invaluable on the road.

Unfortunately for Lawrence, however, she failed to patent this creation or her next—the first electric windshield wiper, which began selling in 1917 under the Bridgwood Manufacturing Company. Lawrence’s mother would later try to remedy the oversight, but by then it was too late as other companies were quick to claim ownership and receive patents for similar designs.

While she failed to claim the first patent and, some would argue, was not even the first to devise such a system (that honor going to a Percy Douglas-Hamilton in England), Lawrence’s ingenuity and passion for the automobile was something of an anomaly at the time. The fact that she performed all her own mechanical work and devised these safety measures put Lawrence at the forefront of what could be viewed

as an early form of women's liberation, one for which she's largely since been forgotten, but is by no means diminished in significance. Amazingly, it wouldn't be until 1925 that anything resembling Lawrence's design would see a patent, one turned in by the larger auto manufacturers (Paul, 2016).

The design of car signals were continued by Oscar J. Simler an American who has patented and invented a turn indicator in 1929 as shown in Figure 2.2 (Hedgbeth, 2017). After that in 1935 a company in United States of America make a touch up and invented a flashing turn indicator. Then the concept were expanded by Buick in 1938 that its the first production car to be fitted with an electrical turn indicator.



Figure 2.2: Oscar J. Simler's handmade turn signal

(Hedgbeth, 2017) Buick was the first U.S. automaker to offer factory-installed flashing turn signals. Introduced in 1939 as a safety feature, the new-fangled feature was advertised as the "Flash-Way Directional Signal" operated from a switch on the new "Handi-shift" column-mounted shifter. The flashing signals only operated on the rear lights. In 1940 Buick enhanced the directional indicators by extending the signals to front lights and adding a self-canceling mechanism. That year directional signals became standard on Buick, Cadillac, LaSalle, and the Hudson Country Club vehicles

and optional on Chevrolet, Oldsmobile, and Pontiac (for a cost of \$7.95), Hudson (for \$10), and Packard. In 1941, Dodge offered turn signals as an option on all its models.

2.1.2 History of LEDs

The first known report of a light-emitting solid-state diode was made in 1907 by the British experimenter H. J. Round. In the mid 1920s, Russian Oleg Vladimirovich Losev independently created the first LED, although his research was ignored at that time. In 1955, Rubin Braunstein of the Radio Corporation of America reported on infrared emission from gallium arsenide (GaAs) and other semiconductor alloys. Experimenters at Texas Instruments, Bob Biard and Gary Pittman, found in 1961 that gallium arsenide gave off infrared radiation when electric current was applied (Whelan, 2012).

After that, (Whelan, 2012) also discussed on his writing about Biard & Pittman received the patent for the infrared light-emitting diode. In 1962, Nick Holonyak Jr., of the General Electric Company and later with the University of Illinois at Urbana-Champaign, developed the first practical visible-spectrum LED. He is seen as the "father of the light-emitting diode". In 1972, M. George Craford, Holonyak's former graduate student, invented the first yellow LED and 10x brighter red and red-orange LEDs. Shuji Nakamura of Nichia Corporation of Japan demonstrated the first high-brightness blue LED based on InGaN. The 2006 Millennium Technology Prize was awarded to Nakamura for his invention.

2.2 Overview of Turn Signal System

Turn signal system is a device that used to indicate other road users. This system were used to let the other vehicle noticed what you are going to do or plan to do after. The purpose of applying signal is to inform others that you are making a turn whether right or left or you are moving out of traffic.

2.2.1 Type of Signal

Bulb that has been used in signal system were variety of sizes and shapes. Different type of bulb signal is prescuted below in Figure2.3.

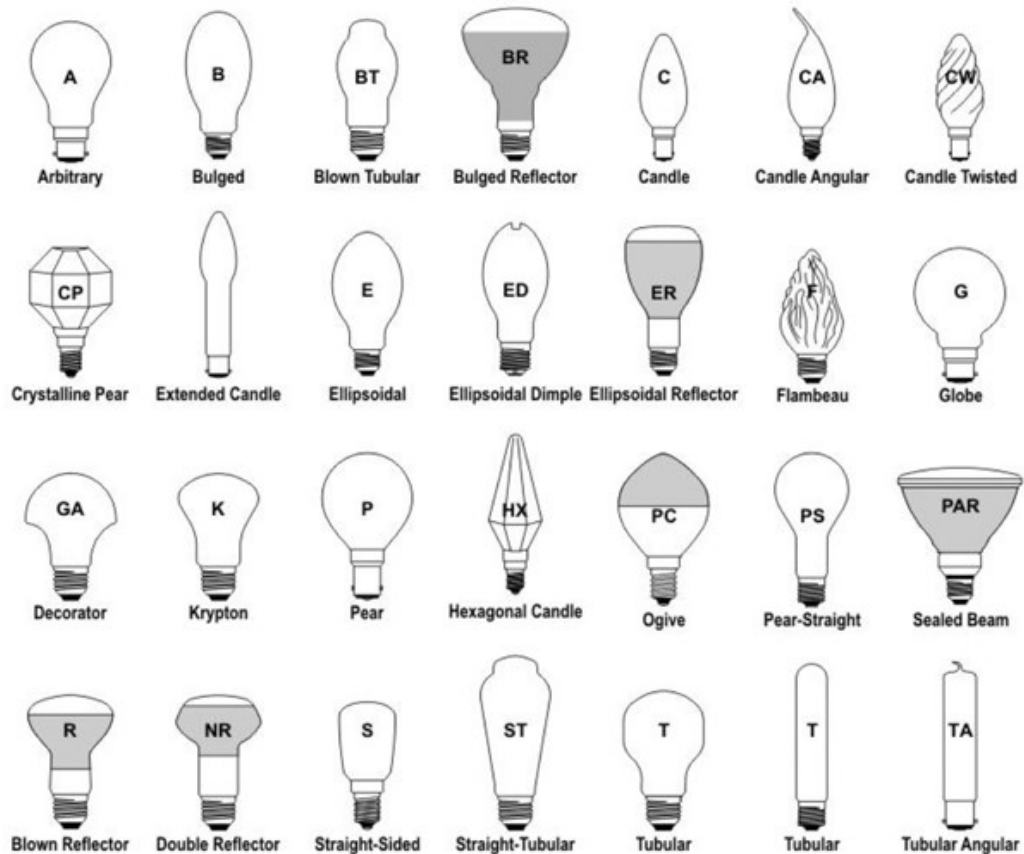


Figure 2.3: Type of Bulb

- A: Standard household incandescent light bulb shape
- B: Bulged bulb shape
- BT: Bulged or Blown Tubular bulb shape
- BR: Short reflector style light bulb
- C: Candle or Conical bulb shape
- CP: Crystalline Pear bulb shape
- E: Ellipsoidal bulb shape
- ER: Extended reflector light bulb shape
- F: Flame style candelabra bulb shape