



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOP AN INTERACTIVE DRIVING EDUCATION
KIT FOR ROAD SAFETY STUDY**

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

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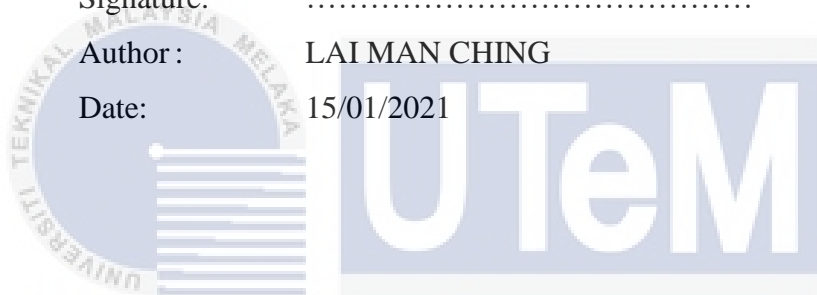
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APPROVAL

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 Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:



ABSTRAK

Pemandu remaja terutamanya pemandu baru lebih mudah mengalami kemalangan jalan raya berbanding dengan orang dewasa kerana kebanyakan mereka mempunyai keputusan memandu yang buruk. Simulator memandu diciptakan untuk memberi latihan memandu kepada pemandu baru. Objektif dalam projek ini adalah untuk merancang dan mengembangkan kit pendidikan memandu yang bernilai harga rendah dengan menggunakan modul transceiver tanpa wayar NRF24L01 + PA. Projek ini dilengkapi dengan Arduino Uno sebagai mikrokontroler untuk mengawal komponen dalam kereta dan pengawal. Selain itu, kamera FPV dengan spesifikasi kecil, ringan, beresolusi tinggi dan latensi yang rendah sesuai untuk memberikan pengalaman mengemudi yang nyata kepada pengguna. Modul transceiver wayarles NRF24L01 + PA mampu memberikan prestasi yang lebih baik daripada modul Bluetooth HC-05 dalam jangkauan penghantaran. Dengan versi modifikasi NRF24L01, dengan menambahkan antena luaran, jangkauan dapat ditransmisikan hingga 1000m pada daya maksimum, dibandingkan dengan jarak operasi 10m modul Bluetooth HC-05. Hasil yang diharapkan adalah merancang kit pendidikan memandu yang berkesan, mudah alih dan harga berpatutan yang dapat memiliki jarak komunikasi yang panjang. Terakhir, projek ini juga diharapkan dapat digunakan dalam tujuan pendidikan untuk meningkatkan kesedaran mengenai isu keselamatan jalan raya di kalangan remaja.

ABSTRACT

Teenage drivers especially the new drivers are more easily to have a road crash compare to the adult because most of them have poor driving decisions. The driving simulator was invented in order to giving driving training to the new driver. The objective in this project is to design and develop a low-cost driving education kit by using NRF24L01 + PA wireless transceiver module. This project is equipped with Arduino Uno as a microcontroller to control the component of the car and controller. Besides that, the FPV camera with the specification of small, light, high resolution and low latency in order to give user a real driving experience. NRF24L01+PA wireless transceiver module able to provide a better performance than HC-05 Bluetooth module in transmission range. With a modify version of NRF24L01, by adding the external antenna, the range can be transmitted up to 1000m at maximum power, compared to the 10m operating range of HC-05 Bluetooth modules. The expected outcome is to design an effective, portable and reasonable price of the driving education kit that can have a long communication range. Lastly, this project also expected to be use in education purpose in order to increase the consciousness of road safety issues among the teenagers.

DEDICATION

This thesis is dedicated to my parents and family members that give me physically and mentally support and encouragement during completing this report. I would also like to dedicate to my fellow friends and supervisor, they always assist me when I meet trouble on the completion of this project.



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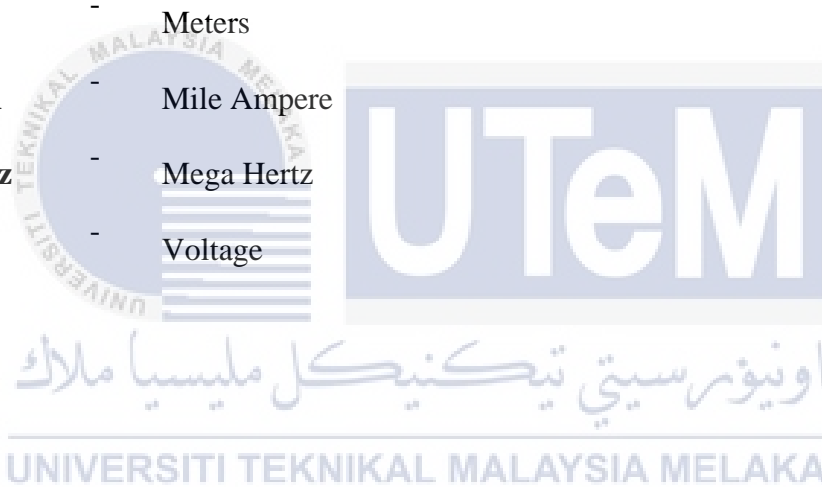
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LIST OF SYMBOLS

D, d	-	Diameter
F	-	Force
l	-	Length
kbps	-	Kilobits per second
kHz	-	Kilo Hertz
Km	-	Kilo meters
m	-	Meters
mA	-	Mile Ampere
MHz	-	Mega Hertz
V	-	Voltage



LIST OF ABBREVIATIONS

FPV	First Person View
VR	Virtual Reality
PA	Power Amplifier
SPP	Serial Port Protocol
RF	Radio Transmitter
SIRCA	Securities Industry Research Centre of Asia-Pacific
HMD	Head Mounted Display
DOF	Degree of Freedom
SCL	Super scape Control Language
LCD	Liquid Crystal Display
BT	Bluetooth

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Nowadays, with the more and more vehicles on the road every year, traffic crashes have become very normal. In 2011, the United States National Institutes of Health (NIH) performed an observational study of adolescent and their parents during the first 18 months of licensing. Based on the observation, per mile driven, drivers ages 16–19 have rates of fatal crashes and police-reported crashes approximately three times as high as adult drivers in the United States [1]. The inexperienced drivers are four times more likely than adults to get into an accident [2]. The reason is because they are lack of experience and easy to get distract. Hence, the enforcement of road safety laws and regulations carry out steps to reduce the possibility of people for getting accidents or killed while on the highways.



Figure 1.1: Common cause of distracted driving

(Source: allstate.com)

The implementation of road safety study gives a better benefit to the road user like enhance the mind set of public awareness. With the time goes on, technology has exploded in the automotive industry and has totally transformed the way cars operate. Lane Departure Warning System is intended to monitors the position of the vehicle on the lane markers on either side [3]. This system uses camera to assess if the car has moved across another lane.

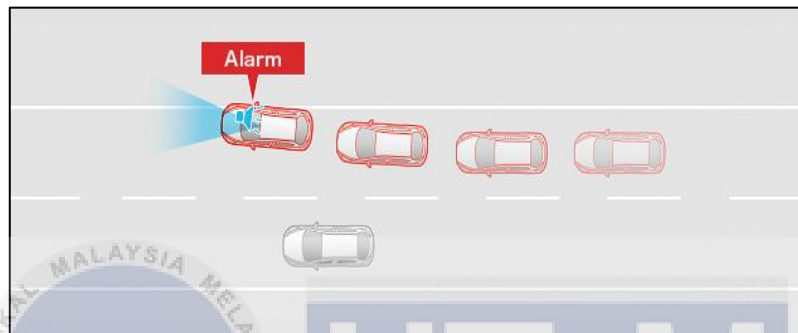


Figure 1.2: The operation of Lane Departure Warning System
(Source: Mazda.com)

Furthermore, rear cross traffic alert (RCTA) is built to inform the driver when they are approaching objects, rather than stationary ones. When backing up parking spaces, the alert system is helpful as they can identify any approaching cars, people and etc.



Figure 1.3: The operation of the Rear Cross Traffic Alert (RCTA)

(Source: Youtube.com)

Nevertheless, all of this system is using for the one who has already learned how to drive. Teen drivers that lacks of driving experience still will have high probability to led a car accident happened due to their nervousness. Similarly, if the newbie that lack of experience or knowledge to identify the road sign, it also will cause the car accidents happened.

Therefore, driving simulators was introduced for entertainment and for the learning of driver training courses at educational companies in order to cause the real damage. Actually, the usage of drive simulators progressed from first application that relating to driver training or study the impact of different substances such as alcohol or drugs to the driver behaviors. Nowadays, driving simulators are not commonly used in research studies, but also in planning, production and testing of in-car technologies. Driving simulators are currently the most advanced implementation of computer-aided kinematic and dynamic simulations, as well as one of the greatest achievements in their development. Hence, the manufacturing cost for high technology driving simulator is very high in the market.



Figure 1.4: Advanced Driving Simulators Nowadays

(Source: en.wikipedia.org)

In this project, Arduino Uno, NRF24L01 wireless transceiver module and the FPV camera are the main component to use. Arduino Uno is a microcontroller board that developed by Arduino cc based on the ATmega328[4]. Arduino Uno is suitable for the beginners because the programming is easy to learn for them. A real time driving simulator have been created with the main component of Arduino Uno. By using the gaming steering wheel and pedals to control the car moving in the simple 3D city model brings the feeling of reality and interesting to the driver. It's interactive when the user is able to control the car by using gaming steering wheel. Moreover, the awareness of road safety rules can be concern among people through driving education kit.

1.2 Problem Statement

Most of the people in our country have driving license, but who know whether they have good skill in driving? Nowadays, driving in modern society is a normal feature because driving can bring us a lot of convenient like shorten the time to reach a destination and etc. Therefore, driving becoming a part of our daily life, but people are rarely worried with all the possible dangers when driving on the highways.

Besides that, the statistics of fatal car accidents among beginner driver is scary. Thus, fatal car accidents are sadly one of the leading deaths of young people in worldwide. The common risk factors that led crashes among drivers are inexperience, teenage passengers and distraction when driving. In order to reduce common risk factors that causes car accidents, several solutions were introduced. For instance, car driving simulators.