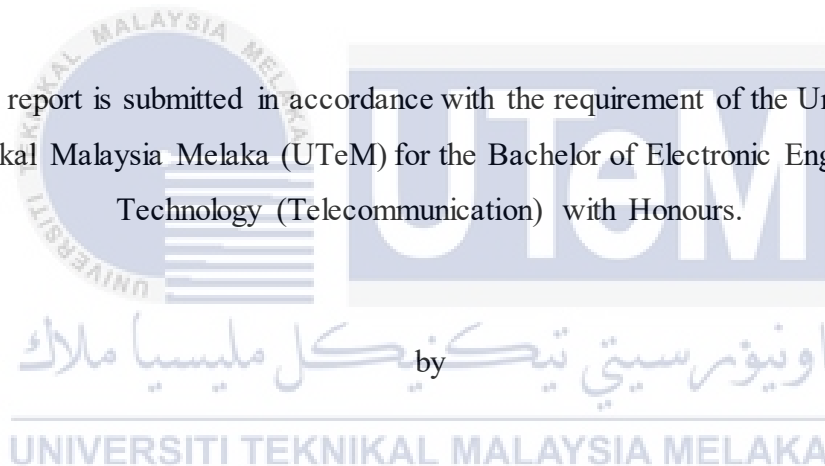




UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN AND DEVELOPMENT OF REMOTE
CONTROL CAR USING ESP32 CAM**

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



TOH HENG FATT

B071710463

960605146191

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING
TECHNOLOGY

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

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ESP32 CAM

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TIDAK TERHAD

Yang benar,



.....

TOH HENG FATT

Disahkan oleh penyelia:



.....

Ir. Dr. Mohd Farriz Bin Hj Md Basar

Alamat Tetap:

43-17-04,

PPR Gombak Setia,

53100 Kuala Lumpur.

Cop Rasmi Penyelia



Tarikh: 06 Jan 2021

Tarikh: 06 Jan 2021

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Signature:

Author : TOH HENG FATT

Date: 06 Jan 2021



اونيورسيتي تيكنيكل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

APPROVAL

This report is submitted to the Faculty of Electrical and Electronic 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:

Signature: 

Supervisor : Ir. Dr. Mohd Farriz Bin Hj Md Basar



اونيورسيتي تيكنيكل مليسيا ملاك
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRAK

*Peralatan elektronik tidak mungkin terpisah dari kehidupan manusia untuk meningkatkan kemudahan dan keselesaan dalam memenuhi keperluannya. Aktiviti harian dilakukan terutamanya melalui peranti telefon pintar yang hampir selalu ada di tangan. Dengan menekan butang pada telefon pintar yang dapat mengawal banyak alat elektronik. Projek ini dicadangkan untuk merancang dan mengembangkan kereta kawalan jauh yang dapat dikendalikan dengan menggunakan telefon pintar. Selain itu, analisa prestasi kereta kawalan jauh bagi mikrokontroler menggunakan ESP32 Cam. Modul ESP32 Cam dipilih sebagai pengawal mikro kerana projek ini bertujuan untuk kos yang lebih rendah dan dapat melihat keadaan masa nyata tanpa membeli kamera luaran. Servo Motor dan Motor Driver dipilih disebabkan motor servo mengendalikan belok kiri atau kanan kereta kawalan jauh, dan Motor Driver untuk mengawal empat motor di roda. HTML GUI dipilih untuk merancang dan mengembangkan kawalan di telefon bimbit. Penemuan projek ini adalah untuk membangunkan sebuah kereta kawalan jauh yang beroperasi dengan penggunaan kuasa rendah lima volts. Jejak kaki kamera adalah 27*40.5*4.5mm dan arus dalam enam milliampere. Akhirnya, kereta kawalan jauh dapat mengawal dan melihat kamera dalam masa nyata dalam kawasan liputan hotspot Wi-Fi.*

ABSTRACT

Electronic equipment is impossible to separate from human life to improve the ease and comfort in satisfying their requirements. Daily activities are mainly performed via a smartphone device are almost always in hand. By pressing a simple button on smart phone able to control a lot of electronic device. This project is proposed to design and develop of remote control car that can be control using smart phone. Besides that, analyze the performance of the remote-controlled car towards the microcontroller using ESP32 Cam. ESP32 Cam module is selected as the microcontroller because this project is aimed to be lower cost and able to view the real time environment on the road without purchasing external camera. Servo motor and motor driver were selected while servo motor is controlling turn left or right of the remoted control car, and motor driver to control four motor at the wheel. HTML GUI is used to design and develop the application on the mobile phone. The finding of the project is to develop a remote-control car operate in five volts low power consumption. The footprint of the camera is 27*40.5*4.5mm and deep sleep current for six milliampere. Finally, the remote-control car able to control and view the camera in real time within the Wi-Fi hotspot coverage area.

DEDICATION

This thesis is dedicated to my parents and family members who give moral support and encouragement during completing this report. I also would like to dedicate to my friends and supervisor that always possibly help me when I have trouble with this project.



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LIST OF SYMBOLS

Hz	-	Hertz
A	-	Ampere
V	-	Volt
m	-	Meters



LIST OF ABBREVIATIONS

GUI	Graphical User Interface
IoT	Internet of Things
HTML	Hypertext Markup Language
PC	Personal Computer
DC	Direct Current
CAM	Camera
PWM	Pulse Width Modulation
USB	Universal Serial Bus
ICSP	In-Circuit Serial Programming
IDE	Integrated Development Environment
IP	Internet Protocol
UHF	Ultra-High Frequency
LAN	Local Area Network
UDP	User Datagram Protocol
RAM	Random Access Memory
IC	Integrated Circuit
TTL	Time to live
RPM	Revolution per Minutes
OLED	Organic Light-Emitting Diode
AC	Alternating Current

CHAPTER 1

INTRODUCTION

1.1 Introduction

Long time before, the basic concept of the remote-controlled car was very simple, the required components include a transmitter, a receiver and a power supply. The transmitter contain joystick for throttle, wheeling and steering (Simatupang and Yosua, 2016). To control the motor, the receiver uses amplitude modulation for modulate the radio signal and the pulse width (Simatupang and Yosua, 2016). The power supply provides the power required to operate the car. Remote-controlled cars currently use radio frequency technology (Simatupang and Yosua, 2016). After that comes out with the project Spybot. Bluetooth module, Arduino Motor Shield, two dc motors, and one servo motor are used. It also uses two smart phones, one for receiving Bluetooth signal, another one is to streaming the live video.

Electronic devices cannot be isolated from human life in order to enhance comfort and ease in the fulfil of their demands. The day to day activities are carried out mainly via a mobile app. By pressing a simple button on smartphones, many electronic devices can be operated. Wi-Fi technology has been introduced in high data rate (54Mbps) wireless powered cars but also with high power consumption (Simatupang and Yosua, 2016). It is used for linking directly to the internet, such as an internet-of-things computer (IoTs), and it has an external power source.

In this project, the remote-control car able to control by using smart phone and able to viewing the real time environment on the road. The remote-controlled car can be

control as long as the remote-controlled car is in the Wi-Fi hot spot coverage area. Due to low cost, the Ai-Thinker ESP32 cam is selected as the microcontroller because the ESP32 Cam contain the smallest cameras module and built in flash lamp. ESP32 Cam is definitely fulfil the requirement of this project. ESP32 cam is able to program with C language by using Arduino Ide software.

In the controller part, the controller is designed by using HTML GUI. The advantages of using HTML GUI is can designing and implementing apps easily. Hence, it is more suitable for beginner start to learn how to create a controller.

1.2 Problem Statement

Over the last three decades, traffic incidents over Malaysia have risen by 9.7 percent a year on average (Mustafa, 2005). One of the factors cause the road traffic accident is lack of training and experience in the road. Hence, this project is to driving kit that allow user to learn driving as they are drive on the road.

On the other hand, it able to increase the attractive of driving lesson class. This is because the driving lesson class is too boring, student may pay more attention and made more attractive for student to learn road ethics, rule and instruction with the instructor.

Furthermore, a lot of beginner lack of knowledge to the rules and instruction in the road. Due to lack of knowledge will cause road traffic accident, because they do not know the meaning of the instruction board.

However, this project is to overcome the problem above. During using the remote-controlled car able to let the driver to gain experience as they drive in reality. Besides that, this project also able to overcome the emotion while driving. Lastly, beginner driver also able to learn about the rules and instruction with the instructor.

1.3 Objective

- i. To design and develop a low-cost remote-controlled car for road safety
- ii. To investigate the transceiver connectivity coverage distance using Wi-Fi
- iii. To analyse the performance in term of time delay of remote-controlled car towards the microcontroller using ESP32 Cam.

1.4 Project scope

This project focus on the design and development of remote-controlled car to help beginner to learn driving and learn the rules and instruction on the road. Wi-Fi as the channel to transmit data from transmitter to receiver. The microcontroller called ESP32 Cam is used in this project, this is because the microcontroller if totally fulfil the requirement of this project which consist of Wi-Fi module and Camera Module. HTML GUI is used to develop the controller to control for the remote-controlled car. This is because the HTML GUI is easy to develop an application for beginner. Below is the scope of this project.

- i. The coverage distance for Wi-fi able to cover up to fifteen meters
- ii. The coverage distance for hotspot able to cover up to ten meters
- iii. The total cost for this project below RM150.

1.5 Thesis Organization

In Chapter one the probability of the project will be briefly clarified. It provides a brief overview of this project in this part. The objective, problem statement and scope of the project will also be discussed. Chapter two, the features of the project will be described. This section also discusses the idea, function of the equipment and part used for this project. Chapter three will explain the methodology for this project. The methodology explains the steps to be taken and studies to accomplish the objective. The development of this project is discussed in chapter four. Besides that, the data sheet of all component also had been attached in this chapter. The expected outcomes and review of this project will be discussed in Chapter five. Based on the methods used, the desired findings and discussion can be achieved. The conclusion of this project is stated in Chapter six. The outcome is based on the results predicted. This chapter will also discuss the recommendation for future research.

1.6 Summary of Chapter 1

The introduction of this project had been studied in this chapter. In part one, the background and introduction of the remote-controlled car had been discussed. The remote-controlled car used mobile phone to control the movement, direction and the position of the remote-controlled car. The remote-controlled car is controlled by using Wi-Fi hotspot. Within the Wi-Fi hotspot coverage area, user able to control the remote-controlled car. ESP32 cam is used as the microprocessor of this project due to this processor is fully fulfil the requirement of this project. Besides that, ESP32 cam is selected because of low cost and easy to implement. The performance and advantages of