



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DEVELOPMENT OF TICKETLESS PARKING SYSTEM  
USING LICENSE PLATE RECOGNITION**

This report is submitted in accordance with the requirements of Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer System) with Honours.

by

**ANG WAI CHUN**

**B071510576**

**941223-03-5863**

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING  
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Alamat Tetap:

Cop Rasmi Penyelia

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Author : ANG WAI CHUN

Date:

## **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 Computer Engineering Technology (Computer System) with Honours. The member of the supervisory is as follow:

Signature: .....

Supervisor : SHAMSUL FAKHAR BIN ABD GANI

Signature: .....

Co-supervisor: IZADORA BINTI MUSTAFFA

## ABSTRAK

*Di Malaysia, tempat letak kenderaan adalah terhad di kebanyakan pusat membeli-belah, jadi mereak melaksanakan sistem meletak kenderaan bertiket untuk mengelakkan kenderann terlalu banyak. Selain itu, sistem letak kenderaan bertiket akan menghasilkan banyak tiket yang tidak boleh digunakan semula akan menjadi sisa buangan. Oleh itu, projek ini dicadangkan untuk mengatasi masalah ini. Projek ini akan mengurangkan pembaziran tiket dengan menggantikan sistem pengesahan plat kenderaan yang beroperasi di MATLAB. Dalam projek ini, terdapat dua proses utama dalam sistem iaitu pengesana gerakan dan pemprosesan imej. Ia akan mengurangkan kos pemasangan berbanding dengan sistem letak kenderaan bertiket yang diperlukan untuk menanam sensor induktans di bawah tanah. Kenderaan tiba akan dikesan dengan pengesanan gerakan dengan menggunakan "Background Substraction" pada kamera. Seterusnya, plat kenderaan diiktiraf oleh "Optical Character Recognition" dalam MATLAB. Setelah plat kenderaan disahkan, papan halangan akan dibuka dengan menggunakan servo motor. Keputusan menunjukkan bahawa semua jenis plat kenderaan terdapat di Malaysia boleh dibaca sekiranya kamera di hadapan kenderaan. Projek ini boleh dilaksanakan di mana-mana Kawasan swasta kecil seperti university untuk mengurangkan beban kerja pengawal keselamatan untuk mengesahkan setiap kenderaan. Ia juga boleh digunakan di pusat membeli-belah selepas sistem pembayaran dimasukkan.*

## **ABSTRACT**

In Malaysia, there are always have limited parking space in most of the shopping center, so they applied ticket parking system to avoid the vehicle is overloaded. Besides, ticket parking system will produce a lot of not reusable ticket which will make a lot of waste. Therefore, this project is proposed to overcome this problem. This project will reduce the waste of ticket by replacing with license plate recognition system which operated in MATLAB. In this project, there are two main process in the system which is motion detection and image processing. It will reduce the cost of installation compared to ticket parking system which required to plant the inductance sensor below the ground. The vehicle arrived is detected with motion detection by using background subtraction on camera. Next, the license plate is recognized by optical character recognition in MATLAB. Once the license plate is verified, the barrier will open by using servo motor. The results show the all type of license plate available in Malaysia can be recognized as long the camera is located in front of the car. This project can be implemented on any small-scale private area such as university to reduce the workload of the security guard to verify every car arrived. It also can be applied on shopping center after the payment system is included.

## **DEDICATION**

This project is dedicated to my lecturer and friend who always been a constant source of support and encouragement during the challenges of my whole university life. This work also dedicated to my parent who have always loved me unconditionally and whose good example have taught me to never give up on what I aspire to achieve.



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## LIST OF SYMBOLS

<b>p</b>	-	Pixel
<b>S*</b>	-	Image Region

## LIST OF ABBREVIATIONS

<b>MATLAB</b>	Matrix Laboratory
<b>OpenCV</b>	Open Computer Vision
<b>GSM</b>	Global System for Mobile Communication
<b>RFID</b>	Radio Frequency Identification
<b>SMS</b>	Short Message Service
<b>PIC</b>	Peripheral Interface Controller
<b>RGB</b>	Red Green Blue
<b>NTSC</b>	National Television System Committee
<b>HIS</b>	Hue Intensity Saturation
<b>FPGA</b>	Field-Programmable Gate Array
<b>HLS</b>	Hue Lightness Saturation
<b>CCL</b>	Connected Component Labelling
<b>VEDA</b>	Vertical Edge Detection Algorithm
<b>ULEA</b>	Unwanted-Line Elimination Algorithm
<b>HDD</b>	Highlighted Desired Details
<b>CSI</b>	Camera Serial Interface
<b>OCR</b>	Optical Character Recognition
<b>MSER</b>	Maximally Stable Extremal Region
<b>GUIDE</b>	Graphical User Interface Development Environment

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

The number of vehicles increase dramatically every year, therefore, the efficiency of a vehicle parking system is needs to be improved (Kannadasan *et al.*, 2014). It is difficult to increase the number of parking spaces due to the limited space inside an area especially in a city. The parking system mostly applied in Malaysia is the ticket parking system, but this type of parking system requires a huge amount of paper to produce the parking system ticket. Therefore, a system to overcome the present traditional parking system is developed. Smart Parking is one of the most adopted and fastest growing Smart City Solutions across the world because the number of vehicle increase rapidly and some of the entities start to realize the significant benefit of automated parking technology which able to real-time monitor and analyze and gather data without the interference by human (Kumar *et al.*, 2017).

In recent years, license plate recognition technique has been discovered progressively helpful in intelligent traffic control systems such as toll payment, real-time traffic monitoring and parking system (Pan, Ye and Zhang, 2005). Studies show that this technique will improve the efficiency of the present parking system to reduce traffic congestion (Yu and Kim, 2000). There are several methods for license plate recognition technique, the most common application is MATLAB which is most widely for image

processing and another is OpenCV which operates on a low-cost single board computer which is portable called Raspberry Pi.

## **1.2 Objective**

- i) To develop a ticketless parking system with license plate recognition system by using image processing technique in MATLAB.
- ii) To develop a smart parking system to reduce the average waiting time in the parking area.

## **1.3 Problem Statement**

Vehicle makes people life easier but the parking system cause a serious problem due to poor administration of the parking system (Qin and Yao, 2013). The problem of the present parking system are high installation cost, mismanagement of vehicles, time-consuming process of issuing a ticket and making payment leads to traffic congestion and driver frustration (Shejwal *et al.*, 2017). Based on Geng and Cassandras (2012), they mention that it is unsurprising that 30% of vehicles on the road in the downtown region of major cities are search for a parking spot and it takes an average of 7.8 minutes to discovery one on a daily basis. It causes unwanted time and fuel consuming for drivers due to traffic congestion. Therefore, a smart parking system that overcomes these problems using image processing will be developed.

## **1.4 Project Scope**

A prototype of the system will be on small-scale indoor parking system which consists of one barriers installation on the entrance to identify the car is valid or not. The coverage of the area is for a single floor parking lot sufficient for 10 cars.

## **1.5 Project Significant**

This system is developed to enhance the efficiency of the existing parking management system and reduce the difficulty when entering the parking area.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

The parking system is divided into several methods to identify the driver entering and leaving the parking. It also verifies the duration inside the parking to calculate the parking fee. This chapter will elaborate on several existing systems using Ticket System, GSM Technology system, RFID system and License Plate Detector by image processing.

#### 2.2 Ticket System

The ticket parking system is the most used parking system applied in Malaysia. This parking system is divided into human-based and machine-based. Human-based parking system consists of a person manually monitoring the parking area by giving the parking ticket to who enter the parking area and receive payment from those leaving the parking area. The ticket of this type of parking system content the time they enter the parking and calculate manually by the people. Machine-based parking system generates the ticket to the driver at the entrance and the driver need to pay the parking fee at the machine provide in the parking area.



**Figure 2.1: The human-based parking system (Melaka Sentral, Malaysia)**

### **2.3 GSM Technology**

Global System for Mobile Communication (GSM) is commonly used in mobile device standards. Since the GSM network has almost available on the whole country, there is no required to set up additional network when using wireless technology. GSM module system is easy to operate and cell phone users able use it without any difficulty (Qin and Yao, 2013). Drivers simply need to request a parking space and make the payment through sending a message to the parking system. Some of the parking systems consist of the reservation feature to allow the driver to make the reserve the parking space. The sent short message services (SMS) is processed by PIC microcontroller and a booking validation is sent to the driver with details of reservation like password and lot number. The password is used to enter the parking area and valid for a certain period (Kumar *et al.*, 2017).

### **2.4 RFID Technology**

Radio Frequency Identification (RFID) is a system to recognize the objects through radio waves. There are two main components of RFID, the first component is the