SMART CAR PARK SYSTEM

TAN LIN WENG

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Tajuk Projek : SMART CAR PARK SYSTEM

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APPROVAL

"I hereby declare that, I have been read this report and in my opinion it has been satisfied the scope and quality needed for Bachelor Electronic Engineering (Electronic Industry)."

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Supervisor Name : MISS KHOO CHIN FOON
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DEDICATION

For my beloved family

For my dearest lecturers

For those who support me and bring me laughter

Sincerely and genuinely from

Lin Weng, Tan

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First of all, I would like to take this opportunity to say a million thanks to Miss Khoo Chin Foon for her guidance, advice and inspiration. The knowledge and encouragement given has helped me a lot throughout the completion of project.

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Thirdly, I would like to say thank you to those who spend their precious time to share their knowledge with me and helped me out to find the best solution for the project. I appreciate it very much for your unselfish attitude. I was overwhelmed with gratitude for the help and care given.

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Again, thank you.

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ABSTRACT

The purpose of this final year project is to build an automatic of two-level parking platform in order to increase the number of parking lot since there is shortage of parking lot in the urban area nowadays. With the same total surface area as traditional parking lot, this system able to let the users to park their cars in both of the parking platforms at the same time. The parking platform will automatically lifted up or lifted down according to the condition met. By implementing this system, it saves users' precious time by finding a parking lot. Moreover, this system is easy to use and control. There are two main parts in this system which is infrared sensor part and DC gear motor part. Infrared sensor is used to detect the existence of car in the parking or in the waiting area. While the DC gear motor is used to lift up and lift down the parking platform. Besides, the project was separated into few stages in order to ensure the system can be completed smoothly. This preliminary report will provides the details of literature reviews, discussion about whole process of the project, results been done according to schedule and the future work of the project. In addition, the knowledge by doing this final year project is important because it can be used and applied in real working world after graduated.

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ABSTRAK

Tujuan projek tahun akhir ini adalah untuk membina suatu automatik garaj dua tingkat yang mampu menambahkan bilangan garaj disebabkan kekurangan bilangan garaj di kawasan bandar kebelakangan ini. Dengan menggunakan jumlah luas permukaan seperti garaj tradisional , sistem ini dapat menampung dua kereta pada masa yang sama. Platform garaj ini akan naik dan turun secara automatik apabila manghadapi situasi yang berbeza. Dengan melaksanakan sistem tersebut, sistem ini dapat menjimat masa pengguna apabila pengguna mencari tempat letak kereta. Tambahan pula, sistem ini senang digunakan oleh pengguna. Terdapat dua bahagian yang utama dalam sisem ini, bahagian pertama adalah bahagian sensor pengesan inframerah dan bahagian kedua adalah bahagian DC gear motor. Sensor pengesan inframerah digunakan untuk mengesan kereta yang letak di platform garaj dan kereta yang letak di kawasan menunggu. Manakala DC gear motor digunakan untuk menaik dan menurun platform garaj. Selain itu, keseluruhan sistem ini dibahagikan kepada beberapa bahagian supaya memastikan sistem ini dapat diselesaikan dengan lancar. Laporan awal akan menyediakan butir-butir ulasan sastera, perbincangan mengenai proses keseluruhan projek ini, keputusan mengikut jadual dan penambahbaikan projek ini. Di samping itu, pengetahuan yang pelajari dalam projek ini adalah penting kerana ia dapat digunakan dan diaplikasikan semasa bekerja pada masa depan.

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CHAPTER I

INTRODUCTION

1.1 Project Introduction

A parking lot, also known as car lot or car park, is a cleared area that is intended for parking vehicles. Usually, the term refers to a dedicated area that has been provided with a durable or semi-durable surface. In most countries where cars are the dominant mode of transportation, parking lots are a feature of every city and suburban area. Shopping malls, sports stadiums, mega churches and similar venues often feature parking lots of immense area.

Smart Car Park System is an innovative and brand-new underground parking solution specifically designed for the shortage of parking lots in the urban area or private housing area, even in condominium area. Smart Car Park System doubles the vehicle storages potential by extending the space where cars can be placed on top of each other. This means that the parking lot of Smart Parking System allows two cars parked at the same time with the same total surface as traditional parking lot. The design of Smart Parking System is a significant invention to the limited space nowadays.

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The following Figure 1.1 shows the expected design of the project:

Figure 1.1: Expected Design

Smart Car Park System is an user friendly car parking system. This model utilizes a two-vehicle lifting system which is capable of lifting any production vehicles, for example, the luxury saloons, 4x4's and SUV's.

Under such a system, the first coming driver will park his/her car on the upper parking platform. The car will be lifted up automatically when there is another car looking for parking lot at the waiting area later, hence an extra bottom parking platform can then be provided. On the other hand, when the driver want to move his/her car out from the parking platform later on, the driver just simply operates the controller so that the platform is either lifted up or lifted down, then the driver can get into the vehicle and drives away.

Smart Car Park System is an effective solution to overcome the vehicle parking problems. In short, this system provides a quick and easy parking system which is far more convenient than a traditional parking lot. The project has a significant contribution to the society that it is very cost efficient in terms of time and space.

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1.2 Project Objectives

a) To design a two-level of parking platforms to increase the number of car parking lots.
b) To detect the car which park in the parking platform by using the Infrared sensor (IR sensor).
c) To lift up and lift down the parking platform by using the DC gear motor.

1.3 Problem Statement

Nowadays, the shortage of car parking lots is an unavoidable problem to the people in the town area, business district or even in the housing estate. The drivers need to spend a lot of times to find a parking lot for their vehicles. As a result, some drivers may force to park their cars far away from the destination. Sometimes, some irresponsible drivers may even park their vehicles illegally on the street and consequently cause the severe traffic problem in urban areas.

With the implementation of the Smart Car Park System, the system can increase the number of car parking lots and therefore overcome the problem of shortage of car parking lots, save the time of drivers and reduce the traffic problem in the society.

1.4 Project Scopes

Smart Car Park System is designed with two-level of parking platforms. Smart Car Park System doubles the vehicle storages potential by extending the space where cars can be placed on top of each other. The infrared sensor is used to detect the car which park in either upper platform or bottom platform and another parking lot for in the waiting area. Other than that, the DC gear motor is used for the purpose to lift up or lift down the parking platform according to the requirement of the user.

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1.5 Summarize Methodology

Firstly, literature review, especially the researches on each of the components used in this project is done.

Next, the infrared sensor circuit is designed for the detection of the car which park in upper and bottom parking platforms and the car which entering the waiting area. On the other hand, the DC gear motor circuit is also designed for lifting up and lifting down the parking platform. The hardware and the circuits of the project are designed simultaneously in order to avoid any problem dealing with the position of the circuit placed.

In addition, the programming language of the PIC microcontroller 16F877A for the project is designed according to the requirement. The programming of the PIC microcontroller is combined with the infrared sensor circuit and the DC gear motor circuit.

After completing the hardware and software of the project, the last part of final year project is the finishing. The hardware and software are combined and the outcome for project is presented.

1.6 Structure of Report

In Chapter I, the project introduction, project objectives, problem statement, project scopes, summary of methodology and the structures of report are discussed.

Next, the literature review is discussed in Chapter II. In particular, the components used in the project are discussed in details in this chapter.

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The methodology of this project is summarized in a flow chart in Chapter III. The procedure for completing the project is discussed in details in this chapter.

Result and discussion are included in Chapter IV. Basically, the simulation results for the infrared sensor circuit and DC gear motor circuit are shown in this chapter. Furthermore, some discussions regarding to the infrared sensor circuit and DC gear motor circuit are done in this chapter too.

The last chapter in the report is conclusion and suggestion, a complete conclusion and appropriate suggestions for the project are discussed here. Furthermore, the further improvement of the project also given in this chapter.

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CHAPTER II

LITERATURE REVIEW

The same devices of different models are compared in literature review. The device that will be compared is microcontroller PIC 16F87XA family. Then, the most suitable model for this project is chosen. Moreover, the functions and features of the infrared sensor and DC gear motor are also studied in this chapter.

2.1 Microcontroller PIC 16F87XA

A microcontroller is an integrated chip that is often part of an embedded system. [4] The microcontroller includes a CPU, RAM, ROM, I/O ports, and timers like a standard computer, but because they are designed to execute only a single specific task to control a single system, they are much smaller and simplified so that they can include all the functions required on a single chip. [5]

A microcontroller differs from a microprocessor, which is a general-purpose chip that is used to create a multi-function computer or device and requires multiple chips to handle various tasks. A microcontroller is meant to be more self-contained and independent, and functions as a tiny, dedicated computer.

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The great advantage of microcontrollers, as opposed to using larger microprocessors, is that the parts-count and design costs of the item being controlled can be kept to a minimum. They are typically designed using CMOS (Complementary Metal Oxide Semiconductor) technology, an efficient fabrication technique that uses less power and is more immune to power spikes than other techniques.

There are also multiple architectures used, but the predominant architecture is CISC (Complex Instruction Set Computer), which allows the microcontroller to contain multiple control instructions that can be executed with a single macro instruction. Some use a RISC (Reduced Instruction Set Computer) architecture, which implements fewer instructions, but delivers greater simplicity and lower power consumption.

Early controllers were typically built from logic components and were usually quite large. Later, microprocessors were used, and controllers were able to fit onto a circuit board. Microcontrollers now place all of the needed components onto a single chip. Since they just control a single function, some complex devices contain multiple microprocessors.

Microcontrollers have become common in many areas, and can be found in home appliances, computer equipment, and instrumentation. They are often used in automobiles, and have many industrial uses as well, and have become a central part of industrial robotics. Since they are usually used to control a single process and execute simple instructions, microcontrollers do not require significant processing power.

A single microcontroller is very brilliant and useful. It is very easy to be assembled, programmed and also the price is very cheap. A single unit of microcontroller can be purchased at below RM 30.00 price. It is unlike some other Integrated Circuit that must be bought at a minimum order quantity such as 1000 units or 2000 units or else you will not be able to purchase it.

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The erasing time is almost unnoticeable because once new program are loaded into the PIC microcontroller, the old program will automatically be replaced with the new program immediately. [6]

By referring to Table 2.1, microcontroller contains the devices PIC 16F87XA family with specific information such as program memory, data SRAM, EPROM, I/O and CCP (PWM). Those devices are PIC 16F873A, PIC 16F874A, PIC 16F876A and PIC 16F877A. This information below is obtained from the data sheet Microcontroller PIC 16F877A.

Table 2.1: Microcontroller PIC 16F87XA [1]

Device	Program Memory		Data SRAM (Bytes)	EPROM (Bytes)	I/O	CCP (PWM)
	Bytes	#Single Word Instruction				
PIC 16F873A	7.2K	4096	192	128	22	2
PIC 16F874A	7.2K	4096	192	128	33	2
PIC 16F876A	14.3K	8192	368	256	22	2
PIC 16F877A	14.3K	8192	368	256	33	2

As shown in Table 2.1, PIC16F873A and PIC16F876A devices are available only in 28-pin packages, while PIC16F874A and PIC16F877A devices are available in 40-pin and 44-pin packages. The 28-pin devices have three I/O ports, while the 40/44-pin devices have five. As a result, PIC16F874A and PIC16F877A are more suitable for final year project.

The PIC16F873A and PIC16F874A have one-half of the total on-chip memory of the PIC16F876A and PIC16F877A. Microcontroller PIC16F873A and PIC16F874A have 7.2 K bytes while microcontroller PIC16F876A and PIC16F877A have 14.3 K bytes of program memory. In addition, the single word instruction of microcontroller

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PIC16F876A and PIC16F877A is 8192. It is more than the single word instruction of microcontroller PIC16F873A and PIC16F874A which is 4096. For program memory, the higher of bytes and the higher of single instruction word provide advantage on choosing the PIC microcontroller for final year project.

By comparing the data Static Random Access Memory (SRAM) of microcontroller PIC 16F87XA, as shown through Table 2.1 above, microcontroller PIC16F873A and PIC16F874A have 192 bytes while the microcontroller PIC16F876A and PIC16F877A have 368 bytes of data SRAM inside it. Any of the temporary variable storage that wrote in program is stored in the RAM. With using PIC16F876A and PIC16F877A microcontrollers, any external RAM is not needed due to the original 368 bytes RAM.

In addition, by comparing Erasable Programmable Read Only Memory (EPROM) of microcontroller PIC16F87XA, microcontroller PIC16F873A and PIC16F874A have 128 bytes while microcontroller PIC16F876A and PIC16F877A have 256 bytes of EPROM. EPROM is very useful to store information such as PIN Number, Serial Number and so on. EPROM is very important because all stored data can be retained when power supply turns off. RAM does not store data permanently. Data in RAM is not retained when power supply turns off.

After comparing those microcontrollers PIC 16F87XA, PIC 16F877A is chosen as the microcontroller chip to use in this project.

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