INTELLIGENT CAR PARKING SYSTEM

RAJANDRAN A/L MORTHUI

MAY 2007

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This Report Is Submitted In Partial Fulfillment Of Requirements For The Degree of Bachelor In Electrical Engineering (Power Electronics & Drive)

Fakulti Kejuruteraan Elektrik
Universiti Teknikal Malaysia Melaka

MAY 2007

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"I hereby declared that this report is a result of my own work except for the excerpts that have been cited clearly in the references."

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ACKNOWLEGDEMENT

First of all, I would like to take this opportunity to extend my deepest gratitude to all those who have assisted me in making this report successfully.

My sincere thanks to my respected and supportive supervisor, Puan Maaspaliza bt. Azri for her patience and guidance throughout the duration of this project.

I would also like to take this opportunity to thank all the UTeM lecturers for their support and guidance throughout the course of the project. Last but not least, I would like to thank all my friends and family who have given me spirit and support during my project.

Saying thank you is surely inadequate, yet most appropriate at this juncture. To the above mentioned, this report seals the author's gratitude to you all.

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"I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Power Electronics & Drive)."

Signature : .....

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ABSTRACT

This project is to design the car park control system using PLC as the programming tool. This project is chosen because it exposes to few fields of studies for example PLC. Furthermore this project also is very practically feasible to construct, practically applicable and useful and has the potential to be marketed in addition it is different from other existing similar in the market. The PLC was chosen since it gives more structured approach rather than conventional way. This project uses the PLC to control the parking area. This simple car park control system allows a certain number of cars parking space. Every time a car comes in, the PLC will add one and subtract one when a car goes out. When a determined number of cars are registered, the car park full sign will be lighted to inform oncoming vehicles not to enter. Basically this system allows a car when there is a space in the car park and show sign (light) to inform when the car park is full. The final product of this project is a fully functional hardware that achieves the initial objectives of this project and at the same time illustrates the practical feasibility of our idea. However since the main objectives is only to illustrate the practical feasibility of our idea, therefore the specification and quality of certain components have been compromised to reduce the project cost. Therefore in real life application, the specifications of certain components have to be changed for optimum and satisfactory performance.

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ABSTRAK

Projek ini adalah merekabentuk sistem letak kenderaan dengan menggunakan pengaturcaraan PLC. Projek ini dipilih kerana untuk mendedahkan tentang bidang-bidang pelajaran seperti PLC. Dengan ini, projek ini juga boleh dilaksanakan secara praktikal. Ia juga beraplikasi dan sangat berguna dimana ia mempunyai potensi di pasaran. Tambahan lagi, ia berbeza dari sistem yang sedia ada di pasaran kini. Pengaturcaraan PLC dipilih kerana ia memberi struktur yang menggalakkan berbanding dengan sistem lama. Projek ini menggunakan sistem pengaturcaraan PLC untuk mengawal keseluruhan sistem letak kenderaan ini. Sistem ini juga membenarkan kenderaan yang terhad mengikut jumlah kenderaan yang ditetapkan di dalam PLC. Setiap kali kenderaan masuk ke dalam kawasan letak kenderaan, PLC akan menokok sekali manakala apabila kenderaan keluar ia akan menolak sekali. Apabila jumlah kenderaan penuh dalam kawasan letak kenderaan, maka ia akan memaparkan 'FULL'. Ini memudahkan pemandu lain bahawa kawasan letak kenderaan tersebut tidak ada lagi tempat kosong untuk meletakkan kenderaan mereka. Hasil produk ini dijangka berfungsi dengan baik untuk mencapai objektif projek ini. Walaubagaimanapun untuk penggunaan seharian, kita perlu menukar beberapa komponen bagi keselesaan sepenuhnya.

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Appendix A	The PLC Model CQM1H, CPU Type-CPU21
Appendix B	Miniature Basic Switch
Appendix C	DM74LS47 BCD to 7-Segment Decoder/Driver with Open - Collector Outputs
Appendix D	Intelligent Car Parking System Ladder Diagram

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CHAPTER 1

INTRODUCTION

1.0 Introduction

The aim of this final project is to design the car park control using the PLC to control the parking area. The automated car park control system using PLC as programming tool. PLC programming tool is chosen since it gives more structured approach rather than conventional way. The ability of the PLC system is to perform work automatically with minimum or without human supervision or intervention. The proposed automatic car park control system will help to reduce the cost in terms of requirement such as job opportunity. Beside that, this system also is faster flexible and appropriately to market needs.

The proposed automated car park control system allows a number of cars to be parked. The amount cars, which are allowed to park, will be decided or fixed according to customer requirement. For an example, the parking lot requirements in shopping complex are more than the public transportation area. In this case the amount of cars can be control by the proposed system.

The proposed car park control system works, whenever a car comes in and goes out. When a car enters the car parking lot, a sensor will detect the incoming car and send the signal to PLC. After that, PLC will detect the signal and the counter, which is related to PLC, will add in the incoming car. At the same time it will allow the car to enter the parking lot. The same process will be repeated when a car goes out of the parking lot. The same process will be repeated when a car goes out from

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the parking lot. But here the counter will subtract the amount of outgoing car from the total. Beside that, when the parking lot become full and cannot receive anymore car, the counter will display the word 'FULL' to inform the drivers that there is no more empty parking space.

1.1 Project Objectives

The objective of the project proposal:

1. To develop the user friendly car park system by PLC such as when the parking lot is full the word 'FULL' be displayed. So the car users will not waste their time to find a free parking lot.
2. To develop the automated car park system which the system reduces the manpower.

1.2 Problem statements

The problem statements are:

1. The current car park system is not user friendly.
2. The car park system can function automatically because there is a sensor to detect when cars approach and do not need a manpower.
3. It is very difficult when there is no counter display when a car comes in and out.
4. Since some car parking system doesn't equipped with programmable signage to inform whether the parking is full or not, the car users will not waste their time and petrol consumption to find a free parking lot.

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1.3 Scope Project

The scopes of the car park control by PLC are:

1. Using CX-programmer V6.0 software to write the program (ladder diagram)

2. Electronic components were used at the end of this project.

3. 7-segment displays were used in the project design and application.

4. Electronic counter were used in the project design and application.

5. Indicator for car park "FULL" sign was designed and built at the end of the project.

1.4 Review Thesis

The thesis was divided into six chapters: They are:

- Chapter 1: Project introduction.
- Chapter2: Explain the literature review and the project methodology.
- Chapter 3: Project design, the hardware development and electrical wiring are be explained in this chapter.
- Chapter 4: Software development, the I/O list, flow chart and ladder diagram are show in this chapter.
- Chapter 5: Project result and features the project.
- Chapter 6: Conclusion.

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CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter briefly reviews previous work and theory related to the proposed project. It also reviews selected tools used in the project. The review of parking system product is based on AMTEL.

2.1 Review of parking system product - AMTEL

AMTEL is a one of parking system product. AMTEL offers complete solutions for parking and revenue control that can work independently or can integrate seamlessly with Access Control, Visitor Processing and other systems required in any medium to large complex. It offer multiple solutions for handling "Monthly" (Regular) as well as "Transient" (short term) parking patrons and with TCP/IP connectivity for all components, integration with existing LAN/WAN infrastructure is assured. The AMTEL parking system consists of Ticket dispenser & entry lane control tower, Proximity Card Readers, RF-ID Readers, Barrier gates, Lot 'FULL' display and Parking & revenue control software. [1]

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2.1.1 Ticket dispenser & entry lane control tower

Figure 2.1.1 Ticket dispenser

The Figure 2.1.1 shows ticket dispenser. Ticket dispenser tower is designed to provide all the features that maybe needed for control at the entrance. It can accommodate any combination of the following devices: [1]

i) Ticket Dispenser can print a ticket with the data, time, lane, ticket etc. in regular print as well as bar-code formats. This ticket can be issued automatically or as soon as the flashing "Touch-for-ticket" button is used.
ii) Card Reader can read the access card of monthly parkers. This card reader can be a separate unit that is mounted on the front of the Tower or can be an embedded AM Smart reader that offers long read range (about 12" from the front surface of the tower) and is also usable as a read / write device with the "Prepaid" (Debit) cards used by some transient parkers.
iii) Back-lit LCD Display a large character, 4line LCD display provides user instructions in up to two languages at every step of the transaction.
iv) Optional Voice Instructions a separate voice module is available that will offer instructions in audio. Surveys show that some parkers prefer voice instructions over instructions provided on the LCD display.
v) Credit Card Reader shall accept any major credit card.
vi) Intercom most towers include one of the following two forms of intercoms:
    1. Hardwired Intercom station that is connected to a master station located nearby in the building.

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2. Telephone Intercom that automatically dials a number and gets assistance from the person on that number. This is ideal where the Help is coming from a remote location or from a guard who is carrying a cell-phone while on roving patron on the premises.

vii) Interlocks system offers many different interlocks for proper operation. Some of these include:

1. Card/Ticket/CC interlocks is assures that the parker can only use one of the access modes available to him. So a card user cannot take a ticket and so on.
2. Vehicle present interlocks none of the control options will be active unless there is a vehicle present on the arming loop in front of the tower.
3. Ticket Such-back Interlock ticket is issued but not retrieved, the system will automatically suck-back this ticket and reset the gate system for the next parker.
4. Specialized Interlocks depending on the application, different interlock systems can be programmed in the controller.

viii) TCP/IP Controller is heart of the system is this high-power controller that monitors all the activity in the lane and provides the interaction to the central PC via a LAN/WAN interconnection that is standard in most locations (the conventional RS485 communication option is also available).

2.1.2 Proximity card readers and cards by AMTEL

Figure 2.1.2 Proximity card readers and cards by AMTEL

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The Figure 2.1.2 shows proximity card readers and cards by AMTEL. IDC80 is a very thin, truly credit card thickness (0.8mm) of contact less proximity card and it has very flat surface to apply any photo ID on both sides of card. IDC80 is pre-programmed at the factory with AMTEL's unique encryption code and it has very flexible data format to meet any customer's requirement and any OEM format up to 64 bit ID is also available. It can be supplied without code and customer can write their unique code by using STAR PGM1000 Programming Devices with Programming software. IDC80 has 2 punch hole marks on the back side and can also be slot punched either vertically or horizontally and also available with a Magnetic Stripe and smart chip for use with other systems. [1]

2.1.3 Proximity card readers and cards by HID

Figure 2.1.3 Proximity card readers and cards by HID

The Figure 2.1.3 shows Proximity card readers and cards by HID. HID offers a broad range of readers with read range from 2" to 24". Cards are available for standard applications and for Photo-ID applications. Compatible key tags are also available. Proximity cards are preferred because they are easy to use (many times you don't even need to take them out of the wallet or purse), vandal-resistant, secure, reliable, long life and extremely user friendly. They can individually coded and canceled, and can be used with practically any access control panel that will accept a Wiegand or RS232 signal. Uses passive (no battery) cards that are almost as thin as a typical credit card. [1]

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2.1.4 Proximity card readers and cards - INDALA

Figure 2.1.4 Proximity card readers and cards - INDALA

The Figure 2.1.4 shows Proximity card readers and cards - INDALA. Indala provides a full array of card readers (with varying read ranges) and a complete selection of cards and tags. Cards are available in standard format or in the Direct Print format for high volume Photo-ID badging applications. Key chain mountable tags are also available. Proximity Readers and Cards are preferred because they are extremely User Friendly (many times you don't even need to take them out of the wallet or purse), vandal-resistant, secure and reliable. They can be individually coded and canceled, and can be used with most access control panels. Note: Read range shown below with photos is achievable with ASC-121T hard plastic lifetime cards. Range with other cards and tags will be lower. [1]

2.1.5 RF-ID readers

Figure 2.1.5 RF-ID readers

The Figure 2.1.5 shows RF-ID readers. An RFID system consists of two major components - a reader and a transponder (or tag). They work together to provide a non-contact solution to uniquely identify people, objects or vehicles. RFID

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