CAR PARK GATE CONTROL SYSTEM USING PIC MICROCONTROLLER

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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 (Control, Instrumentation, and Automation)

Signature :……

Supervisor's name :……

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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."

Signature :……

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Date : ……

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ABSTRACT

This project is to present a real time car park control system using Peripheral Interface Controller (PIC) microcontroller as controller. The system allowed car to enter or exit from the parking lot. The security design is fully automated system and easy to operate and troubleshoot. This car park system allows a certain number of car parking lots. When a car comes in, the sensor will detect and close the contact. Then, the sensor will gives signal to motor or relay to run. The motor will generate current to open the gate and allowed car enters the parking lots. After the car in, the gate will automatically close. Lastly, the counter will start count and display the number of car lots available. Although, the led will display if the parking lots are full and not allow any car in. The same process is applied to car out area (exit). The counter will decrease after there is a car move out of area.

ABSTRAK

Project ini menggantikan satu sistem kawalan tempat letak kereta menggunakan pengawal mikro PIC sebagai pengawal Sistem ini digunakan untuk membenarkan kereta untuk masuk atau keluar dari tempat letak kereta. Rekabentuk keselamatan ini adalah sistem automatik sepenuhnya dan senang untuk beroperasi dan baikpulih sistem. Sistem tempat letak kereta ini membenarkan jumlah lot kereta yang ditetapkan. Apabila sebuah kereta masuk, pengesan akan mengesan dan menutup kontak. Kemudian, pengesan akan menghantar isyarat kepada motor ataupun relay untuk berkerja. Motor ini akan menghasilkan arus untuk membuka palang supaya kereta dibenarkan masuk kedalam tempat letak kereta. Selepas kereta masuk, palang akan tertutup secara automatik. Akhir sekali, pembilang akan mula membilang dan memaparkan jumlah tempat letak kereta yang masih ada. Walau bagaimanapun, led akan menyala sekiranya tempat letak penuh dan tidak akan membenarkan kereta lain masuk kedalam tempat letak kereta. Proses yang sama digunakan untuk keluar kawasan. Pembilang akan menolak satu selepas terdapat sebuah kereta meninggalkan kawasan.

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PIC	PERIPHERAL INTERFACE CONTROLLER
PLC	PROGRAMMABLE LOGIC CONTROLLER

CHAPTER 1

INTRODUCTION

1.0 Introduction

The aim of this project is to present a real time car park control system using PIC to control the parking area. The automated car park control system using PIC as programming tool to run the whole operation. The automatic car park control system will help to reduce the cost in terms of requirement such as job opportunity and increase security. Moreover, this system also is faster flexible and approximately to market needs.

The purposed automated car park control system allows a number of cars to be parked. The amount cars, which are authorized to park, will be decided according to customer requirement. For an example, the parking lot requirements in private area such as apartments are fixed to authorize only. The amount of cars can be control by the proposed system.

The car park control system works when there is a car comes in or out. When a car enters the parking area, a sensor will detect the incoming car and send signal to PIC. After that, PIC will receive the signal and gives order to the counter, which is related to PIC to increase the number of cars display. Meanwhile, the motor will energized and allow the car to enter the parking lot. The same process will be used when a car goes out of the parking area. But, for this step, the counter will decrease the number of cars display. Although, when the parking lot become full and cannot receive anymore car, the led will display as the lot is full to inform the customers that there is no more empty space lot.

1.1 Project Objectives

The objectives of the project proposal;

1. To develop a model of car park control system using PIC controller.
2. To interface the model with computer programmer in order to get signal for a real time car park control system.

1.2 Problem Statements

The problem statements are;

1. The car park control system can function automatically because there is sensor to detect when cars authorize and can reduce manpower.
2. It is easier to know if the car park full or not through a counter display at the same time.
3. The current car park system is not user friendly.

1.3 Project Scope

The scope of work for this project is divided into two parts; the hardware and the software are;

1. Using MicroC software to write the program for PIC16F877A
2. Electronic components were used at the end of this project.
3. Seven segments are used as counter in the project design and application.
4. The mechanical part involves the motor drive system, the sensor layout, and FULL display

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter will discuss about the overall theories and works of the project. It also reviews selected tools used in the project. The full understanding of the theory is very important as a guideline.

2.1 Review of the car park system product-AMTEL

AMTEL is one of parking system product. AMTEL offers complete solutions for parking and revenue control that can work integrate with Access Control, Visitor Processing and other system 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 and exit lane, Proximity card reader, RFID readers, Barrier gates, ‘LOT FULL’ display and Parking & revenue control software.

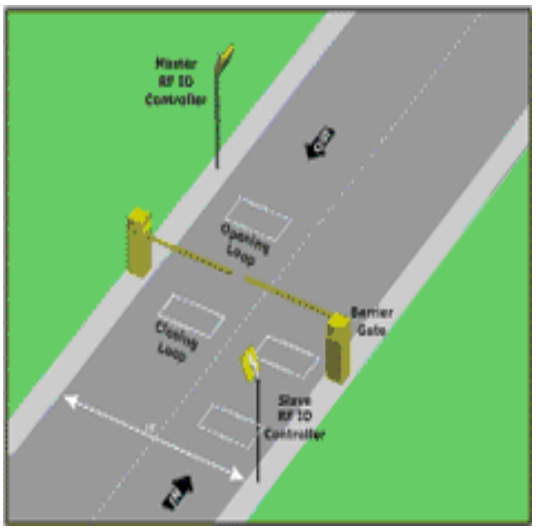

Figure 2.1: The car park system

2.1.1 Ticket Dispenser and entry lane control tower.

Ticket dispenser tower is designed to provide all the features that maybe needed for control the lane.

1. 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.
2. Card reader can read the access card of monthly parker.
3. Back-lit LCD Display a large character, 4 line LCD display provides user instructions in up to two languages at every step of the transaction.
4. Intercom most tower include one of the following two forms of intercoms;
    a. Hardwired Intercom station that is connected to a master station located nearby in the building.
    b. Telephone Intercom that automatically dials a number and gets assistance from the person on that number. This is idea where the Help is coming from a remote location or form a guard who is carrying a cell-phone while on roving patron on the premises.

2.1.2 RF-ID reader

An RFID system consists of two major components- a reader and a tag. They work together to provide a non-contact solution to uniquely identify people, objects or vehicles. RFID does not require line of sight between the tag and the reader and works effectively in dirty environment.

The reader consists of an antenna, a RF receiver and processing circuitry. The antenna couples the electromagnetic energy transmitted by the Tag to the Reader. The processing circuitry of the reader decodes the received information and sends the data to a Host Computer or a control Device/ panel. The reader reads ranges could be programmed using dedicated software.

2.1.3 Barrier gates

AMTEL provides an automatically Barrier Gates that are compact, reliable and versatile and perfect for any application with traffic control, entry control or security..

Figure 2.2: Barrier gates

2.1.4 Lot Full system

The entry lane and exit lane consist a lot “FULL”. Each tower is capable of tracking all the vehicles passing through their lane. This data is passed on the Capacity Control Program in the server PC which controls Lot Full systems.

AMTEL has four different types of Lot Full Control. The types are Lot Full count for Monthly patrons only, Lot Full count for Transient patrons, Lot Full count for total garage or lot, and Lot Full count for a “specific” customer.

The Lot Full count for Monthly patrons: the system tracks only the monthly cardholders and turns off entry for the cardholders if their capacity is used up. Lot Full count for Transient patrons: the most common approach, where a certain capacity is reserved for transient patrons and the Lot Full sigh in activated when this capacity reaches zero.

Lot Full count for total garage or lot: under this system, the total capacity of the lot/garage is monitored. Lot Full count for a “specific” customer: this system only has fixed number of customers. It will not allow next customer.

2.2 Microcontroller

Microcontroller had beginnings in the development of technology of the integrated circuits. This development has made it possible to store hundreds of thousands of transistor into one chip. These integrated circuits contained both processor and peripherals. This chip is called as microcomputer or later it would be known as microcontroller. It includes input and output ports, memory, timer and etc.

The main reason to use microcontroller is the cost and easy to get. Even though it has various applications, the price is more cheaply compared to complex circuit such as IC MC14528B.

The second reason is its ability to re-program. User can program microcontroller to apply in their project. They are also can simply change the program they made.

Other than that, microcontroller also can operate logic and mathematic. This is important operation in any project development. It can use for logic program to convert analog input to digital (ADC) signal.

Lastly is its ability to programmed in various type of software language such as C++, C, basic pro, assembly language, and any other language that make this microcontroller known as user friendly.

There is a lot of company that produced microcontroller such as Atmel (Attiny II), Microchip (PIC16CR509A), Motorola (68HC705KJI) and etc.

The controller will works as the brain of system that will do all the logic for system. It will interpret the output of sensor and control the drive system. All these tasks will be complete by programming the controller. In this project, PIC16F877A microcontroller will be use.

2.2.1 PIC16F877A

Microchip technology has series of microcontroller called PIC in purpose of better application and low cost. PIC usually assumed as an interface control between hardware and software. With this device, circuit efficiency problem can easily solve compared to its application that commonly easier to be influenced by temperature and noise factor.

There are two types of PIC series, flash (F) and eeprom *(*C). The series such as 12C5XX, 16C62X, 16F8XX, and the latest is 18CXXX. Each type has various function and criteria such as number of input and output, memory, and etc.

PIC16F877A is a microcontroller that used in car park control system. PIC16F877A unit is 8-bit devices composed of standard on-chip peripherals including 368 bytes of Data Memory (Ram), 256 bytes of Eeprom Data Memory, 14-bit wide instruction words and also have 15 interrupt sources such as RB0/INT, and etc.

The peripheral features including Timer0: 8-bit timer/ counter with 8-bit prescaler, Timer1: 16-bit timer/ counter with prescaler, can be incremented during Sleep via external crystal/clock, Timer2: 8-bit timer/ counter with 8-bit period register, prescaler and postcaler, Two capture, compare and PWM modules: capture is 16-bit, max. resolution is 12.5 ns, compare is 16-bit, max. resolution is 200ns and PWM max resolution is 10-bit. Other peripherals are Synchronous Serial Port (SSP) with master mode and master/ slave, Universal Synchronous Asynchronous Receiver Transmitter (USART/ SCI) with 9-bit address detection, Parallel Slave Port (PSP): 8-bits wide with external RD, WR, and CS controls, and Brown-out detection circuitry for Brown-out Reset (BOR).

The analog features has 10-bit, up to 8-channel Analog-to-digital Converter (ADC), Brown-out Reset (BOR), Analog Comparator module; two analog comparators, Programmable on-chip voltage reference (VREF) module, and Programmable input multiplexing from device inputs and internal voltage reference. Meanwhile the comparator outputs are externally accessible.

The special features for this microcontroller are its wide operating voltage range; for commercial and industrial, 2.0V to 5.0V, low power consumption, 4MHz crystal and also this device comes in PDIP.

This microcontroller can be re-program or erase the program anytime. The user can change or modify the program if there is error occur or adding other devices in the circuit.

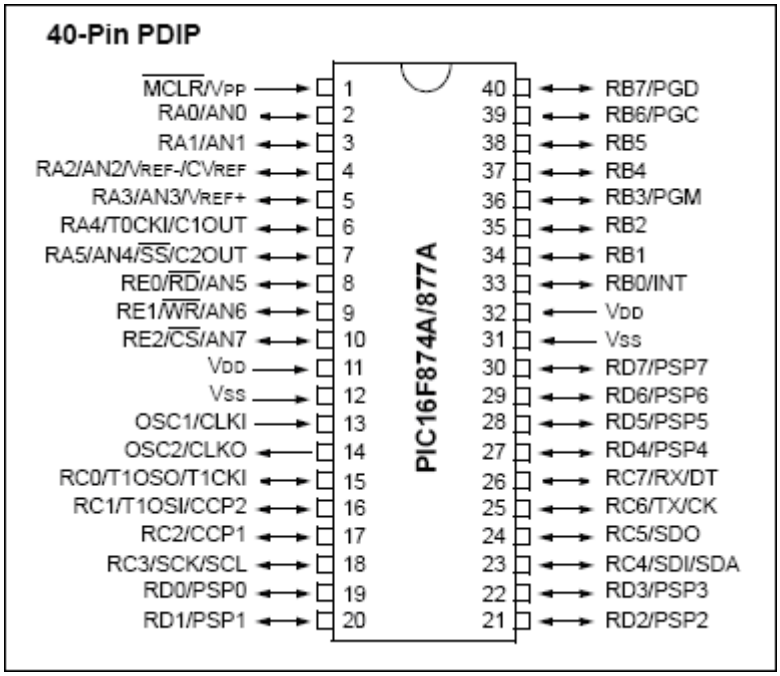

Figure 2.3: PIC16F877A Pin out Diagram

2.2.1.1 Memory

There are three memory blocks in PIC16F877A. The blocks are the program memory, the data memory, and PCL and PCLATH. Each block has its own buses, so that access to each block can occur during the same oscillator cycle.