PARKING COUNTER WITH AUTOMATIC CROSSBAR AND LED DISPLAY

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Sesi Pengajian : 2007/2008

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I dedicate this to my parents, family members, friends and all which helping a lot.

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ABSTRAK

Projek ini bertujuan untuk membina satu sistem untuk mengira bilangan petak letak tempat kenderaan yang masih kosong. Sistem ini akan mengira bilangan setiap tempat kenderaan yang masih tinggal selepas kenderaan lain memasuki dan keluar daripada kawasan letak kenderaan tersebut. Untuk memudahkan pemandu, satu paparan akan diletakkan di bahagian pintu masuk. Paparan ini akan memaparkan bilangan petak letak kenderaan yang masih tinggal. Di setiap pintu masuk dan keluar kawasan tempat kenderaan tersebut akan diletakkan satu palang automatik. Di pintu masuk, palang akan dinaikkan secara automatik sekiranya ada kenderaan yang ingin masuk. Untuk menaikkan palang secara automatik, satu pengesan (sensor) akan diletakkan sebelum palang tersebut untuk mengesan kehadiran kereta yang masuk. Pengesan yang akan digunakan ialah pengesan infra-merah. Satu lagi pengesan iaitu pengesan berat (load cell) akan digunakan untuk menutup kembali palang selepas kenderaan melepasi palang tersebut. Prinsip kerja yang sama juga digunakan untuk bahagian pintu keluar. Sistem ini akan dikawal oleh Omron PLC di mana bilangan kereta yang keluar dan masuk akan dikira oleh PLC tersebut. Proses bilangan kenderaan ini akan berterusan sehinggalah kawasan tempat letak kenderaan tersebut penuh. Jika penuh, palang di pintu masuk tidak akan terbuka walaupun ada kenderaan yang ingin masuk. Paparan pula akan memaparkan perkataan "FULL" bertujuan untuk memaklumkan kepada pemandu lain bahawa kawasan letak kenderaan tersebut telah penuh.

ABSTRACT

This project aim is to build a system that will count the parking spaces remaining in a parking lot. This system will count each of the remaining parking spaces that available each after the vehicles is come in and go out from that parking lot. To make easier to the driver, a display will be located at the enter of the parking space. This display will show the total of the empty parking bay remaining. Each of the in and out from the parking, there will be located a crossbar. At the enter, the crossbar will open automatically when there are a vehicle want to come in. To open the crossbar, a sensor will be attached before the crossbar to sense each vehicle that wants to come in. the sensor that will be use in this system is infra-red sensor. Another sensor will be use to close the crossbar after the vehicle come in. The sensor that will be use is load-cell sensor. The same working principle goes for the exit of the parking lot. This system will be controlled by Omron PLC where the calculation of the vehicles that are come in and come out will be calculated by that PLC. The calculation process continues until the parking is full. At that time, the crossbar at the way in will not open to allow other drivers to come in. The display will shows "FULL" sign to mention to the other drivers that the parking is full.

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LIST OF ABBREVIATION

AC	-	Alternating Current
ADD	-	Addition
BCD	-	Binary Coded Decimal
C	-	Capacitance
CNT	-	Counter
CNTR	-	Reversible Counter
DC	-	Direct Current
DIFD	-	Differentiate down
DIFU	-	Differentiate up
f	-	Frequency
F	-	Farad (Capacitance unit)
Hz	-	Hertz (frequency unit)
IC	-	Integrated Circuit
IR	-	Infrared
LED	-	Light Emitting Diode
NC	-	Normally Close
NO	-	Normally Open
PIC	-	Peripheral Interface Control / Programmable Integrated Circuit
PLC	-	Programmable Logic Controller
PV	-	Present Value
R	-	Resistor
SUB	-	Subtraction
V	-	Voltage
Ω	-	Ohm (Resistance)

LIST OF APPENDIX

CHAPTER 1

INTRODUCTION

In this chapter, the overview of the project will be presented. This will include the simple introduction to the project, the project significance and the perspective of the project. Besides that, the objective of the project will be explained in this chapter. The problem of statement will discuss about the problem that will be overcome by this project soon. The scope and the methodology of the project also will be discussed in this chapter.

1.1. Introduction to project

This project is about to count the empty parking spaces remaining in a parking lot. From the Figure 1.1, each of the cars that entering the parking lot will be sensed by the infra-red sensor and the data will be sent to the PLC system and will be calculated. At the way in of the parking lot also will be located a crossbar as a barrier. At the same time the sensor sense the cars, the crossbar also will open to allow the driver to come in. This same process goes with the way out of the parking lot. Each of the cars that come out from the parking lot also will be sense by the infra-red sensor at that area and the data will be sent to the PLC to be count. A display will be located at the way in to shows to the incoming drivers regarding the

remaining parking spaces that available. If the parking is full, the PLC system will not allow the crossbar to open and the display will show the "FULL" sign to tell the drivers outside that the parking is already is full.
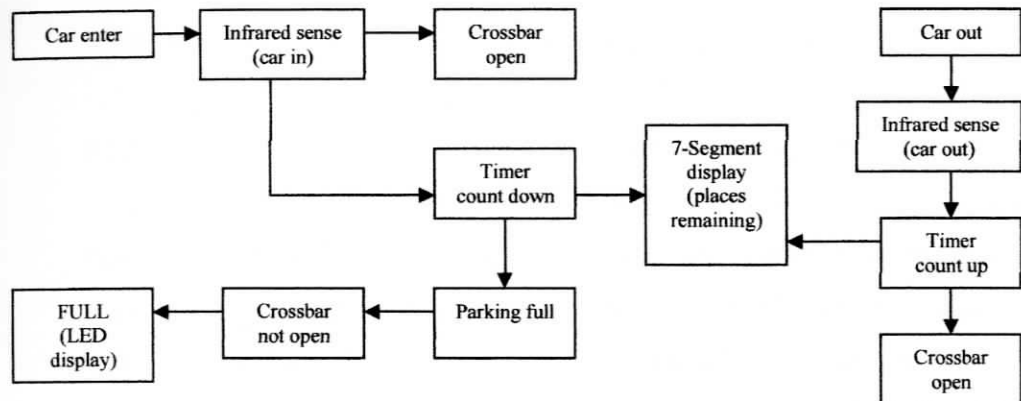
Figure 1.1 : Block diagram of the system

1.2. Objectives of project

The objectives of the project will be achieved when this project is finish and working successfully. The objectives are:

i. To count the remaining parking spaces

Each of the cars that want to enter the parking lot, the car will be sensed by the infra red sensor that are located near the crossbar. Then the data will be sent to the PLC system for internal calculation. This data will be subtracted with the total amount of empty parking lots that are still in the remaining. An output will be displayed at the way enter by using 7 segment display. The calculation of this display is done by the switches that are located at the ground and the infrared sensor.

The same way goes with the way out of the parking lot. Each car that is come out from the parking lot will be sensed by the nearby infra-red sensor. Then the data will be sent to the PLC program and will be calculated. The data is added with the total amount of the remaining empty parking spaces that are found in the parking lot. Then the output will be displayed on the 7 segment display to tell other driver how much parking is available now.

ii. To help the drivers to look for the parking and remaining parking spaces

For now, there are some difficulties in looking for the empty parking spaces. This system is completed with a 7 segment display that will show the amount of the parking space that is still available. Each time the car is enter and come out form the parking lot, the system will count the amount of the total empty parking space that available. This calculation is done by the PLC program as the heart of the system. The output data will be displayed on the 7 segment display. When the parking is full, the sign "FULL" will be displayed on the LED display. By this working principle, it will help the drivers in looking for the empty parking space. They will no need to wasting their time in looking for the parking for their car.

iii. Understanding how the sensors, PLC and counter working and related with each other.

This system will use some sensors. The sensors are infra-red sensor and load-cell sensor (switch) and both sensors will be located at each of the way in and way out of the parking lot. The calculation system is controlled bye the Omron PLC system and the 7 segment display will be count by the counter circuit. Each time the sensor sense the car either at the way in or out, the output from the sensor will become the input of the PLC program. So to make the signal can be related to each other, the output from the sensors will be connected parallel to the PLC toggle switch. The output from the PLC will be connected to the forward reverse motor circuit. At this connection, relays

will be used and the signal from the PLC is used to energize the relays and make the relays as the switch for the output circuits.

iv. Understanding in how to work with the counter circuit.

In this project, a counter circuit will be used to count each car that entering and go out from the parking lot. To count this operation, a switch will be located at the both entering area and exit area. These switches are act as the inputs for the counter circuit. The widely counter is used in this circuit are 74247 and 74192.

1.3. Problem statement

For nowadays, there are not much of this system is applied at the parking lot especially for the free parking lot. For the bigger parking lot such as at the stadium or the supermarket, majority of them is not completed with this system. The ordinary parking lot is still use the manual man power to tell that the parking is full. This will become a problem for the drivers that are looking for the parking space. For looking the free space of parking, they have to sacrifice their time for finding one. This will annoy the drivers that in the important business. This is happen because most of the parking lot is do not has a mechanism in telling the drivers how much the empty parking is available.

This problem is always happen at multilevel parking lot. The drivers have to drive through each level for finding the parking. This condition will waste a lot of time. If the drivers knew there is no parking at on level, they will find another parking at another level.

This problem is also happen at the single level of parking lot. Usually if the parking is full, there are no sign that will tell the drivers that there are no parking spaces that are available. For some of the parking lot, there will be a worker that will manually locate the full sign at the way in of the parking lot. Sometimes, the

worker will not alert that the parking is already full. If there are no signs, the driver will come in to look for the empty parking although the parking is actually full.

The problem is also happen at the parking at the shopping complex and other parking lot such as at the private parking lot or owned by a company. To overcome these problems, a system will be build to count the remaining empty parking and tell the drivers outside the parking area.
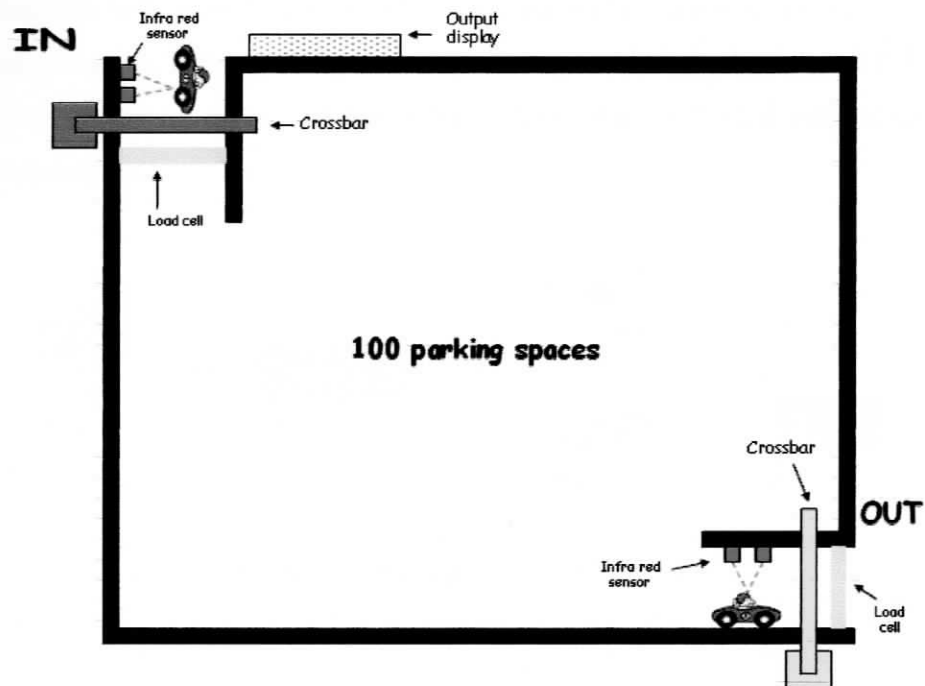
1.4. Scope of work

Figure 1.2 : Layout of the system

According to the Figure 1.2, assume that the parking lot will be 100 of parking spaces. This system is suitable located at the large usage parking spaces such as at the supermarket, shopping complex and the stadium. The infra red sensors will be

attached to the both gates to open the crossbar while the load cell of each gate will close the crossbar. The crossbar will be controlled by the forward reverse DC motor.

Each time a car enters, the infrared sensor will sense the car and send the signal to the PLC. Then the PLC will count the parking spaces remaining and the counter will minus 1 number from the remaining number. The output then will be displayed at the 7 segment display. At the same time, the crossbar will open to allow the car to come in. The same procedure goes for the exit way. Each time a car drives out, the infrared sensor will sense it and transmit the signal to the PLC. Then the PLC will count the parking spaces remaining and the counter will add 1 to the remaining number and will displayed it on the 7 segment display. At the same time, the crossbar also will open. The load cell is attached to close the cross bar each time the car has passed it. If the parking reach maximum number, in this case will be 100, the crossbar will not open and output for "FULL" sign will be displayed on the 7 segment display.
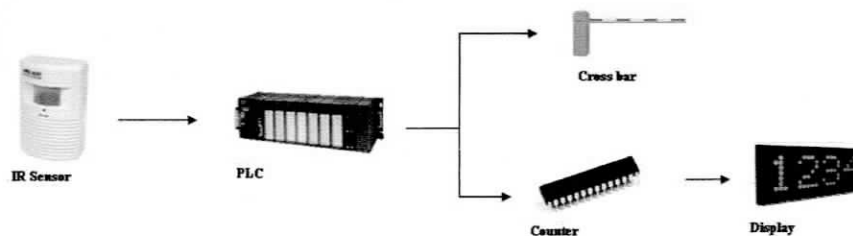

Figure 1.3 : System at way in and out
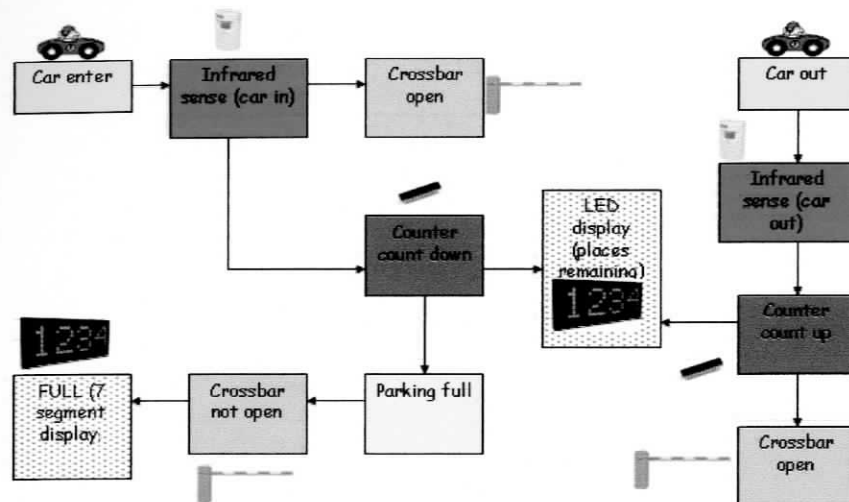
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The Figure 1.4 below shows the flow diagram in how the system is working.

Figure 1.4 : System working principle

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