

PARKING CONTROL SYSTEM USING PLC

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This report is submitted in partial fulfillment of the requirements for the award of
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*Dedicated to my parents, Mat Zin b Ahmad and Rahmah bt Md Taib ,my siblings, and
all my beloved persons.*

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ABSTRACT

The purpose of this project is to develop a parking system that can solve the problems regarding the availability of parking space with high efficiency through application of Programmable Logic Controller (PLC). The principle objective of this project was to develop a prototype which is fully functional, usable and can sufficiently accurate follow the available number of free space .This parking system will be able to detect and count the incoming and outgoing vehicles (cars/vans) at a parking space and at the same time each of parking lot will provided some indicators to indicate the availability of the parking area. In addition, this research also includes the mechanism on how the FULL indicator will be triggered by a chosen metal detector. As an early indication for available parking space, a screen will be posted in front of the Entrance/Exit gate as one of the way to visualize and information medium to drivers. This screen will be used Visual Basic software to design the required output that should be display on the screen and the display will be updated time to time depend on the availability of parking space. Furthermore, the drivers therefore can decide which parking lot area that he will be able to park. Once the vehicle is parked, a sensor that place over the parking lot will mark the parking lot is occupied, and activate the suitable indicator.

ABSTRAK

Tujuan projek ini itu adalah bagi membangunkan satu sistem tempat letak kereta yang dapat menyelesaikan masalah-masalah mengenai kekosongan tempat letak kereta dengan kecekapan yang lebih tinggi melalui Programmable Logic Controller (PLC). Objektif projek ini adalah untuk membina sebuah prototaip yang berfungsi sepenuhnya, dapat digunakan dan tepat mengikut jumlah kekosongan .Sistem tempat letak kereta ini mampu mengesan dan mengira kenderaan keluar masuk pada tempat letak kereta dan pada masa yang sama juga, setiap tempat letak kenderaan akan menyediakan beberapa penunjuk untuk menunjukkan kekosongan kawasan tempat letak. Tambahan lagi, penyelidikan ini juga termasuk mekanisme tentang bagaimana penunjuk '*FULL*' itu akan diaktifkan oleh satu pengesan logam yang dipilih. Sebagai satu penunjuk awal untuk kekosongan tempat letak kenderaan, sebuah skrin akan diletakkan di depan *Entrance / Exit* sebagai satu cara untuk memvisualkan dan menjadi perantara maklumat untuk pemandu-pemandu. Skrin ini akan menggunakan asas visual untuk mereka keluaran yang dikehendaki dan dipaparkan melalui skrin. Paparan itu akan dikemaskinikan ke semasa bergantung kepada kekesongan tempat letak kereta itu. Tambahan pula, pemandu-pemandu boleh memilih kawasan tempat letak kenderaan yang disukai. Apabila kenderaan diparkir di salah satu tempat letak kenderaan, sensor yang terdapat di situ mengenai tempat letak kereta itu akan mengaktifkan penunjuk sesuai sebagai menandakan tempat letak kereta digunakan.

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LIST OF ABBREVIATION

PLC	-	Programmable Logic Controller
ROM	-	Read-Only-Memory
RAM	-	Random-Access-Memory
EPROM	-	Erasable and Programmable Read-Only-Memory
EEPROM	-	Electrically Erasable and Programmable Read-Only-Memory
CPU	-	Central Processing Unit
PC	-	Personal Computer

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CHAPTER I

INTRODUCTION

1.1 Project Introduction

The conventional car park system normally just have some signboard of direction of vehicles need to follow. It does not have any display panel and it cannot show the total vacancy of parking lot in the parking area. The drivers has take risk to seek either there are any vacancy or not. By developing a parking system that includes the availability of vacancy display can help the drivers as a user to shorter their searching time. This PLC and VB based Parking system is a electronic applications will improving the conventional parking system by using suitable sensor and display panel

Upgrading the conventional parking system is a needed especially in the urban area. Most of the urban area suffer from parking traffic, where the traffic is caused by the vehicles that looking for parking space or moving out of parking area. For example, an article from THE TIMES OF INDIA [11], stated that overall 35 lakh or approximately 25,500 vehicles that wasting almost 4 hours daily seeking for parking. This has become an issue to the country as well to others country.

1.2 Project Objectives

- 1.2.1 To build a system based on Programmable Logic Controller (PLC) based parking system.
- 1.2.2 To design a system that can detect any changes of number of available parking space and inform the drivers through Indicators.
- 1.2.3 To build a mini prototype of this parking system.

1.3 Problem Statement

Nowadays, there are many shopping malls, hotels, hospitals and airports that using a conventional way for their parking system where all the vehicles in and out or by an auto-pay system entering and leaving a parking lot. The problem that often faced by the drivers is they do not know on how many parking spaces that still available and whether all the parking lots are full or not. Besides, they also wasted their time by roaming round and round just to get a car park and some of them need to leave the parking area because of no empty space at the roadside of the parking lot. These problems are occurred usually during peak hours and holiday/festival time.

1.4 Scope of Work

SOFTWARE

i. Counting the free parking space

The system must be able to calculate the number of available parking space. A sensor will be used to sense a vehicle and will be an input to the counting program. Increasing or decreasing the total number of free parking space (output) depends on the number of cars entering and leaving the parking area.

ii. Display number of available parking space and display the info of available parking space through a screen.

The number of free parking space will be displayed on a 7 segment as the output. The 7-segments will be displayed at the main Entrance/Exit. It also needs to ensure the hardware can trigger the Visual Basic to a screen that will display the total vacancy of parking lots,

iii. Build a parking system that can operate in real time.

A complete parking system needs to be developed by integrating the software and hardware application. Furthermore, the system must be ensured can be operated in real time. When software and hardware is put together using the internal interface inside the PLC and the whole system will cooperate to make it functional smoothly.

CHAPTER II

LITERATURE REVIEW

2.1 CONTROL SYSTEM

In general, control system is a collection of electronic devices and equipment which are in place to ensure the stability, accuracy and smooth transition of a process or a manufacturing activity [1].

In most industries, automation of processes and machines is required to increase product output, or to improve product quality. The workers is put their workers in control of machines and equipment, instead of requiring them to carry out the task manually. This control requires the worker to know the operation of certain process, and the necessary inputs to achieve and maintain the desired output. The system that controlling any process must has the capability to start, stop and regulate a process. In addition the system needs monitoring and measured variables, in order to obtain the desired output.

2.1.1 Elements of Control System

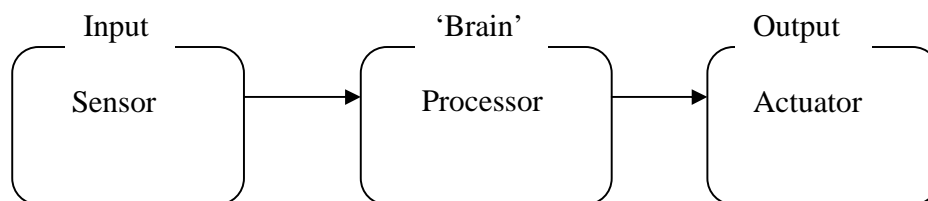


Figure 2.1.1: block diagram of control system.

Normally, a control system consists of three sections which is input, processing and output of the system. Input section or also known as the input signals for a system, usually come from various sensors that convert physical quantities into electrical signal. Examples of these inputs are push-button switch, limit switch or proximity sensors and etc. The input signal is vary depending on the sensors used; it may be represents by an on/off (binary) or a continuous (analog)

For processing section, the automatic control will produce the necessary output signals in accordance the control plan into the processor. This control plan system can be implemented either hard wired control system or programmable logic control system. The disadvantages if hard-wired control system, the control function is fixed permanently when the system components are connected together, while, in a programmable logic control system having the function programmed and stored within a memory unit. This program can be change or modify whenever necessary.

The last section of a control system is the output system that produces the desired output. It converts signals from the control system into another necessary quantity. A pneumatic signal for example, converts signals into linear motion. Other output example of output devices is solenoid, stepping motor and speaker [6].

2.1.2 Traditional Control System (Relays).

Relays are used in many modern control systems, as it is an electrical switch with a high current rating that is indirectly operated by a low control current.

Small relays often come packaged in clear, rectangular, plastic cases, which had led to the name ice cube relay to be commonly applied to them. These so-called "ice cube" relays have either eight or eleven pins protruding from the bottom, allowing them to be plugged into a special socket for connection with wires in a circuit:

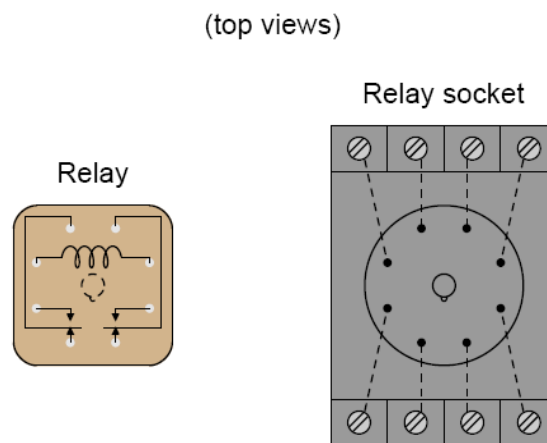


Figure 2.1.2 : Example of top view of relay [8].

A typical relay control system consists of several hundred or thousand switching contacts, which makes designing becomes a considerable tasks. Even for a simple tasks the number of relays used result in a large control panel, because each relay can only provide a small number of contacts relay coils, example less than 10. The function of relay can only described and designed on a relay circuit diagram which illustrates the interconnection of all electrical contacts and relay coils, together with information of the electrical and mechanical construction of the system.

One of the disadvantages of this control system is hard to modify the control function of a relay system once it has been connected up, and usually a complete re-

wiring of the system necessary. Another disadvantage of this system is the control system is cost, speed and reliability. Relay is still being used extensively as output devices (actuator) on other types of control system, being suitable for the conversion of small control signals to higher-current/higher-voltage driving signals.

2.2 PROGRAMMABLE LOGIC CONTROLLER (PLC)

The Programmable controllers (PLC), can be classified as a solid state member of the computer family. A formal definition of PLC comes from National Electrical Manufactures Association (NEMA). Programmable controllers were originally designed to replace relay-based control systems and solid state, hard wired logic control panels. However the modern programmable controller's system is far more complex and powerful. The most basic function of PLC is to examine the input's status and, in response, control some process or machines through outputs. Several logic combinations are usually required to carry out a control plan/program. The program is stored in memory using a programming device that inputs the program into the system. Meanwhile, the processor that usually a high-speed microprocessor periodically scans/monitoring the control plan in memory in a predetermined sequential order. The amount of time that required to analyze the inputs and the outputs, perform the logic control, and execute the outputs (known as Scan Time) [2].

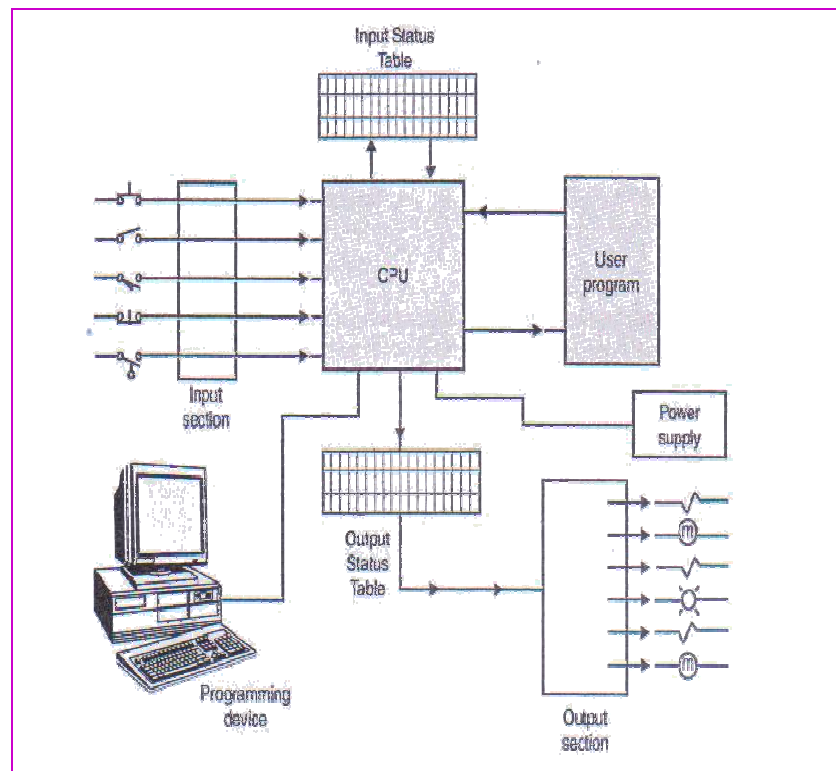


Figure 2.2.1 : Example of PLC system using Discrete Input [4].

A typical typical configuration of the early programmable controller applications is intended to replace relay or hard-wired logic control systems. The input circuits are used to convert various field of voltage and current into the low voltage signals (normally 0-5Vdc –Digital). The output circuits convert the logic signals to a level that will drive the filed devices. [2]