3 LEVEL ELEVATOR CAR PARK SYSTEM CONTROL BY PLC

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MARCH 2005

"I/~~We~~ am/~~are~~ accepting that have been read this work of report. In my/our opinion this report is suppose in the scope and quality for purpose to award the Degree of Bachelor In Electric Engineering (Industrial Power)"

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DEVELOPMENT OF A 3 LEVEL ELEVATOR CAR PARK SYSTEM CONTROL BY PLC

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"I hereby certified that this report is of my own work except for the extracts and summaries in which the sources have clearly noted"

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ABSTRACT

This is a demonstration and prototyping project for a 3 level car parking system using PLC control. It is a mechatronic's project where combine the knowledge of mechanical and electrical and electronics in the project. The objectives of this project were design and implement an elevator with DC motor. The elevator should able fetch car and move up and down follow an input. Instruction This project uses a PLC as the control system to control all the activities. The input device like sensors, limit switch and push button will send a signal to PLC and PLC will made a response. The response normally involves turning ON or OFF an output signal to some of out devices. The motion of the elevator is control by PLC. A control panel will design as the input device for PLC. This system can give a message when the building is fully parking and if the car is overweight. This project is suggesting to be installed in hotel, office building, shopping centre situated in the congested town area and the airport car park. The project consists of few features such as, Automatic door opener, Automatic level recognition, Dual function lifts (car and human), Car park full indicator and Instruction display.

ABSTRAK

Pojek ini adalah merupakan protaip dan demotrasi bagi "3 level car parking system using PLC control". Ia adalah merupakan projek mekatronik yang dikombinasikan dengan asas elektrik, elektronik dan mekanikal. Objektif utama projek adalah mereka dan mengimplementasikan motor DC dengan lif. Dalam aplikasinya, ia perlu mendapatkan kereta serta bergerak naik dan turun mengikut input arahan. Projek ini mengunakan PLC sebagai sistem yang mengawal semua operasinya. Peranti masukan seperti sensor, suis mikro dan suis tekan akan menghantar isyarat kepada PLC dan PLC akan bertindak balas. Kebiasaannya, tindak balas akan memberikan keadaan ON atau OFF kepada peranti keluaran. Pergerakan lif dikawal sepenuhnya oleh PLC dan satu panel kawalan akan direka dimana ia adalah sebagai masukan arahan kepada PLC. Disamping itu, sistem ini akan memberikan isyarat parking penuh atau pun kereta terlebih had. Secara khususnya, projek ini dicadangkan agar ianya dibina di hotel, bangunan pejabat, pusat beli belah yang terletak di kawasan Bandar dan juga lapangan terbang. Amnya, projek ini merangkumi beberapa kelebihan dimana ia mempunyai pintu automatic, pengesan tingkat automatik, lif dua fungsi (kereta dan manusia), Isyarat parking penuh dan papan paparan arahan.

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CHAPTER 1

INTRODUCTION

1.1 The 3 Level Elevator Car Parking System Project.

The 3 level elevator car parking system controls by PLC is a demonstration project. This project is using lift system concept and applies to become a car parking system in a building. Many elevator is use to accommodate people, but this system can accommodate people and car. But the major function of the elevator is accommodating a car to the parking lot in the building.

This car parking is not fully automatic system. A worker is needed to drive the car into the elevator before the car is park in the building. Also it needs worker to drive the car into the parking lot in the building. Before sending the car into an elevator, there have an electronic component to make sure the car is not overweight. If the car is overweight, there would be an alarm came out and call the driver the car is not suitable to use for the system. There also have an alarm came out when either one of the level is parked by car. Fully parking alarm also will display when 3 levels were parked by car.

A worker needs to take a card before drive the car into the elevator. The function of the card is to active the elevator. All the door of the system will close when the elevator is in use. When the elevator is moving up to level need, the elevator will automatic stop. The elevator will hold and waiting the worker parking the car to the level. Worker need to give an instruction to move the elevator up or down by using the control panel inside the elevator.

The control system in this project is using by 240 volt. However the input device and the output device would be supplied by 24 VDC, 12VDC and 3VDC. The input devices are like sensor, limit switch and push button. The output devices are DC motor, LED display and buzzer.

1.2 The project objectives

I. To create a dual function elevator that can accommodate people and car. The elevator is not only design to accommodate cars in a building but it also can function like normal elevator too.

II. To make a more secure system in car park. This car parking system can decreases the risk of robbery that normally can occur in regular parking lots. The drivers will remain safe because the process of parking would only take a short time.

III. To create a car park environment that is safer than ramp-style parking facilities. This is because in a conventional garage, drivers will risk vehicle damage, theft and personal injury during parking their car.

IV. To save the customers time and more convenient. User would not have to take long walks to or from their car, look for parking spaces, memorize where

the car was parked, or spend time waiting for elevators and climbing stairs. People simply leave their car at the entrance to the parking structure, and the system will handles the rest.

V. To create a more user-friendly parking system. User should not have a problem to use the system and the system also can provide a few important features to user.

1.3 Benefits for elevator car parking system.

I. Automatic door opener. The door of the elevator will always remain open during at ground floor until user activated the elevator. The door will close when the elevator begin to move.

II. Automatic level recognition. The elevator will stops at level the user determined and while waiting for the user to take or park their car before go down to ground floor.

III. Dual function elevator. The elevator can use to accommodate both people and car.

IV. Car park full indicator and instruction display. Each level has a detector to detect whether the car is in the level or not. The system also has the instruction display such as FULL PARKING and CAR OVERWEIGHT.

V. Optimization of space utilization. There is no need for driveways, access ramps and stairways of conventional multi-story car parks and it would saves valuable space.

VI. A lower emissions and less pollution car parking system. (Clean parking system). This system offers a pollution free alternative. No cars are running inside and no choking car emissions that have to deal inside the garage.

VII. A more secure car parking system (vehicle and personal). People do not need to afraid about the tendency of their car losses in the car park area and also the losses of the car accessories such as audio system. Furthermore user also does not need to worry about case of stealing by plunderer at the car park area.

1.4 Scope Project

The scopes of the 3 level elevator car parking control by PLC are:

1. Using CX-programmer V3.0 software write program (ladder diagram).
2. Electronics components are use in this project.
3. Simple weight sensor will design and build up end of the project.
4. LED display will design and build up end of the project.
5. A safety card system will design and build up end of the project.
6. A prototype (structure) of the project will design and build up.
7. Control panel will design and build up end of the project

1.5 Review Thesis

This thesis is dividing in six chapters. There are the:

- Chapter 1 was talk about the project introduction.
- Chapter 2 was explaining the lecturer review and the project methodology.
- Chapter 3 was the project design, the hardware development, electrical and electronic assembly and electrical wiring will explain in this chapter.
- Chapter 4 was the software development, the I/O list, flow chat and ladder diagram are show in this chapter.
- Chapter 5 was the project result.
- Chapter 6 was talk about the conclusion and feature work of the project.

CHAPTER 2

LITERATURE REVIEW AND CONTROL SYSTEM PROJECT

2.1 Project Literature Review

It would appear to be the height of folly to assume that Americans will soon turn away from their love affair with automobiles. Within the metro region, well over 90% of the households in the region own cars, and those that do own cars frequently own two or more. In fact, almost 20% of regional households with cars own three, four, or five. Although these fractions decline somewhat in and near the "inner city", the basic reason seems more closely related to lower household income and size than to any unique urban culture.

By the same token, among all metro area commuters, more than 80% still commute by car, and over 80% of those drive alone to and from work. Half of all commuters work in a different county than where they live, and half of those commute to a different state (or DC). Not to be outdone, some 20% of DC workers also "reverse commute" to the suburbs. A major question for urban and suburban planners is what to do with all these cars when they are not in use.

It is suggested in several places around this web site that more attention needs to be directed towards the storing of personal vehicles when not in use (particularly downtown) both to encourage the use of public transit and to avoid the cluttering of limited public rights of way with dormant vehicles. For instance, the subject of parking is hardly mentioned in DC's existing long-range transportation plan, and the subject of pollution reduction is ignored completely. NARPAC believes that trying to design an American urban 'cityscape' which focuses on denying the ownership of private cars is futile.

Most American (barely) adults place a down payment on a car way before they buy into a home, and most Americans live, work, and play in places only accessible by private cars. Surely there are more cars in the US than mothers, or even apple-pie eaters. Car-denial goals are likely to skew urban populations towards those who cannot afford cars, when in fact cities need more resident taxpayers who can afford and do own several cars. The trick is not to limit their ownership, but to limit their inappropriate use and to encourage a switch to environmentally cleaner technologies.

Parking facilities currently consist primarily of open, surface level parking lots, or at best, big (ugly) open garage buildings with several "floors" (above or below grade) of parking spaces accessible to the cars' drivers. Almost all of these lots accommodate all sizes of vehicles, and for that matter, all sizes (height) of drivers. The use of modern technologies is limited to automatic ticket dispensers and gate openers: even the use of automatic billing (like "E-Z Pass") is minimal, and the notion of car ID systems (like bar-coding) is still in the future. Such technologies could easily be used to recognize the car's home garage, for instance, or determine its size, weight, and fuel economy (for variable billing); or match the driver to the car (for security purposes).

The elevator car parking system is already existence in much country especially true with the rising land costs in increasingly crowded Asian cities such as

Singapore, Kuala Lumpur, Manila, Jakarta, Bangkok, Hong Kong and Shanghai. The Car Parking system is advancement on the original mechanical models.

Figure 2.1 An Example of Automatic Car Parking System MODEL RPS 20W

The RPS 20W from Modular Automated Parking System (MAPS) is an ultimate space efficient solution! A fast, very flexible automated parking system for small applications with a need for 10—30 cars per module (with the capability of building modules adjacent to add more cars) and fits on sites with dimensions as small as: 10' x 60' to 68' x 60' (with capability to fit designs on various multiples of these dimensions) with a height of 45' — 120'.

It is ideally suited for condominium, apartment, hotel, small office building development projects where land is very limited (and expensive) and a large part of the success of the project is dependent upon the capability to fill the parking requirements, which can't be easily met with a conventional garage. The RPS 20 series in these cases is a developer's dream.

The facade is completely flexible and can be designed to blend in with the neighboring buildings with a look that is contemporary, historic, traditional etc. The materials that can be used are completely versatile as well as concrete, wood, brick,

stone, aluminum, etc. It is completely up to the imagination of the owner and his architect.

From a user perspective, it is a very safe and convenient system. The system virtually eliminates the risk of any vehicle damage or theft and the risk of personal injury or robbery that can occur in regular parking lots because drivers remain safely outside the building at all times. Imagine, arriving to your destination. Rather than having to spend an exorbitant amount of time driving around looking for a space to park, you drive right up to the garage, drive in at ground level into a well lit easy access entrance area, get out of your car, push a button and then you simply walk away.

Underground applications are particularly well suited for this system. Because only half the space is needed, one can realize as much as 50% cost savings on the excavation alone. Also, due to lower lighting and ventilation requirements (since no cars are driving around and no one is walking inside), lower insurance costs, lower personnel expenses, land savings, etc. the overall development costs can be significantly lower than for a conventional garage.

This system uses the latest electronic and automation technology .In addition, this system offers a pollution free alternative. No cars are running inside, so there are no choking car emissions to have to deal with inside the garage. Also, because cars do not have to circle around and around the block looking for spaces, there is less pollution (and less traffic) from cars driving at slow paces for extended periods of time.

2.2 Control System

In general, a 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. It takes any form and varies in scale of implementation, from a power plant to semi-conductor machine. As a result of advancement of technology, complicated control tasks accomplished with a highly automated control system, which may be in the form of Programmable Logic Controller (PLC) and possibly a host computer. Besides signal interfacing to the field such as operator panel, motor, sensors, switch, solenoid valves and etc, capabilities in network communication enable a big scale implementation and process co-ordination besides providing greater flexibility in realizing distributed system. Every single component in a control system plays an important role regardless of size. [1]

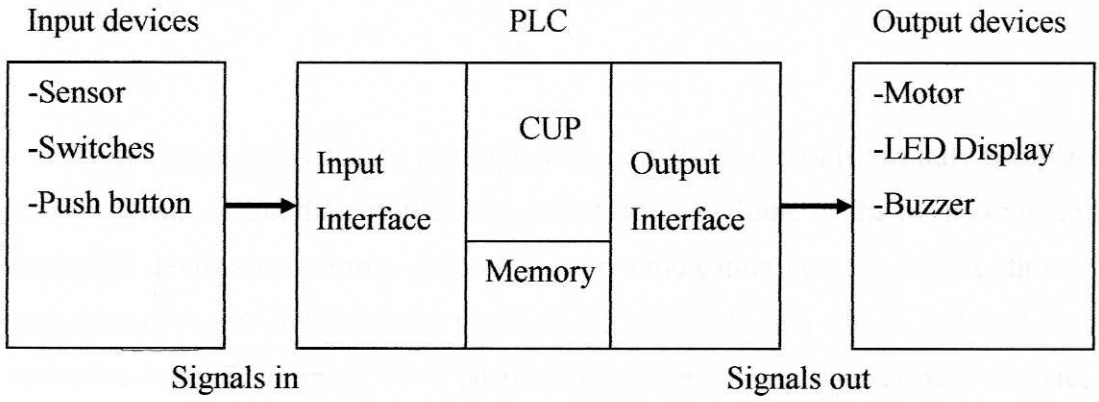

Figure 2.2 A Control System Block Diagram