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A Novel Control System Design Based On Solid the PLC

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Abstract: This system uses Mitsubishi PLC and computer configuration screen monitoring control mode, press the button or picture can complete automobile access process, simple operation, easy access. Control circuit of traditional way by ac contactor, safe and reliable operation. Through the configuration software, database construction, the animation process control, connection and debugging, realized the monitoring system of three-dimensional garage. Finally discusses in detail the design of control system based on the two layers of garage structure for three models. Lift the solid carport, its part can be divided into three parts: the garage structure parts, motivation and control system is part. According to lift the operating principle of the solid carport, on the fluctuation of three-dimensional garage control system design, uses the advanced PLC control, using the software Mitsubishi of lifting the solid carport control procedures, commissioning, operation and proved by using the Programmable Logic Controller (PLC) as the control system is simple.

Key words: Mechanical parking system, PLC controller, Mitsubishi PLC simulation software, configuration software

INTRODUCTION

At present the world stop production is developing to diversity, the park contains almost the mechanical, electronic, hydraulic, optical, magnetic and computer technology in the field of all mature and advanced technologies. Machinery, used a lot of new materials, new technology. Modular equipment construction, convenient combination, easy mounting and dismounting. Steel structure selection of new quality just material, which can improve the equipment of the strength and stiffness of the equipment, advantages of compact appearance, a car carrying board using a molding of galvanized sheet was coated board assembly, beautiful, strong, durable. Control technology, widely using PLC and vector frequency conversion variable speed closed loop control technology, high speed operation, is smooth, save power, vibration and noise to a minimum. Control form, button key type, IC card, keyboard, touch screen, remote control type. Security element with various light delete display, a photoelectric tube, a mechanical type travel switch, proximity switches, magnetic properties of photosensitive induction switch, safety protection device improvement, such as car and light guiding and positioning, vehicle size

and weight, automatic recognition speed and multiple mechanisms are interlocked, parking automatic tracking, chain and wire rope length of elastic deformation range alarm and automatic compensation, auto image photography comparative safety detection, automatic fire extinguishing system (Yu and Yong, 2002; Jia *et al.*, 2005; Ozbay and Ercelebi, 2005).

Japan is one of the countries for first application of mechanical garage, in the last century in the early 60 sec the development and use of the maximum utilization of the space of mechanical parking equipment. At that time the Japanese national car retains the quantity of approximately 500,0000 vehicles, mostly used is the vertical circulating parking equipment. Begin from 80 time, Japan began to Korea of Asian area, China and Taiwan area export product and technology. Mechanical garage is Japanese mechanical parking technology derived. The mechanical parking industry from the nineteen seventies metaphase begins to start, 80 time begin the introduction of Japanese technology, through digestion into production and localization, 90 time begin to supply the trial stage. Due to these a few phase gets high attention of the government, all kinds of mechanical parking equipment has been widely developed and utilized, South

Korea in recent years, the growth rate is 30%. At present Korea parking equipment industry to enter the stage of steady development.

PROGRAMMABLE LOGIC CONTROLLER (PLC) WORKS

The basic structure of the internal circuitry of the programmable controller is similar to ordinary computer, in particular and the structure of the SCM are very similar. The basic principle is the fact the control of programmable controller to input and output transform is implemented in accordance with a certain algorithm and the hardware implementation. Today's most common way of information processing in the industrial control is the use of computer processor technology and its applications and industrial production site, professionalization. Relative to ordinary computer, the physical implementation is the specialty of the PLC, because most ordinary computer only consider its own data and information processing capabilities and communication functions, less and for other considerations, the PLC is necessary to consider the data and information out of processing power and communications and other functions, but also consider issues such as the actual ability to control and achieve (10-13). Thus, PLC pay more attention in the design of the hardware I/O interface technology and anti-jamming problems. PLC from the internal structure can be divided into four parts. The PLC works are shown in Fig. 1.

Central processing unit: The CPU by the control circuit, the computing unit, the memory and bus member,

these circuits are generally integrated on a single chip. CPU through an address bus, a data bus, a control bus and a storage unit is connected to the input-output interface circuit.

Memory

Power section: Power components of the AC power into DC power required for the PLC to the CPC, memory, etc., so that the PLC can work. The PLC internal power the whole supply center, it will directly affect the functionality and reliability of the PLC switching regulator power supply, so the majority of the PLC.

The CPU memory is curing the CPU chip inside, a runtime temporary instruction and intermediate data cache storage function, the memory is used for storing the programmer or computer input the user program. PLC often use two types of memory: RAM, ROM and part also use EEPROM and EPROM memory.

Input and output interfaces: The interface circuit by optical coupling circuit and microcomputer input interface circuit. Optical coupling circuit prevents the scene of strong electrical interference into the PLC, to play the role of isolation of electrical signals.

The output interface circuit is generally output from the microcomputer interface circuit and a power amplifying circuit. The microcomputer output interface circuits generally by the output data memory, the gating circuit and the interrupt request circuit integrated formed. The power amplifier circuit PLC output signal to be enlarged to accommodate the requirements of industrial

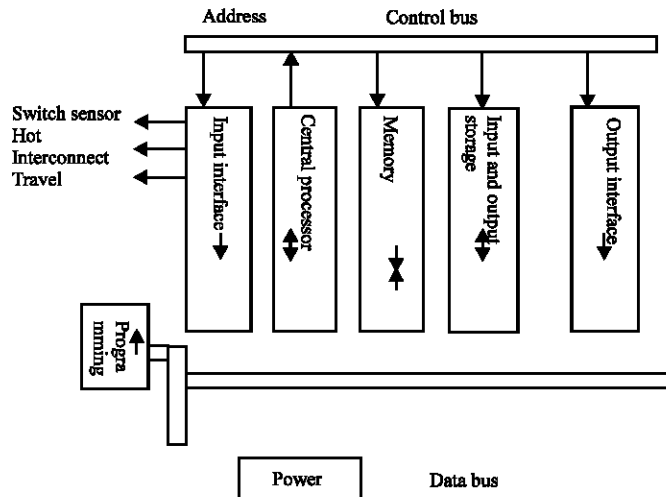


Fig. 1: PLC internal structure

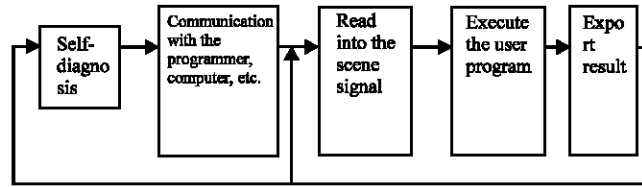


Fig. 2: PLC work process

control. PLC relay output commonly used part of the PLC using thyristor or transistor output.

The PLC work process is shown in Fig. 2:

First stage

Self-diagnosis: Before each scan user-generated fault self-diagnostic procedures are executed first. I/O, memory, CPU, self-diagnostic content. Abnormal shutdown display an error. Self-diagnosis is normal, continue down the scan.

Second stage

Programmer or computer communications: The PLC check whether programmer or computer letter request accordingly have dealt with accordingly, for example, to receive the program sent by the programmer.

Commands and various data to be displayed status, data, error messages, etc. and is sent to the programming display.

Third stage

Reading into the live signal: The PLC central processor to each input terminal to scan, the input terminal of the state to the state memory. Input sampling stage.

Fourth stage

Implementation of the user program: CPU will order item by item v and implementation, to input and the output state of processing, namely the data according to the program logic, arithmetic and then will correct the results to the output state memory, this is the program execution stage.

Fifth stage

Output results: When all the instruction finished, concentrated the output state memory state through the output unit convert was accused of equipment can accept the voltage or current signal, in order to drive was accused of equipment, this is the output refresh stage. PLC after the five phase of the work process, called a scan cycle. Complete a scan cycle and to the implementation of the above process, scanning on. Scan cycle is one of the important indexes of PLC and PLC in normal work, scan

cycle T: $T = (\text{speed} \times \text{program steps}) + \text{I/O refresh time} + \text{fault diagnosis time}$ with the use of cyclic scanning way of working is different from the microcomputer PLC and other control equipment the biggest characteristics.

PLC selection: Stereoscopic parking equipment type selection of PLC to consider the following factors:

- PLC control points and then the economic and reasonable, which can meet the future expansion need and not waste too much
- PLC operation speed and stability
- PLC networking compatibility with superior communication interface scalability

The world of high performance PLC products mainly for foreign products. Commonly used for the German Siemens company, Japan Omron mitsubishi company series PLC product, this subject adopts mitsubishi PLC takes into account not only the good performance-to-price ratio, also taking into account factors such as the service network is convenient. But along with the domestic PLC or high stability controller to improve the quality of, will give parking control equipment more choice space.

UNDERCARRIAGE SPORTS ACTION PROCESS

Process description of the action is in the process of actual memory car, take the car to the process of car plate movement, is also prepared on the basis of the PLC software programs to control parking sport.

Car number plate movement process: Car number plate in the front row on the ground floor, access to vehicles does not affect the action of the other car plate, so the process can be as a basic process is shown in Fig. 3.

Note 1: Car number plate vehicle access it directly at the bottom, so the No. undercarriage usually do not need to queue.

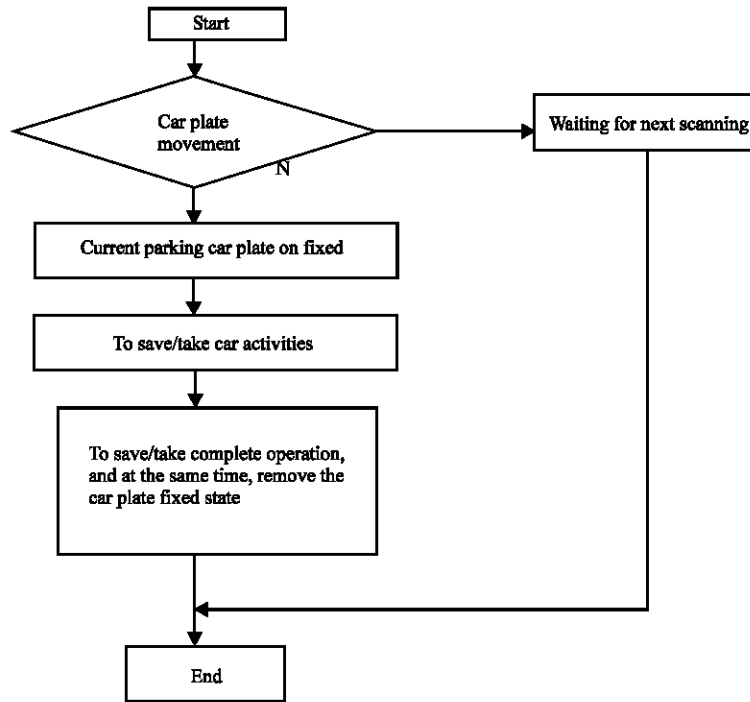


Fig. 3: Car number plate action logic

Note 2: The so-called car plate "fixed" means: can not have "fixed" the car plate position change to the rest of the car disc set/reset.

CONCLUSION

In this study, some studies stereo garage, through research and explore the following conclusions can be drawn: functional requirements for intelligent parking control system program. Determine the economic face adaptation sensor testing requirements garage. In the garage automatic control system, the selection of the Mitsubishi FX2N Series PLC and PLC functions and features detailed analysis and control procedures.

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