Control and Realization of the Cylinder Based on Remote Module in Motion control Card

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Abstract

Based on remote module of output and input motion control card , aiming at the demand of the cylinder which is widely used in industrial and then it is necessary to learn its function and application . According to the control requirements, the control platform is built in MFC through Microsoft Visual Studio and the time function is selected depending on the accuracy requirements . By this method, it is installation and commissioning in kind and the control of two cylinders is accurately realized.

Keywords

Inertia; cylinder; motion control card; MFC; time function.

1. Introduction

With the development of industrial production, a large number of industrial robots are used in automated production, while the main components of industrial robots are servo motors. Servo motor in the robot as the execution unit, is the main factor affecting the robot performance. Therefore, the servo motor control is particularly important. Servo motor generally adopts pulse signal control. Other equipment control signals are digital and analog signals. There are many types of controllers, the main can be divided into: PLC control, relay control, motion control card based control.

This article is based on Delta motion control card and remote control of the input and output modules, through the Visual Studio MFC programming, and then through the pulse signal servo motor synchronous motion control, the digital signal through the cylinder control, through the analog signal grating Displacement sensor control and calibration, while comparing the accuracy of time functions to select the appropriate time function, respectively, to build a control platform, installation and commissioning.

2. Servo motor synchronization control

Servo motor is the core component of the automation system. The AC servo motor has gradually replaced the DC servo motor with the superiority of its performance and becomes the development trend of servo motor.

2.1 Motion control card selection

This article is the selection of Taiwan's Delta Motion Control Card, model PCI-DMC-A01. Motion control card A01 and remote module input and output modules in Figure 1.

2.2 Servo motor selection and physical hardware wiring

Servo motor is selected Delta 2 400W and 1 Taiwan 200W, the external physical hard wiring shown in Figure 2, first of all, the computer's motion control card using CAN bus and servo motor connected in series in series, synchronous control system.[1]

2.3 Realization of synchronous motion control

First of all to set the ID of each servo motor, if you do not set the ID, the system will cause confusion can not identify the motor. Through the MFC design interface in software Microsoft Visual Studio 2010, using c + + language programming,with the following function commands

_DMC_01_sync_move and _DMC_01_sync_move_ config for synchronization control, and set up a servo motor synchronous motion control platform, as shown in Figure 3. The control platform can not only realize the motion control of a single servo motor, but also realize the synchronous motion control of three servo motors, which is more practical.

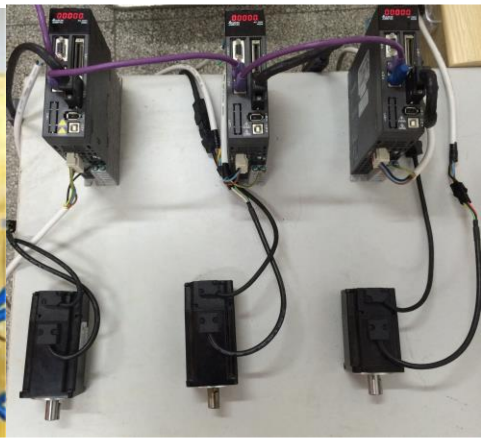

Figure 1 Motion control card A01 and input and output modules Figure 2 External wiring of servo motor

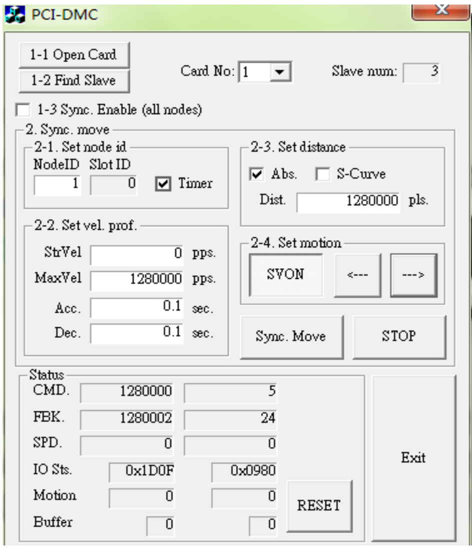

Figure 3 Synchronous motion control platform Figure 4 Cylinder and solenoid valve

3. Digital signal control of equipment

Because there are many types of devices that use digital signal control, the device in this article uses a cylinder as an example.[1]Pneumatic components and hydraulic, hydraulic, sealing and other basic components belong to the adjustment and rejuvenation of equipment manufacturing industry is a strategic industry, equipment manufacturing and technological progress to upgrade the protection, but also the basis for the country's overall strength. Among them, the typical representative of pneumatic components is the cylinder. In modern industry, the cylinder plays an indispensable role, especially in the printing, semiconductors, automation and robotics industries, it plays a very active role.

3.1 Equipment selection and hardware wiring diagram

There are many types of cylinders, the cylinder used in this article HITOP double-acting type, its model AMR80 * 125. Solenoid valve is also HITOP company, model HVE3230D24L. The physical cylinder and solenoid valve shown in Figure 4. External physical hard-wired as shown in Figure 5, the first is the air compressor through the use of gas through the solenoid valve for the cylinder to provide a stable source of gas, followed by the DC power supply for the analog output module to provide the necessary 24V DC voltage, and then Through the communication line from the motion control card to the output module, and finally the output module and the solenoid valve connected to form a complete control system.

3.2 Comparison and Selection of Time Functions

In this paper, the control of the cylinder as an example to compare the time function and select the appropriate time function. In industrial production control, to use a lot of timing operations, such as timing display, timing refresh, timing and communication between the host computer and the next crew and data transmission. Especially in real-time systems with high control precision, more precise timing is needed. Windows is based on a messaging mechanism that executes events by sending and receiving messages. Therefore, once the computer's CPU is occupied, the messages sent are temporarily suspended and can not be processed in real time. Because Windows encapsulates the access to the underlying hardware of your computer, you should take the appropriate timing method for your specific accuracy requirements.

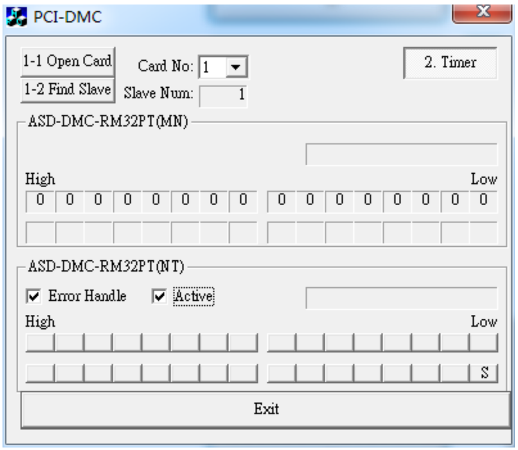

Figure 5 Cylinder control physical hardware wiring Figure 6 Cylinder motion control platform

VC provides a lot of time functions[2] used to manipulate them to precisely timed the timing operation. The accuracy of the time function directly determines the accuracy of the control cylinder. Therefore, it is very important to select the appropriate time function. This paper selects three ways to achieve timing, that is, three kinds of time functions, by comparing its accuracy, select the appropriate time function.

Way one: Sleep () function. Sleep () function is used to delay, the unit is ms, such as 1 second delay, with Sleep (1000). Its accuracy is very low, the minimum timing accuracy of 30ms. Because the CPU usage is very high, and the delay can not handle other messages, if the delay time is too long, like a crash, it can only be used in less demanding delay procedures.

Way two: GetTickCount () function. The unit of the GetTickCount () function is also ms, and the return value is of type DWORD, indicating the time interval during which the computer starts up. The accuracy is higher than the Sleep () function, with a timing error of 15ms in a short period of time. Similarly, its CPU utilization is very high, can only be used in less demanding delay procedures. The following code for the realization of timing 1s:

```
DWORD dwStart=GetTickCount();
DWORD dEnd=dwStart;
do
{
dEnd=GetTickCount()-dwStart;
}while (dEnd<1000);
```

Way three: QueryPerformanceFrequency () and QueryPerformanceCounter () function. These two functions are the exact time functions provided by VCs, which are very accurate but require the computer to support precise timers from hardware. In the timing before, we must first call QueryPerformanceFrequency () function to obtain the internal timer clock frequency, and then before and after the timing event call QueryPerformanceCounter () function twice, using the difference between the clock frequency and calculate the exact time, its Timing error does not exceed 1 microsecond, the accuracy and CPU and other machine configuration. The following code to achieve 1s precise timing:

```
LARGE_INTEGER litmp;
LONGLONG QPart1,QPart2;
double dfMinus, dfFreq, dfTim;
QueryPerformanceFrequency(&litmp);
dfFreq = (double)litmp.QuadPart;          //Get the counter clock frequency
QueryPerformanceCounter(&litmp);
QPart1 = litmp.QuadPart;                  //The initial value obtained
do
{
QueryPerformanceCounter(&litmp);
QPart2 = litmp.QuadPart;                  //Get the termination value
dfMinus = (double)(QPart2-QPart1);
dfTim = dfMinus / dfFreq;                 //Get the corresponding time value
}while(dfTim<1);
```

Considering the above method, the computer hardware to meet the requirements of the premise, select QueryPerformanceFrequency () and QueryPerformanceCounter () two time functions.

3.3 Digital signal control platform to build

Through the software design interface of MFC in Visual Studio, using c++ language programming, we can set up the cylinder motion control platform through the control of time difference of cylinder motion once per second, as shown in Figure 6.

4. Analog signal to device control

4.1 Equipment selection and hardware wiring diagram

This article selects the German NOVOtechnik company grating displacement sensor[3-6], model is TP1-414-102. External hardware wiring as shown in Figure 7, the first DC power supply to the remote module and the grating displacement sensor power supply, the remote module through the communication line to connect the motion control card, and then the grating displacement sensor connected to the remote module.

Figure 7 Grating displacement sensor control physical hardware wiring

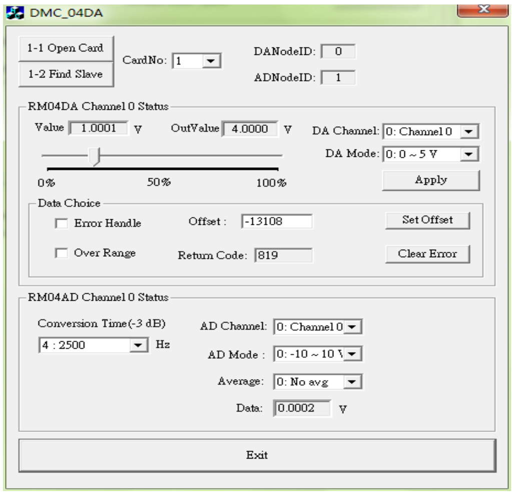

Figure 8 Grating displacement sensor control platform

4.2 Analog signal control platform to build

Through software programming to build analog signal motion control platform shown in Figure 8. The first is a series of initialization, and then the frequency is selected 2500Hz, mode selection is -10 ~ 10v, the final calibration to 0.0002v.

5. Conclusion

In this paper, the motion control card and the analog output module were studied and studied, the use of Visual Studio under the MFC tools to build a motion control platform, and through the pulse signal on the servo motor control, digital signal on the cylinder control and analog signal pairs Grating displacement sensor control calibration, which can provide control of various types of signal and application of theoretical practice. At the same time, the time function is selected according to the accuracy of the time function, which provides the basis for a large number of time functions in industrial control.

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