Design and Implementation of Automatic Sample System

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Abstract: In order to adapt to the demand of sample treatment before experiment, this paper designed a three axis based on motion control card and VB sample control system. The system takes the motion control card as the core, stepping motor as the actuator, and VB operating system on the movement control CARDS transplantation. Command on the PC, condition monitoring and other tasks, for man-machine interactive operation. The results showed that the system has characters such as high degree of automation, accurate in sampling, rapidity reaction. The system has wide application value and popularization value.

Introduction

With the progress of science and technology, the experiment study is more and more complex, the species involved more and more, but the washer existing usually structure is more complex, processing production is not convenient, liquid move at the same time is not convenient to remove and clamping, and liquid moving clamping firmly is poorer, can't well meet the requirements of precision and accuracy of the test results.

This paper designs a new type of automatic sampler, four axis movement by general motion control card, Vs2010 sample development and system application, good washer solves the defects, which can be widely used in chemical, medicine and other fields, greatly reduce the labor intensity of the operators.
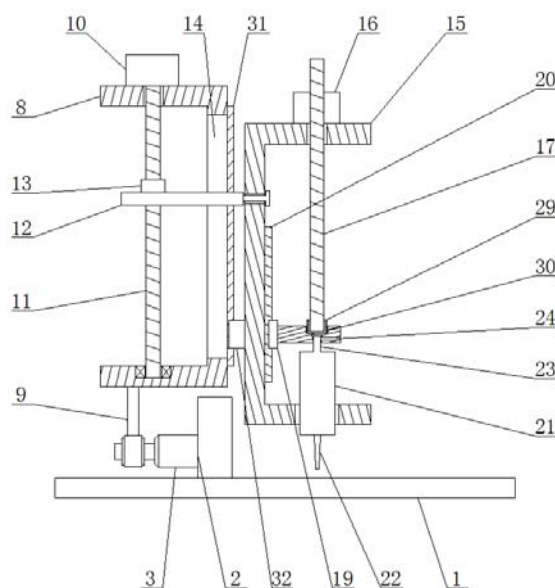
Mechanical structure and working principle

Table 1 automatic sampler, including samples, used to place containers. Sample table 1 end symmetrical set two fixed 2, one of the fixed seat 2 3 set on the first motor, the first motor output shaft driving wheel installed on 4 3, another fixed 2 set driven wheel on 5, position set belt drive wheel and driven wheel 4 5 6, set between two fixed seat 2 polished rod 7, also includes the first u-shaped fixed frame 8, first set up the connection in the lower end of the u-shaped fixed frame 8 9, between 9 and polished rod 7 sliding connection and June belt fixed connection, polished rod used for fixed support effect, smooth transmission, can bear the weight of the heavier, the first motor rotation to drive the first u-shaped fixed frame along the X axis direction. First fixed 8 set up the second motor at the top 10, 10 second motor output shaft is installed on the first bar 11, the first sweep of poles 11 set on the fixed plate, a fixed plate 12 set on lifting wire mother 13, 13 with the first glimmer of lifting wire mother 11 bolt connection rod, a second motor driven in the first sweep of poles, the first sweep of rod rotation driven lifting wire mother moved up and down, lift the silk mother fixed plate move up and down, to realize the movement of the Z axis. First u-shaped fixed frame 8 set on the first 1 slot 14, 12 fixed plate at one end by the first 1 slot 14 exposed to 8 side first u-shaped fixed frame, a fixed plate set the second u-shaped fixed frame 15, 12 end fixed plate driving the fixed frame to move up and down. Second u-shaped fixed frame 15 top 16, set up the third

motor third motor output shaft is installed on the second screw 16 17, set in the lower end of the second screw 17 18 sliding board, sliding board set up the first 18 end sliding block 19, the second u-shaped fixed frame 15 set on the first linear slide rail 20, the first slider 19 connected with the first 20 sliding linear slide rail, sliding plate and the bottom of the liquid set shift, pipetting device including push cylinder 21, push the cone bottom set straw 22, 21 push cylinder 21 set inside the push rod 23 absorption, sliding board 18 set at the bottom of the card slot 24, push the suck rod 23 24 within the top card open card slot, the second set in the lower end of the u-shaped fixed frame 15 nip slot 25, nip slot 25 relative to the two side walls set up end of the second slot 26, with open the second slot 26 27 set in the spring, spring end external exposure in the second pass trough 26, 27 second spring end set splint, 28, 27 push cylinder 21 lies between two plywood 28, move up and down the third motors to drive the screw rotation, the second screw drives the sliding plate move up and down, move up and down sliding plate driven push rod absorption, so as to realize liquid shift of absorption liquid and liquid; By setting the first linear slide rail and sliding block, to ensure the stability of the skateboarding, so as to realize the accurate control of absorption liquid and liquid; By setting the springs and splint, can convenient and out into the liquid receiver, at the same time improve the grip firmly pipetting device.

As optimization, the screw and the second connection bolt connection on the set of 29, the connection of 29 external set corresponds to the screw hole 30 male, 18 set screw hole at the top 30 sliding plate, a second connection with the screw hole in the lower end of the set of 29 30 bolt connection, by setting the second link sets can be the second screw and slide plate, the structure is simple.

As optimization, the first u-shaped fixed frame 8 near the second u-shaped fixed frame 15 set on only one side of the second linear slide 31, 31 is located in the first 1 second linear slide rail slot 14 a side, the second u-shaped fixed frame 15 side set on the second slide block 32, the second sliding block 32 with the second linear slide rail and sliding connection, by setting the second linear slide rail and the second slider can ensure that the second of u-shaped fixed frame to move up and down.

As optimization, 31 for two second linear slide rail, two second linear slide rail 31 is located in the first 1 slot on both sides of 14 respectively, two linear slide rail, to further ensure that the second of u-shaped bracket to move up and down.

Fig.1 The Automatic Frame of the Feeder System

System overall design

The system overall design is mainly composed of the following three parts:

1) three axis motor system consists of three two phase servo motor and servo drive, control the X axis and Y axis and Z axis precision motion; Another servo motor according to the instructions and sample amount to complete the accurate sample and operation;

2) through the VB design of the user program to a serial port operation to realize the control of electromagnetic valve, control switch in the liquid pipe or a liquid;

3) system by software VB interface design, installed on the computer, to realize system monitoring.

After the position of the letter received the upper machine, three axis X, Y, Z axes linkage, arriving at target location, the solenoid valve open to operate at different positions in the precise add the sample.

The system working process, the system interface data entry position, motion control card by VB software command control the movement of the servo motor, thus promote the X, Y, Z axis movement, when running to need add sample tube position, X, Y, Z axes to stop movement, plus sample servo motor to drive and sample needle movement from top to bottom, according to the sample set quantitative to tubes with sample.

2.1 the system hardware

This system adopts the small ink sports card MT - 200, combined with a variety of functions, including zero mode, speed, positioning mode, linkage interpolation, etc.; Provide standard RS - 232 and USB HID interface, convenient and PC connection is used.

The chip - frequency 400 MHZ, a maximum of 533 MHZ, run fast. Several commonly used interface and internal integration, system of peripheral circuit includes memory module, stepper motor control module, liquid crystal display module, serial communication module, power module and a peristaltic pump control module, etc.

According to the requirements of high reliability, chose A 35 byg250bk two-phase hybrid stepper motor, the static phase current of 0.8 A, 0.11, holding torque positioning torque moment of inertia of 0.012 14; Stepping drive model SD - 20403, with 16 kinds of segmentation model, 8 kinds of output current can choose.

The system software

programming

Through the PC interface to add sample task management, implementation of step motor, servo motor control. Adopt the method of combining the modular and structured design application, will be divided into the entire program is function modules, each function module to complete a single specific functions. According to each sub module, the action of relations between reasonable design software general structure, the whole software system is clear and concise, reasonable process.

Initialized after the system is powered on, first of all operations, including the axis long points, setting of motor movement direction, frequency setting, fine set, etc. Initialization complete, according to set the parameters of the API function call sports card, according to the preset model and sample, and sample task is completed, waiting for the new task trigger.

```
Public Function rdxgd(ByVal ack() As Double, ByVal bdk() As Double, ByVal csp() As
Double)
            Dim fhxgd(10000), fhxgd1(10000) As Double
            Dim i As Integer
            Dim s(10000), sf(10000) As String
            For i = 0 To csp.Length - 1
                fhxgd1(i) = 0 - Log((csp(i) - bdk(i)) / (ack(i) - bdk(i))) / Log(10)
                sf(i) = String.Format("{0:n4}", fhxgd1(i))
                fhxgd(i) = Val(sf(i))
            Next
            ReDim Preserve fhxgd(csp.Length)

            rdxgd = fhxgd
        End Function
    Sub yzxsf(ByRef aa As Integer, ByVal zj As Integer, ByVal crsh As Integer, ByVal pc As
Integer)
      For k = 4 To 9
                For j = 0 To H1L1.Length - 1
                    CXH2M(k, j) = (H2(k, j) / H2(2, j)) * CrM
                Next
            Next

            For k = 4 To 9
                For j = 0 To H1L1.Length - 1
                    CXH3M(k, j) = (H3(k, j) / H3(2, j)) * CrM
                Next
            Next
                 For k = 4 To 9
                For j = 0 To H1L1.Length - 1
                    CXH1H(k, j) = (H1(k, j) / H1(3, j)) * CrH
                Next
            Next
            For k = 4 To 9
                For j = 0 To H1L1.Length - 1
                    CXH2H(k, j) = (H2(k, j) / H2(3, j)) * CrH
                Next
            Next
            For k = 4 To 9
                For j = 0 To H1L1.Length - 1
```

$$CXH3H(k, j) = (H3(k, j) / H3(3, j)) * CrH$$

   Next

  Next

 End SUB

Interface design

This system through the VS2010 washer writing software to control the visual interface. After the test, it can reliably and small ink sports card to communicate with each other, realize manual or automatic function, facilitate subsequent operations. Human-computer interaction friendly interface, convenient operation and simple force, the operator through a check box, simple implementation and add sample task. Add pipette control interface as shown in figure 2.

Software main interface including all in order to realize the function of the system, including parameter Settings interface, function test, calibration test interface, interface, operation records sufficient drainage system interface, etc. Respectively to realize the X, Y, Z axes of operation frequency, the position and the database Settings, etc., through direct input Numbers or pull the scroll bar, implement relevant configuration; Touch screen and PLC communication Settings, including serial communication baud rate, data bits, serial number, and many other functions.
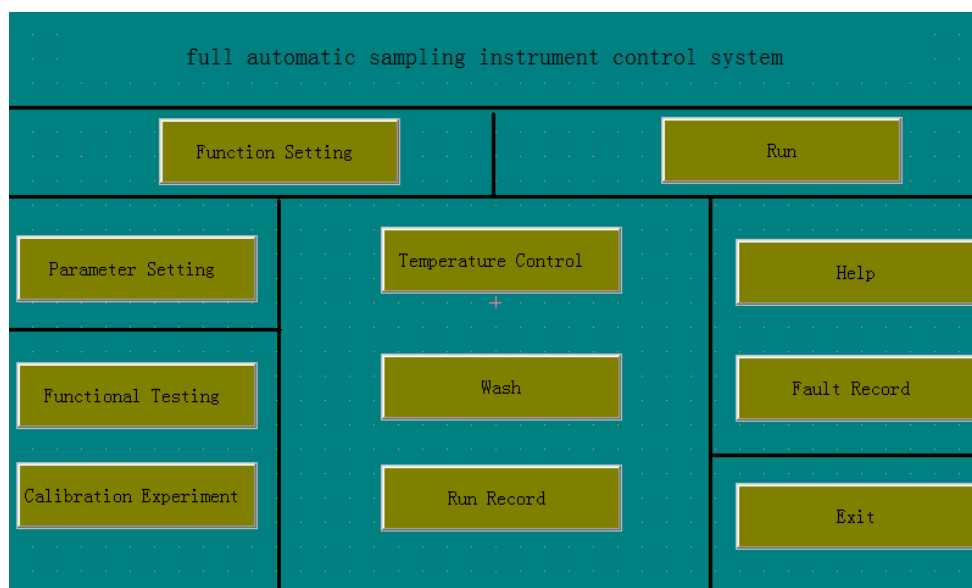

Fig.2 The Automatic Frame of the Feeder System

Conclusion

It is designed by the system adopts high performance sports card as the control core, stepper motor device three-axis linkage, smooth operation, high positioning accuracy. Using VS2010 write monitoring and exercise program, plus sample systems that can perform multitasking, real time and greatly improve the usability of the system. Use computer operation, friendly interface, the system has a stronger recovery human-machine interactive features, has the very good application prospect and promotion prospects.

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