THE APPLICATIONS OF OPC UA TECHNOLOGY IN MOTION CONTROL SYSTEM

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The establishment of data model is more abundant based on OPC UA (Unified Architecture) technology, which has good platform independence and high reliability. Thus it becomes a new direction in the field of data exchange of industrial control. In the paper, the motion control model based on redundant ring network is built by using NI 3110 industrial controller and servo motors. And the data structures used in parallel communication between the upper computer and multi-terminal motors are designed by using OPC UA technology. So the problem of inconvenient data exchange between the RT system of lower controller and the Windows system of upper computer may be solved.

Figure 1: Photos of the field in motion control

The motion control system is used for the motion control of beam diagnostic detectors of the cyclotron in Lanzhou, China. The beam diagnostic detectors contain one SS (scintillation screens), one FC (faraday cup) in LEBT (low energy beam line), and another FC, one scraper in MEBT (medium energy beam line), so five servo motors are needed for the motion control (see Fig. 1).

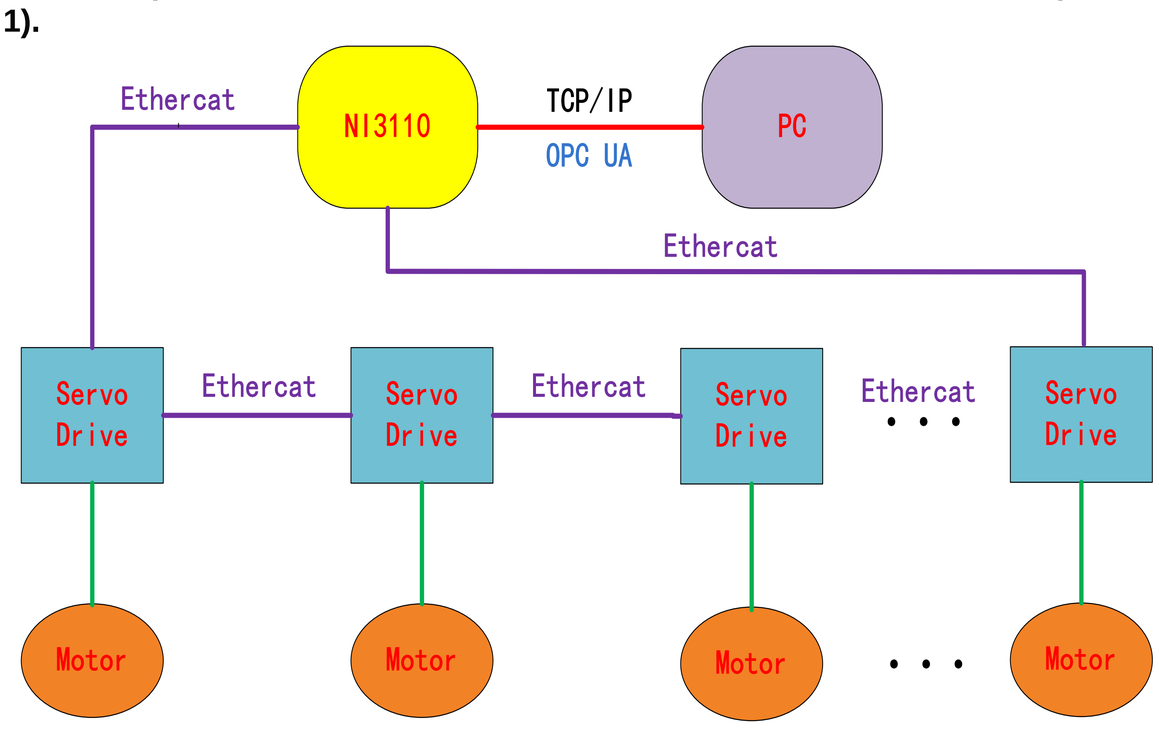

Figure 2: Architecture of motion control system

The motion control system is composed of a plurality of servo drives and motors, a NI 3110 industrial controller and a client computer (see Fig. 2). Each servo drive is connected to a servo motor, servo drive communicates with each other through the EtherCAT interface. In order to build the redundant ring network of EtherCAT and improve reliability of the system, the first drive and the last drive are connected to the output and input of the EtherCAT interface ports of NI 3110 industrial controller, which makes NI 3110 communicate with each drive.
Based on the OPC UA application of LabVIEW, the data structure can be freely built according to the different applications. (see table 1).

Folder	Item_1	Property_1
Name: motor_1	Name: data Access: read only Datatype: float Description:	Name: position Property_2 Name: scale_value
	Item_2 Name: command Access: read/write Datatype: int32 Description:	Property_1 Name: enable Property_2 Name: start Property_3 Name: stop Property_4 Name: home Property_5 Name: distance
	Item_3 Name: status Access: read only Datatype: boolean Description:	Property_1 Name: enable? Property_2 Name: complete? Property_3 Name: fwd_limit? Property_4 Name: rev_limit? Property_5 Name: scale_safe?

Table 1: Data nodes of motion control system.

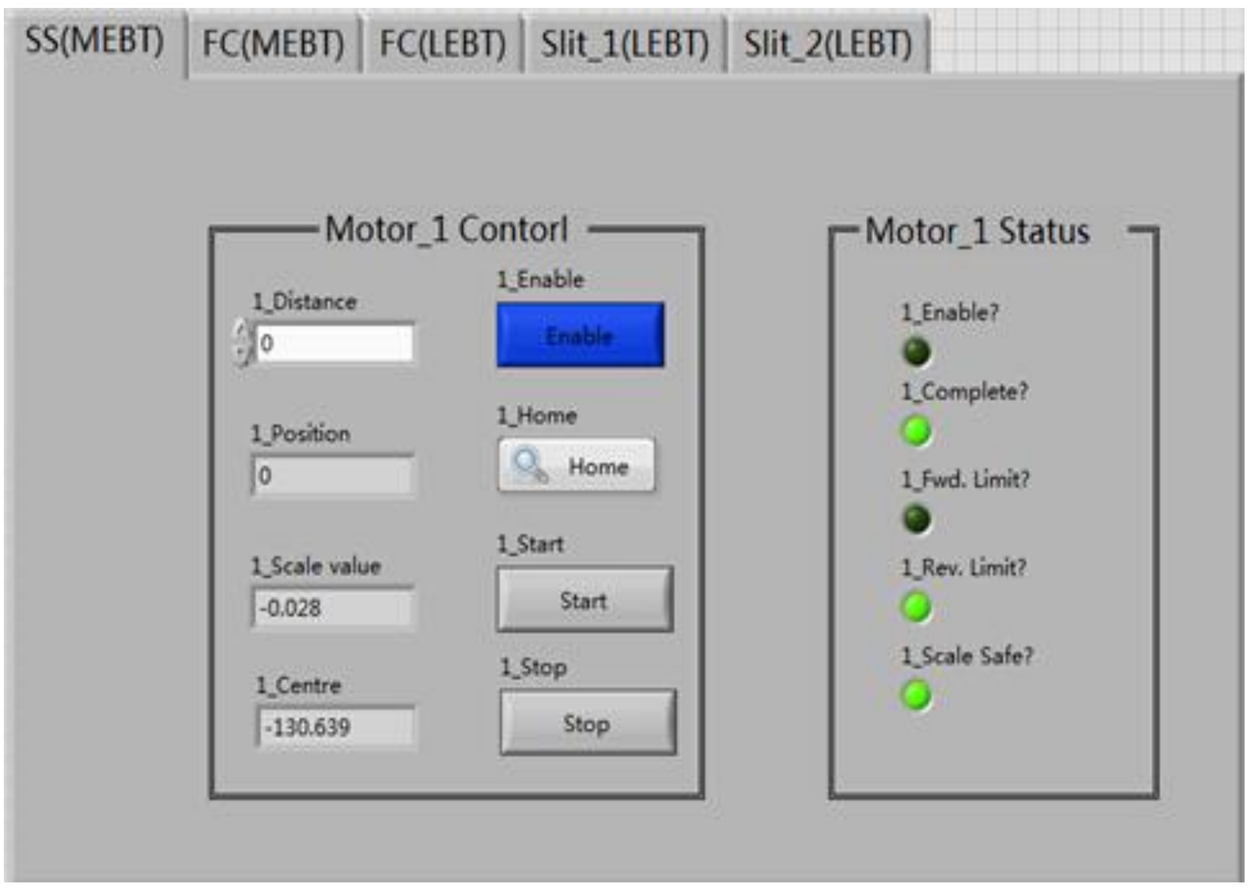

Figure 3: User interface of motion control system

The control interface of the client upper computer is shown in the Fig. 3. From the Fig.3, the motion control interface of SS in MEBT is divided into two parts. The left part named "Motor_1 Control" of the interface with the functions of enabling the Motor, finding the origin, starting and stopping the motion task, inputting the distance of motion, observing the feedback of motion, getting the value of displacement sensor and calculating the distance between the detector and the centre of chamber is used to complete motion tasks. The right part named "Motor_1 Status" is used to get the status containing "enable?", "complete?", "fwd_limit?", "rev_limit?" and "scale_safe?"

CONCLUSION: With the development of industry control, the data communication needs the better reliability and safety, independency of platform and so on. In the paper OPC UA technology is selected for building the motion control system, the architecture of motion control system and the data structure based on OPC UA are designed, and the motion control system which can verify the advantages of OPC UA technology is being tested.