高集成度 EtherCAT 从站设计与多轴控制的研究

党选举，谢桧宝，姜辉，伍锡如
（桂林电子科技大学 电子工程与自动化学院，广西桂林 541004）

摘要： EtherCAT 是目前最高速的实时工业以太网技术，逐渐应用于工业控制领域.为满足复杂运动控制系统高集成度需求，文章采用高集成度的 EtherCAT 从站芯片 LAN9252 设计了一种新的从站方案，同时面向多关节机械臂运动控制，设计了一个从站控制两个轴的控制方案.针对一个从站控制两个轴时引起的数据传输量加大的问题，在应用层对运动控制协议 CiA402 进行了裁剪、移植，节省了成本并能达到很快的数据刷新周期.该文分析了软硬件设计流程，通过实验对该从站进行一系列测试，实验结果证明该从站 I/O 通信正常，同步性能良好，一个从站在控制两个轴的情况下能正常稳定工作.
关键词： EtherCAT；工业以太网；高集成度；同步；CiA402

Design of Highly Integrated EtherCAT Slave and Research on Multi-axis Control

DANG Xuan-ju，XIE Hui-bao，JIANG Hui，WU Xi-ru
(School of Electronic Engineering and Automation, Guilin University of Electronic Technology, Guilin 541004, China)

Abstract： EtherCAT is the most high-speed real-time industrial Ethernet technology, and is gradually used in industrial control field. In order to meet the high integration requirements for complex motion control systems, 1) a new slave scheme is designed for using a highly integrated EtherCAT slave chip LAN9252, 2) For the multi-joint manipulator motion control, a control scheme of two-axis controlled by slave station is designed. In order to solve the problem of the increasing transmission data caused by the control of two-axis, the motion control protocol CiA402 is cut and transplanted at application layer, saves the cost and achieves a fast data refresh cycle. The design process of hardware and software are analyzed. A series of tests are carried out on the slave station through experiments. The experimental results show that the I/O communication of the slave station is normal and the synchronization performance is good. A slave station can operate normally and stably under the control of two-axis.
Key words： EtherCAT; industrial Ethernet; highly integrated; synchronize; CiA402

作者简介：
党选举男，（1965-），博士，教授，博士生导师.研究方向为非线性系统建模、工业现场总线.E-mail:xjd69@163.com.
谢桧宝男，（1992-），硕士研究生.研究方向为工业现场总线.
姜辉男，（1987-），硕士，讲师.研究方向为非线性系统建模与智能控制.
伍锡如男，（1981-），博士，副教授.研究方向为机器人控制、神经网络、智能控制.