Portable data acquisition system for research

——The comuniucation of USB interface

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Abstract

In scientific and technological research and industrial production, data acquisition and processing system is increasingly prominent, and the requirements of the real-time high speed data acquisition have been increased, such as the speed, the resolution, the precision, the accuracy to interface and anti-jamming ability and so on. High-speed data acquisition is widely used in the signal measurement, image processing, audio signal processing and other high-speed, high-precision measurement. Now commonly used high-speed data acquisition is attained with the data acquisition card which is installed in the PC or industrial computer, such as A / D card, RS-422 card and RS-485PCI card. There are many shortcomings in these acquisition systems, for instance the installation of trouble, expensive, the electronic crosstalk in computer is heavy, especially the number of slots by the computer, address, interrupt resources are limited, the extendibility is bad.

USB（Universal Series Bus）is an important new technology of interface based on PC in recent years . The developments and applications of USB devices at home and abroad is in a high-speed stage currently. USB adapter can be used in data acquisition, and it can be used to overcome the shortcomings of the traditional data acquisition cards. USB data acquisition is easy to achieve the data collection of high speed, large-capacity, low cost, high reliability and multiple points, with the advantages of easy installation, plug-and-play, smaller EMI outside the computer case, convenient power supply and easy extension .

A development of information system is that the field programmable gate array (FPGA) technology is rapidly rising. FPGA is abroad used in the fields of data processing and algorithm realization owing to the advantage of high work frequency、short design period、low cost、 unlimited re-programming.

Therefore, the thesis designs a data transmission and processing system by combining the merits of FPGA and USB, and the system can be used in data acquisition by extending.

Based on the whole design idea expounded in the thesis, First of all, some correlation techniques which involves to the paper have been detailed described, then

the structure and performance of the chips adopted in the system are described in brief. Then the method of design and implement of software and hardware is discussed. In the hardware design part, the hardware design scheme of USB data download and upload modules、 USB host and slave modules 、 FPGA modules and Related peripheral circuits are proposed; the connection mode among these modules is also shown. In the software part, the basic function and holistic realization of PDIUSBD12 and SL811 firmware, FPGA inner data processing program, USB driver and PC application are mainly introduced.

The intelligent data acquisition and processing system researched and designed in this paper is used to not only communicate with PC using USB Slave interface in on-line situation, but also save memory data to an U disk using USB Host interface in the off-line situation. The system uses two kinds of technologies—USB Slave and USB Host, and realizes USB OTG with both the functions of USB device and USB Host.

Finally, after a lot of hardware and software testing, the paper designs the data acquisition processing system in each aspect's technical indicator can achieve at the beginning of the design requirements, and the paper has provided the good foundation for the next system's further improvement.

Keywords: Data Acquisition USB FPGA