

基于SOPC技术的高速图像采集控制系统的设计与研究

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基金项目：国家自然科学基金面上项目资助项目

摘要：

本文针对高速图像采集控制系统中带宽不足的问题，应用SOPC（System on a Programmable Chip）技术在Avalon总线中嵌入自定义外设完成图像采集、图像数压缩和图像存储，大大提高了系统的成像速度。首先，通过在图像采集端对数据进行流水线压缩编码的方法，将数据量压缩为原来的四分之三。然后，基于VH计并实现DMA控制器，该自定义DMA控制器可以把图像数据直接存入SDRAM中的两块缓存区，省掉了传统数据采集系统中必须使用FIFO对数据进行缓存的环节，减轻了CPU的数据传输任务。另外，通过将系统图像采集模块和数据传输模块的并行化处理，提高了成像系统工作的效率。最后，本设计在2k × 2k高速C成像系统上进行了实现，通过速度测试和成像测试验证了该图像采集控制系统设计的可行性与灵活性。

关键词：图像采集；SOPC；DMA控制器；并行处理；高速

Design and Research of a High-speed Image Acquisition System Based on SOPC Technology

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Abstract:

Based on SOPC (System on a Programmable Chip) technology, some peripherals embedded in Avalon bus were customized and utilized in image acquisition unit, compression unit and storage unit, and these improved the speed of the whole imaging system. The data is compressed to three-fourths of the original. A custom DMA is designed for transferring the image data to the two cache of the SDRAM. This approach discards the method that FIFO must be put up in the traditional data acquisition system. And therefore, it reduced the CPU task for data transferring. At the same time, the image acquisition and the data transmission can complete a parallel job to improve the system efficiency. Finally, the design is worked on an 2k*2k high-speed CMOS image system, and the test results show its feasibility and flexibility in high-speed image acquisition applications.

Keywords: Image acquisition system, SOPC, DMA controller, Parallel processing, High-speed

投稿时间：2010-12-03