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Ellips Rio High Performance Frame Grabber



Overview

Designed to get the most out of any S-Video/composite color or standard black and white camera, the Ellips Rio is a high performance PCI frame grabber, targeted at real-time industrial image processing applications. The Rio comes in two versions:

- Basic version with one input module
- Full version with two input modules

Basic Rio

The Basic Rio features are:

- 3rd generation PCI bus master with flexible transfer controller
- 6 (CVBS or monochrome) cameras or 3 Y/C cameras can be connected
- Black & white (grayscale) digitizing
- Color digitizing, inputs Y/C or CVBS
- Simultaneous grabbing from two black and white cameras
- Supports progressive scan cameras

Full Rio

The extra Full Rio features are:

- Independent processing of two video sources
- Fast switching between color cameras
- Simultaneous grabbing from four black and white cameras
- High quality black and white input with programmable gain and offset
- Supports RGB and RGBA cameras

Features

3rd generation PCI bus master with flexible transfer controller

Several PCI grabbers have been available on the market for some time, but, depending on their architecture, most of them are not suited for real-time imaging processing applications:

- Some grabbers based on a PCI SVGA controller have an image port that allows write access to the video memory from an external access bus (typical bandwidth 45 MB/s). Although this method offers live video on the desktop without hogging the PCI bus, reading the image back from video memory to main memory suffers from slow memory access due to the nature of these SVGA controllers: typical write bandwidth from PCI to SVGA is up to 90 MB/s, whereas read bandwidth from SVGA to PCI is limited to approximately 7 MB/s. Therefore SVGA-controllers based PCI grabbers are generally not suited for real-time imaging applications.

- Some PCI grabbers employ efficient PCI burst transfers, but lack flexible transfer controller capabilities. Therefore, more data is sent over the PCI bus than is actually needed, thus slowing the system down. For example, when tracking moving objects, the region of interest changes for every video frame. This calls for changing the region of interest at field rate.

The *Ellips Rio* offers PCI bus master DMA, allowing burst transfers of up to 132 MB/s (depending on the quality of the main board) without tying up the main CPU, combined with a very flexible transfer controller. Using a Register Program Sequencer, input window, output destination, scaling, and clipping can be reprogrammed on a line-by-line basis without CPU intervention. The sequencer program can be

changed every field to incorporate complex changes of the image parts transferred over the PCI bus to main memory, thus tracking moving objects**.**
The PCI interface supports virtual memory addressing for operating systems running virtual demand paging (like Windows). The integrated Memory Management Unit (MMU) translates linear to physical addresses using a page table in system memory provided by the software driver. The MMU supports op to 4 Mbytes of virtual address space per DMA channel.

6 (CVBS or monochrome) cameras or 3 Y/C cameras can be connected

Up to 6 CVBS or monochrome cameras or 3 Y/C cameras can be connected to a Rio board. Also CVBS or monochrome connections in combination with Y/C connections are allowed. Of course every Y/C camera needs to be connected to Y and C connectors on the Rio that belong together.

Black & white (grayscale) digitizing

Black and white camera standards CCIR (50 fields per second) and EIA (60 fields per second) are supported. Different output formats are possible (grayscale, binary).

Color digitizing, inputs Y/C or CVBS

The NTSC (60 fields per second), PAL and SECAM (50 fields per second) color standards are supported. A wide variety of output formats is supported.

Simultaneous grabbing from two black and white cameras

Although the basic version of the Rio only has one input module, it still is capable of simultaneous grabbing at 50 (CCIR) or 60 (EIA) fields per second with two genlocked monochrome cameras (stereo locked mode). However to obtain conventional output formats, postprocessing is needed, which will have an impact on the capture rate.

Supports progressive scan cameras

The Rio can be used to digitize from a black and white progressive scan camera both non-interlaced at 25 (CCIR) or 30 (EIA) frames per second as well as interlaced at 50 (CCIR) or 60 (EIA) frames per second, e.g. JAI CV-M10). Full frame camera input is supported for the Full Rio as well as for the Basic Rio. For the Basic Rio however postprocessing is needed to obtain conventional output formats. Additionally the Full Rio can also adjust brightness and contrast in full frame mode, or the Full Rio can be used to digitize from two progressive scan cameras simultaneously.

Independent processing of two video sources

Because the full version of the Rio also has two DMA channels, two color cameras each can be handled totally separately, so it is possible for example for one input module to be connected to a color camera and one input module to a monochrome camera. Also simultaneous grabbing from two color cameras is possible with the Full Rio.

Fast switching between color cameras

For many image-processing applications, evaluating outputs from multiple cameras is desirable. When allowable with respect to speed constraints, hardware costs can be reduced by fast switching between multiple cameras on a field by field basis, using a single frame grabber. With traditional grabbers, fast switching between color cameras demands color carrier sub-locking in addition to a conventional genlock. This often involves modifying camera electronics, thus increasing costs.

The full version of the Ellips Rio frame grabber is capable of fast switching between two color cameras without color carrier sub-locking, because each of the two cameras can be connected to its own input module. In this mode, a field rate of 25 (PAL/SECAM) or 30 (NTSC) fields per second per camera can be achieved. When no RGB output is required, this mode can even be used at 50 (PAL/SECAM) or 60 (NTSC) fields per second per camera.

Simultaneous grabbing from four black and white cameras

With the Full Rio, because it has two input modules, both modules can be used in stereo locked mode, making simultaneous grabbing at 50 (CCIR) or 60 (EIA) fields per second with four genlocked monochrome cameras possible. However to obtain conventional output formats, postprocessing is needed, which will have an impact on the capture rate.

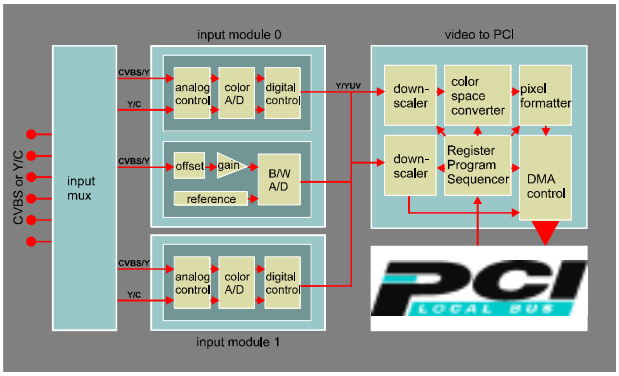
High quality black and white input with programmable gain and offset

For high quality black and white measurements, the full version of the Rio has a separate converter stage with programmable gain and offset. Its input can be switched at field rate between genlocked cameras. In contrast to the other modules (which only have an output range of 192 values, which will result in missing values when mapped to a 256 value scale), the high quality black and white module has a full output range of 256 values.
Therefore for serious black and white measurements, the full version of the Rio is recommended.

Supports RGB and RGBA cameras

With the Full Rio, one RGB (A) camera can be connected. Postprocessing is needed to obtain one of the output formats that are supported (including planar output).

Architectural overview



On a Basic Rio, only input module 0 is available without the High Quality Black & White functionality.

Connected to the input modules are the two scalers; the High Performance Scaler (HPS) that consists of three parts (downscaler, color space converter and pixel formatter) and the more basic Binary Ratio Scaler.Each input module can be connected to either scaler.

The scalers are connected to the DMA control (two DMA channels), which on its turn is connected to the PCI local bus.

Specifications

Host Computer Interface

- High speed DMA burst transfer (up to 132MB/s)
- Programmable transfer controller
- Support for multiple boards in one system

Acquisition

- RS-170, CCIR, NTSC, PAL, SECAM, Y/C or monochrome inputs
- Resolutions: any size up to:
  - PAL, SECAM, CCIR native: 768x576
  - NTSC, EIA native: 640x480
- Output formats:
  - RGB32 (αRGB)
  - RGB24 (RGBR...)
  - RGB16 (5:6:5)
  - RGB15 (α:5:5:5 or 5:5:α:5)
  - RGB8 (3:3:2)
  - YUV16 (CCIR)
  - Y8 (256 grayscale)
  - Y2 (2 bit grayscale)
  - Y1 (B/W)

  Compensation of Gamma Pre-Correction is supported on RGB modes.

- Sample rate: 14.75 / 7.38 MHz for PAL / SECAM; 12.27 / 6.13 MHz for NTSC
- Digital PLL provides stable synchronization even when using still video cameras and VCRs
- Support for any combination of up to three Y/C video sources and six composite or monochrome video sources
- 6 SMB connectors for six monochrome, CVBS, three Y/C pairs (S-Video) or one RGB (A) camera

Software support

- Portable operating system independent C-library

- Supported platforms:
  - DOS (32-bit): (including full source code)
    Watcom C/C++ (11.0) + Pharlap TNT DOS-extender
  - Windows 9x/NT/2000/XP (32-bit):
    Microsoft Visual C 4.x / 5.x / 6.x
    Microsoft Visual Basic 6
    VxD/device driver and DLL for C-library and Visual Basic
  - Real-time operating systems: VxWorks
    WindRiver Tornado 2.x

- Capture and sample applications for DOS and Windows (RioWin demo program for Windows 9x/NT/2000/XP)

- Support for Image-Pro Plus (development tool)

- 3rd party support by ILIB.

Specifications subject to change without notice.
For more information, feel free to contact Ellips.



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