Single-Channel Color or Monochrome Image Acquisition

NI 1411

- Color or monochrome acquisition
- 1 NTSC, PAL, S-Video, RS-170, or CCIR input
- Onboard real-time HSL color conversion for fast color matching
- Partial image acquisition with onboard programmable region of interest
- Onboard pixel decimation
- Programmable gain and offset
- 3 by 8-bit RGB look-up table
- 1 external trigger/digital I/O line
- Transfer rates up to 132 Mbytes/s

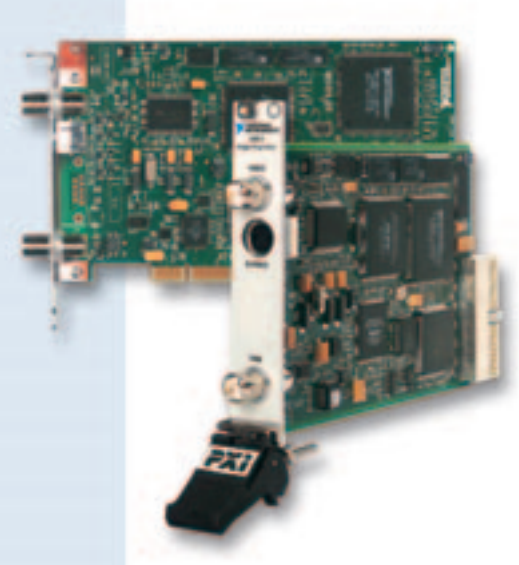
Models
- NI PCI-1411
- NI PXI-1411

Operating Systems
- Windows 2000/NT/XP/Me/9x

Recommended Software
- LabVIEW
- Measurement Studio
- Vision Development Module
  - IMAQ Vision
  - NI Vision Builder

Other Compatible Software
- C/C++

Driver Software (included)
- NI-IMAQ



Overview and Applications

For high-quality analog color image acquisition at an affordable price, National Instruments offers the NI 1411 Series, which consists of PCI and PXI plug-in image acquisition devices that accept analog video input from standard color or monochrome cameras. These devices come with easy-to-use image acquisition driver software. Unlike multimedia "frame grabbers", the NI 1411 Series features increased image processing throughput, such as on-the-fly color conversion to HSL and partial image acquisition with programmable region of interest.

Real-Time Color Conversion

Real-time color conversion is especially useful for high-speed color matching in industrial or scientific applications, even in varying illumination. An example of HSL in action is using color to inspect the presence of an object even though there are shadows and/or reflections. Lighting variations do not affect the image (hue). Use the powerful color matching functions in IMAQ Vision to locate objects quickly and accurately with the onboard HSL conversion.

Easy-to-Use Driver Software

National Instruments NI-IMAQ driver level software offers the most comprehensive software interface for image acquisition. NI 1411 Series devices are shipped with the NI-IMAQ image acquisition driver software and National Instruments Measurement & Automation Explorer for easy configuration of NTSC and PAL color cameras. Using NI-IMAQ, you can quickly and easily start your application without having to program at the register level. You can program your image acquisition application in LabVIEW, LabWindows/CVI, and Measurement Studio. In addition, NI-IMAQ controls the NI 1411 digital I/O line.

INFO CODES

For more information, or to order products online visit *ni.com/info* and enter:

pci1411
pxi1411

BUY ONLINE!

Performance Gains with Partial Image Acquisition

The NI 1411 Series includes features that improve overall image acquisition and image processing speed. You can choose to acquire only a portion of the image using the onboard programmable ROI feature. You can configure the size of the acquired image using Measurement & Automation Explorer, or use the ROI tools in the NI-IMAQ driver software to transfer only a subset of the image to PC memory for processing. Partial image scanning results in fewer pixels to process. For example, using partial image scanning, you can reduce a 640 by 480 image to a 400 by 400 image and increase your processing speed by operating on 48 percent fewer pixels.

Color Image Acquisition Performance Gains with Onboard Decimation

Onboard decimation also provides image acquisition and processing performance gains by allowing onboard scaling or decimating of the image without using the PC processor. Onboard decimation scales the image by removing every second, fourth, or eighth pixel (powers of two only). By reducing the number of pixels (decimation) on the IMAQ board, the system has fewer pixels to process with the PC processor. If you remove every other pixel using onboard decimation, the image size decreases by 50 percent, which speeds up your processing.

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Hardware

PCI Interface

The PCI bus is the electrical interface for both the NI PCI-1411 and NI PXI-1411. The National Instruments custom MITE ASIC for interfacing to the PCI bus offers the highest image acquisition performance available. The MITE ASIC can transfer data at a maximum sustained rate of 100 Mbytes/s in master mode to maximize the use of the available PCI bandwidth.

Onboard Memory

The NI 1411 Series has 16 MB of onboard memory, useful for temporary storage of images being transferred to the PCI bus.

Trigger and Strobe

You can use the digital I/O line as an input to trigger image acquisition or as an output to control solenoids, solid-state relays, or strobes.

Programmable Gain and Offset

The NI 1411 Series has programmable gain and offset circuitry for optimizing the input signal range.

I/O Connector and Cabling

Two external BNC connectors are used for the video source and digital I/O line. Each product shipment includes a 2 m BNC cable.

Applications

The NI 1411 devices offer machine vision developers real-time color conversion of NTSC, PAL, and S-Video formats to the hue, saturation, and luminance (HSL) image planes. Because the hue plane is effective for analyzing images in which shadows and lighting gradients are present, the NI 1411 Series makes inspection systems more reliable. With these devices, industrial inspection and scientific imaging developers can increase the reliability and performance of numerous applications, including inspecting light emitting diodes (LEDs), fabric and textiles, color paint and powder, pharmaceutical blister packs, and difficult to light applications.

Color Pattern Matching

Use color pattern matching to locate quickly known reference patterns, or fiducials, in a color image. With color pattern matching, you create a model or template of an object. The search tool first scans the image to match the color distribution, then scores the match for shape. The score relates to how closely the model matches the pattern found. You should use color pattern matching to locate reference patterns that the color and spatial information in the pattern fully describe. Color can often simplify a monochrome problem by improving contrast or separation.

Ordering Information

NI PCI-1411 777857-01
NI PXI-1411 778006-01

Includes the NI 1411 hardware, NI-IMAQ for Windows 2000/NT/XP/Me/9x, and a 2 m IMAQ-BNC-1 cable.

Specifications

Typical for 25 °C unless otherwise noted.

Supported Formats

NTSC composite or S-video	30 frames/s
PAL composite or S-video	25 frames/s
S-Video NTSC	30 frames/s
S-Video PAL	25 frames/s

Video Inputs

Video 0	Single-ended BNC for CVBS
Video 1	Single-ended S-Video (Y/C)
Input impedance	All 75 Ω ±1%
Input range (black to white)	700 mV (calibrated) or 400 mV to 1.00 V (variable gain)

Accuracy

Luma gain	±2.5% of reading
Chroma gain	±2.5% of reading

Output Formats (Square Pixels)

RGB (Red, Green, Blue)	3 by 8 = 24-bit
HSL	3 by 8 = 24-bit
H, S, or L	8-bit
LUT	3 by 8 bit (RGB only)

Color Decoding

NTSC/PAL	Luma/Chroma COMB, Notch, or optional filters for Peaking

Gain and Offset

Brightness, contrast, saturation, and hue controls

External Synchronization and Trigger Signals

Trigger sense	TTL
Trigger polarity	Programmable (positive or negative)
Pulse width	20 ns minimum detectable
VIH (TTL)	2 V
VIL (TTL)	0.8 V

Pixel Clock (square pixel sampling rate)

Internally generated for square pixels mode

NTSC	12.27 MHz
PAL	14.75 MHz
Bus interface	Master, slave
Bus-master performance	100 Mbytes/s (sustained)

Power Requirements

+5 VDC (±5%)	1.25 A
±12 VDC (±5%)	<100 mA

Physical

Dimensions

PCI	10.7 by 17.5 cm (4.2 by 6.9 in.)
PXI	10 by 16 cm (3.9 by 6.3 in.)

Environment

Operating temperature	0 to 55 °C
Storage temperature	-20 to 70 °C
Relative humidity	5 to 90%, noncondensing