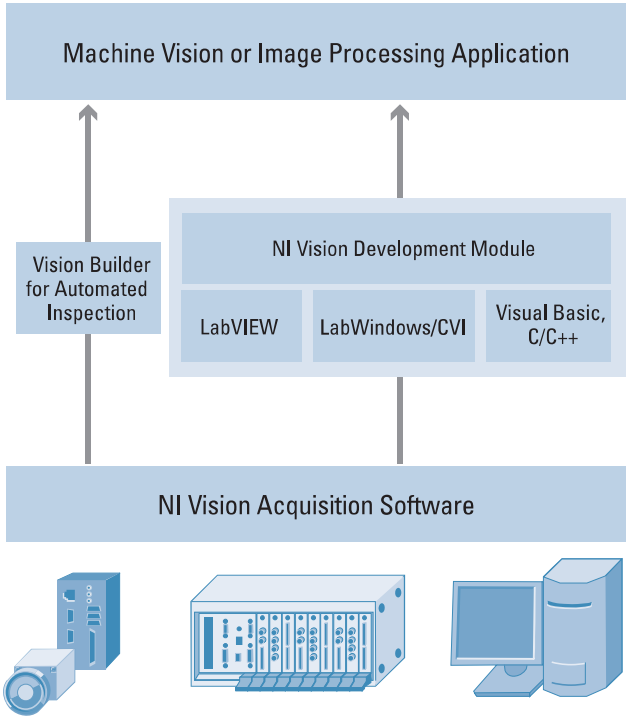
Vision

Contents

Overview

National Instruments is a leading machine vision and scientific imaging hardware and software tools provider. From inspecting automotive parts to researching advanced medicines, engineers and scientists use NI vision software and hardware to meet a diverse set of application challenges, faster and at lower cost.



Vision Hardware

National Instruments image acquisition hardware comes with advanced features that translate into higher performance for your application. These include PCI Express-based frame grabbers and compatibility with thousands of cameras. NI offers a wide range of image acquisition devices that can acquire from analog, digital, Camera Link, IEEE 1394, and GigE Vision (Gigabit Ethernet) cameras.

Compact Vision System

The National Instruments Compact Vision System gives you flexibility, integration, and ruggedness for all of your inspection, alignment, gauging, and identification applications. A high-performance processor integrated with three IEEE 1394a ports means that NI Compact Vision System is equipped to handle any inspection task. The Compact Vision System offers reconfigurable I/O to communicate with a wide range of automation devices including PLCs, relays, and robotics. It is designed for extreme operating temperatures common in manufacturing environments. No longer are you confined to the limited image processing capability, sensor size, and sensor speed of traditional smart cameras.

Vision Software Overview

Vision Software

National Instruments has been a leader in machine vision and image processing for nearly a decade by making powerful software that is easy to use.

Image Acquisition

NI vision software can acquire images from thousands of different cameras. To acquire, display, save, and monitor images from cameras, use Vision Acquisition software, which is included with all NI frame grabbers and with both image processing software packages – Vision Development Module and Vision Builder for Automated Inspection (Vision Builder AI). Vision Acquisition software is also sold separately for IEEE 1394 and GigE Vision image acquisition.

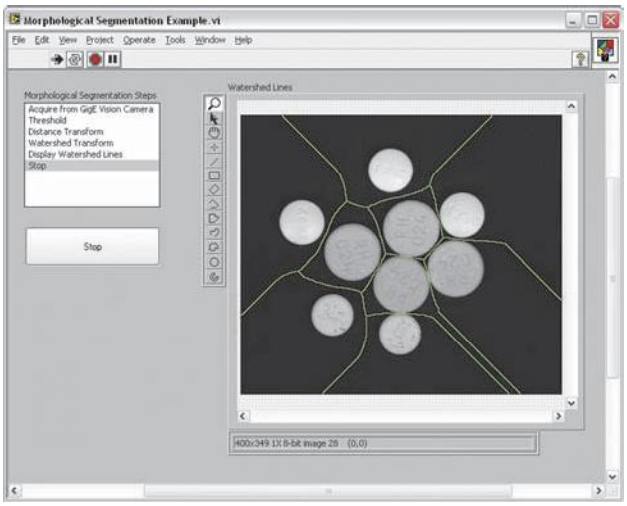


Image Processing and Machine Vision

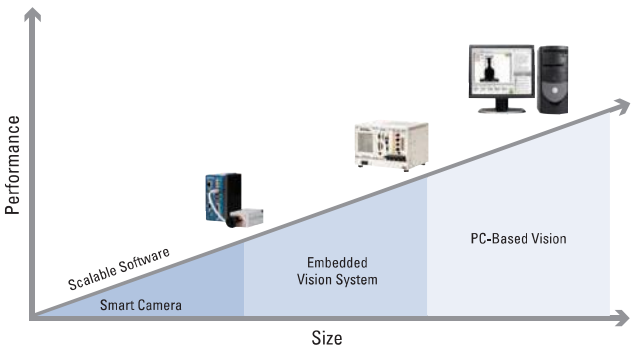
To process images, NI vision software comes in two different packages – the Vision Development Module and Vision Builder AI. The Vision Development Module is a collection of hundreds of vision functions for programmers using LabVIEW, LabWindows/CVI, C/C++, Visual Basic, or .NET. Vision Builder AI is an interactive software environment for configuring, benchmarking, and deploying machine vision applications without programming. Both software packages work with all NI vision frame grabbers and the NI Compact Vision System.

Scalable Software

As your needs change, you can always migrate between Vision Builder AI and the Vision Development Module. You can automatically generate ready-to-run LabVIEW VIs from Vision Builder AI. Conversely, you can expand Vision Builder AI with custom steps and LabVIEW VIs with the Vision Builder AI Development Toolkit. The result is a completely scalable vision platform that can expand with your needs.

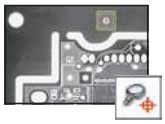
Features	Vision Acquisition Software	Vision Builder for Automated Inspection	Vision Development Module
		Configurable software	Programming libraries
One-shot acquisition	✓	✓	✓
Continuous acquisition	✓	✓	✓
Triggered acquisition	✓	✓	✓
Camera configuration	✓	✓	✓
Trigger output	✓	✓	✓
Full frame-rate display with overlays	✓	✓	✓
Write and read image files	✓	✓	✓
Write and read AVI files	✓	–	✓
Pixel manipulation tools	–	–	✓
Image manipulation tools	–	✓	✓
Image filters	–	✓	✓
Image arithmetic	–	✓	✓
Image logic functions	–	✓	✓
Advanced thresholding	–	✓	✓
Morphology	–	✓	✓
Region-of-interest tools	–	✓	✓
Particle analysis	–	✓	✓
Object classification	–	✓	✓
Gauging	–	✓	✓
Pattern matching	–	✓	✓
Geometric matching	–	✓	✓
Distortion calibration	–	✓	✓
Real-world measurements	–	✓	✓
1D and 2D bar code readers	–	✓	✓
Data matrix grading	–	✓	✓
Coordinate systems	–	✓	✓
Complex and Fourier analysis	–	✓	✓
Optical character recognition	–	✓	✓
Optical character verification	–	✓	✓
Color matching	–	✓	✓
Color pattern matching	–	✓	✓
Defect inspection	–	✓	✓
Instrument reader	–	–	✓
LabVIEW Real-Time-compatible	–	✓	✓
Performance benchmarking	–	✓	✓
LabVIEW VI generation	–	✓	✓
C Code generation	–	–	✓
VB Code generation	–	–	✓
Deterministic algorithms	–	–	✓
Customizable user interface	–	–	✓
Integration with motion control	–	–	✓
Integration with data acquisition	–	–	✓
Industrial communication protocols	–	✓	✓

Table 1. NI Vision Software Products



Vision Software Capabilities

National Instruments vision software includes hundreds of image processing and analysis functions. A subset of the tools available in the Vision Development Module and Vision Builder AI are shown below.



Pattern and Geometric Matching

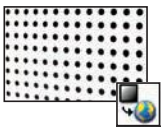
Learn and locate objects and patterns in your images. National Instruments patented matching algorithms locate patterns fast with very high accuracy.

Bar Code Reader and Grader

Read 1D bar codes as well as 2D codes like Data Matrix and PDF 417. You can decipher codes applied through ink jets, thermal transfer, laser etching, or dot peen.

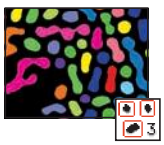
Optical Character Recognition/Verification

NI OCR functions use a trainable OCR algorithm specifically designed to identify and verify all types of fonts, characters, and symbols despite poor and inconsistent image quality.



Spatial Calibration

Using spatial calibration functions, you can calibrate your image to take accurate, real-world measurements from images, regardless of camera perspective or lens distortion.

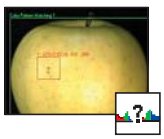


Particle Analysis

Use particle analysis to detect connected regions or groupings of pixels in an image and make selected measurements of those regions. Choose from more than 80 unique measurements that return data in both real-world and pixel values.

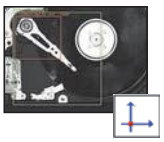
Image Arithmetic and Logic Functions

Operators perform basic arithmetic and logical operations on images. Use operators to add, subtract, multiply, and divide an image with other images or constants.



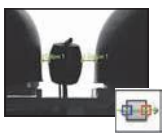
Color Inspection

Color matching quantifies which colors and how much of each color exists in a region of an image and uses this information to check if another image contains the same colors in the same ratio.



Coordinate Systems

Set up coordinate systems to ensure that all your measurements move with the object within the field of view.



Edge Detection

Use the edge detection tools to identify and locate discontinuities in the pixel intensities of an image. Find edges in order to align, measure, or detect features in the image.

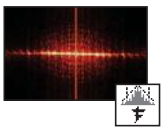


Image Filters and Frequency Analysis

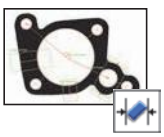
Frequency filters, such as the fast Fourier transform (FFT), alter pixel values with respect to the periodicity and spatial distribution of the variations in light intensity in the image.

Object Classification

Classification is a tool for identifying an unknown object by comparing its significant features to a set of features that represent known samples.

Image Segmentation

NI vision software comes with several options to segment and partition images into related components. Segmentation is an important part of many imaging applications that need to extract certain features or objects in order to process them further.



Gauging

You can use dimensional measurement or gauging tools to obtain quantifiable, critical distance measurements – such as distances, angles, areas, line fits, circular fits, and counts.

Golden Template Comparison

Find defects in an image by comparing a perfect (golden) sample to all subsequent samples. Golden template comparison detects surface defects, label misprints, and overall quality issues.