Vision Development Module for LabVIEW, LabWindows/CVI, and Measurement Studio

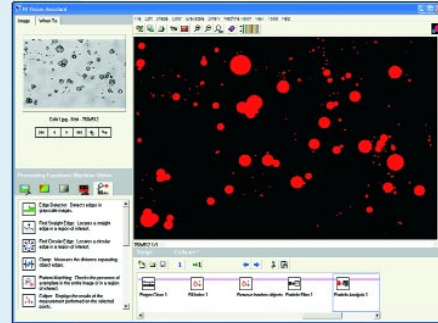## NI Vision Development Module

NI Vision Assistant
- Interactive vision prototyping environment that generates LabVIEW diagrams or builder files for LabWindows/CVI and Visual Basic code
- Offline inspection with automated scripting and batch processing
- Image display with zooming, panning, extracting, and scrolling
- Measurements such as distances, areas, and locations returned
- Visual image management with the image browser
- Performance benchmarking with the performance meter

NI IMAQ Vision
- High-level machine vision and image processing functions as well as display tools
- Processing and analysis of grayscale, color, and binary images
- High-speed pattern matching for locating objects of various size and orientation, even in poor lighting
- Particle analysis for calculating more than 80 parameters, including the area, perimeter, and location of objects
- Image calibration for correcting lens distortion and camera angle
- Compatible with LabVIEW Real-Time

Operating Systems
- Windows 2000/NT/XP

Overview

The National Instruments Vision Development Module is for engineers and scientists who are developing machine vision and scientific imaging applications. The module includes NI Vision Assistant, an interactive environment for developers who need to quickly prototype vision applications without programming, and IMAQ Vision, a library of powerful functions for image processing.

NI Vision Assistant and IMAQ Vision work together to simplify vision software development. NI Vision Assistant can automatically generate a LabVIEW block diagram. You can run the diagram generated by itself, or integrate it into your automation or production test application, which may include motion control, instrument control, or data acquisition. You can also take advantage of embedded capabilities with LabVIEW Real-Time, resulting in greater reliability, determinism, and ease of use. You can find more information about the Vision Development Module by visiting *ni.com/vision*

Prototype Quickly with NI Vision Assistant

Building a vision application often involves time-consuming experimentation. Some of the benefits of using NI Vision Assistant to prototype your application before development include:
- Get ideas about how to solve your application using the solution wizard
- Test different processing strategies
- Test a particular strategy on a variety of images
- Explore "what-if" conditions quickly and easily
- Immediately visualize the effects of changing an image processing control parameter
- Benchmark your solution
- Develop a script that you can run in batch mode on hundreds of images

Develop Your Vision Solution with IMAQ Vision

IMAQ Vision is a high-level programming library that includes an extensive set of functions for machine vision and scientific imaging. Here are some of the tasks you can perform with IMAQ Vision:
- Filter images to improve their quality before inspection
- Search grayscale and color images for instances of a specified template
- Measure features of a part regardless of its image orientation
- Count, label, and measure objects in an image
- Overlay regions of interest, text, and bitmaps onto images
- Calibrate images to take accurate, real-world measurements regardless of camera perspective or lens distortion

Vision Development Module for LabVIEW, LabWindows/CVI, and Measurement Studio

NI Vision Assistant

NI Vision Assistant is for machine vision and scientific imaging developers who need to develop gauging, alignment, inspection, and particle analysis applications. A configurable prototyping environment, NI Vision Assistant, accelerates vision application development. You can easily learn image processing and investigate vision software strategies because it requires no programming. NI Vision Assistant generates a LabVIEW block diagram or a builder file of the machine vision and image processing functions for LabWindows/CVI, Visual Basic, C, and Visual C++. With these features, you can go from the drawing board to a working solution faster than ever.

NI Vision Assistant contains more than 200 functions and is compatible with IMAQ Vision.

Faster Application Development

For developers under pressure to reduce cost and time to market, NI Vision Assistant accelerates development. You can use the Solution Wizard to guide you to success in a wide range of typical applications. You can interactively create an NI Vision Assistant script that you can reuse or run in batch mode on hundreds of images. In addition, NI Vision Assistant generates LabVIEW code or outputs a builder file, which is a text listing of IMAQ Vision function calls, complete with parameters.
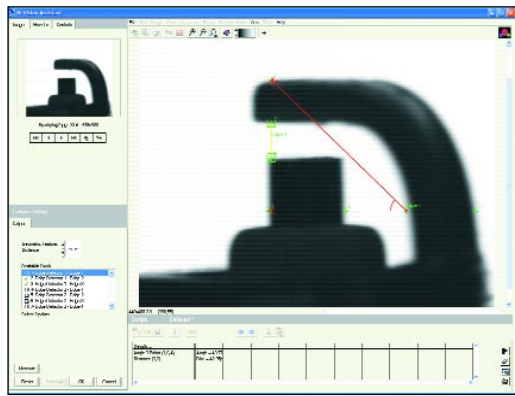
Generate LabVIEW VI Block Diagrams

NI Vision Assistant generates a LabVIEW block diagram based on your interactive prototyping session. This block diagram includes image acquisition functions, IMAQ Vision analysis, and display functions, and the constants for the functions. The diagram is the complete LabVIEW VI source code for your interactive session. You can run the code generated alone, or integrate it into your automation or production test application, which may include motion control, instrument control, and data acquisition. You can also modify the diagram after integration.

Builder Files for LabWindows/CVI and Measurement Studio

NI Vision Assistant generates a builder file for LabWindows/CVI, C, and Visual Basic developers. This builder file gives you a detailed, step-by-step description of the image acquisition, image processing, analysis, display, functions, as well as their parameters. Simply cut-and-paste the builder file text into your C or Visual Basic projects.
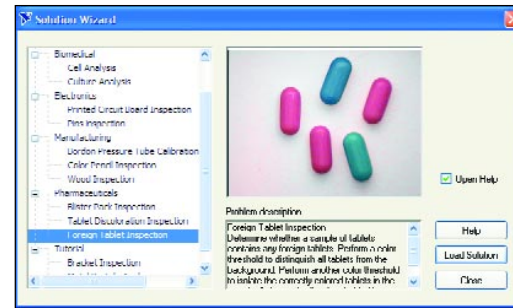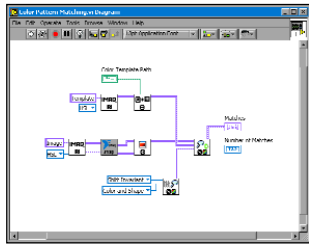
Vision Solution Wizard

The Vision Solution Wizard guides you to success. Select from a variety of generalized solutions for automotive, biomedical, electronics, and manufacturing.

Performance Benchmark Tool

NI Vision Assistant reports the speed of each function in your solution. You can use this information to optimize the speed of your application.
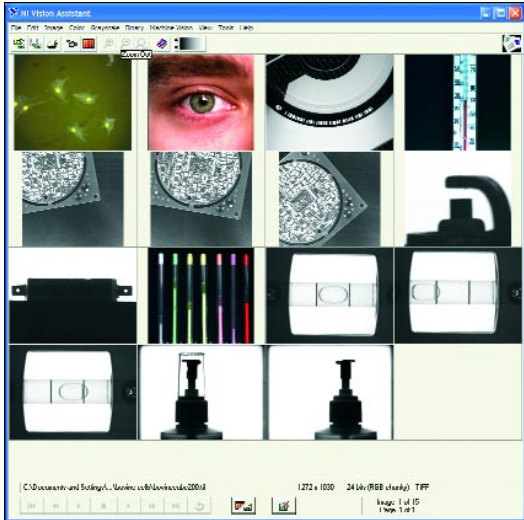
Vision Development Module for LabVIEW, LabWindows/CVI, and Measurement Studio

Image Acquisition

Acquire images at full frame rate using IMAQ hardware and trigger an acquisition with a digital trigger.

Image Browser

Review, load, and display multiple images at once.

Offline Batch Processing

Test your vision strategy or inspect a large number of samples with offline batch processing.

Image Loading and Saving

Load and save binary, grayscale, or color images in BMP, TIFF, JPEG, or PNG format.

IMAQ Vision

IMAQ Vision software from National Instruments adds high-level machine vision and scientific imaging to LabVIEW, LabWindows/CVI, C, and Visual Basic. IMAQ Vision includes an extensive set of functions for grayscale, color, and binary image display; image processing (statistics, filtering, and geometric transforms); pattern matching; shape matching; blob analysis; gauging; and measurement. End users, integrators, and OEMs use IMAQ Vision to accelerate the development of industrial machine vision and scientific imaging applications. IMAQ Vision is used in machines as well as factory and laboratory automation operations that require extremely reliable, high-speed vision systems.

Accelerate Application Development

IMAQ Vision is easy to use. Transparent memory management, in addition to logically named VIs, functions, and parameters, makes IMAQ Vision easy to learn. The high-level machine vision functions work together intuitively, so you can develop applications faster and with fewer steps.
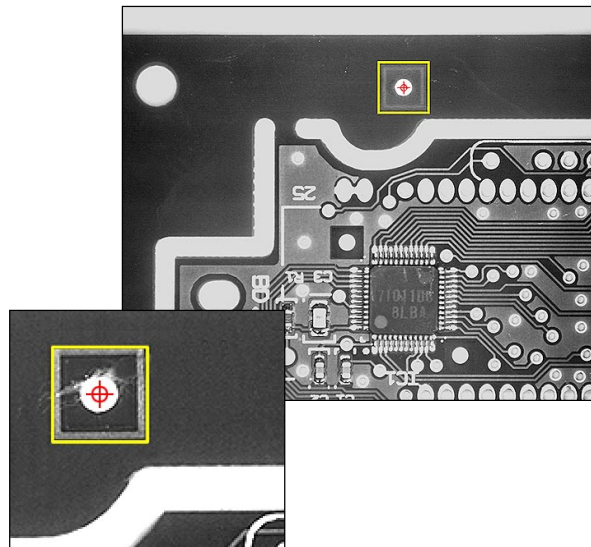
Vision Development Module for LabVIEW, LabWindows/CVI, and Measurement Studio
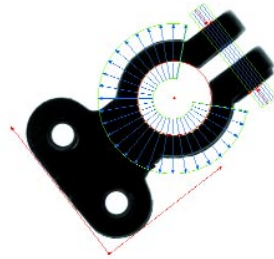
Vision Functions

IMAQ Vision software in the Vision Development Module provides complete functionality for industrial machine vision and scientific image analysis. It includes hundreds of functions for gauging and measurement, particle analysis, edge detection, filtering, image processing, and grayscale and color pattern matching. Listed here is a brief summary of the IMAQ Vision functions, which are also available with NI Vision Assistant.

High-Speed Grayscale Pattern Matching

Use pattern matching for alignment, measurement, and inspection applications. Train on an object and then search for the object. Specify search parameters and constraints to limit the search. The search function uses a smart search strategy to quickly find objects even when objects are out of focus, at various angles, in shadows, or partially hidden.

High-Level Machine Vision Tools

The IMAQ Vision machine vision functions are high-level functions that simplify common machine vision tasks. For example, the machine vision functions include selecting regions of interest in the shapes of points, lines, rectangles, and annuli. In addition, IMAQ Vision defines coordinate systems based on features in an image, so you can reliably make measurements as objects in your image move and change orientation. Machine vision functions for counting and measuring objects, measuring intensities, measuring distances between edges, and locating edges all make machine vision tasks easier than ever.

Spatial Calibration

Using IMAQ Vision spatial calibration functions, you can calibrate your image to take accurate, real-world measurements from images, regardless of camera perspective or lens distortion. You can set simple calibration data by hand or have IMAQ Vision automatically learn the calibration data for an image.

Image Display Tools

Use image display functions for fast image display. You can use the interactive image display with ROI, zoom, and line profile tools. Plus, you can overlay lines, rectangles, arcs, circles, and ellipses with selectable color and use display features to add cursors and line profiles. Overlay bitmaps and text to an image easily. Overlays can be nondestructive so you can display important information without changing your underlying image data.

Particle Analysis and Morphology

Use particle and morphology functions to process and analyze binary particles in an image. Count, label, and measure cells and objects. Calculate the area, perimeter, orientation, location, and 80 other parameters. Plus, to make counting easier, change the shape of blobs with morphology functions, and remove and filter blobs of certain sizes with spatial filters.

Morphology Calculations

Using morphology calculations, you can perform functions such as erode, dilate, fill holes, convex (fill holes on the edges), reject objects on border, remove blobs, grayscale morphology, segmentation, separate blobs, distance, Danielsson, find circles, and skeleton.

Particle Analysis Results

Calculate the area, perimeter, moment of inertia, orientation, mean chord, width, height, ellipse axis, elongation factor, circularity factor, type factor, projection, location, bounding rectangle, and many more.

Color Pattern Matching

Color can often simplify a monochrome problem by improving contrast or separation of the object from the background. Use color pattern matching to locate reference patterns in color images that are fully described by the color and spatial information in the pattern. With color pattern matching, you create a model or template of an object. The search tool first scans the image to match the color of the model and then scores match for shape. The score relates how closely the match resembles the template.

Vision Development Module for LabVIEW, LabWindows/CVI, and Measurement Studio

Image Processing

IMAQ Vision image processing functions filter, manipulate, smooth, and quantify images. Processing functions include the ability to threshold images, including automatic thresholding and multiple threshold ranges; the ability to use built-in and user-defined look-up tables; and the capability to equalize, label, and invert images. Using the Magic Wand function, you can segment an image based on a single pixel value.

Arithmetic operations include add, subtract, multiply, and divide. Plus, there are logical operations – NOT, AND, OR, XOR, and compare. Image statistics functions include histogram, histogram equalization, minimum, and maximum values. Filtering functions include threshold, autothreshold, lowpass filter (Gaussian), median filter, edge detection, and custom filters of any kernel size. Use complex functions such as 2D FFT and frequency-domain filtering to further analyze your images.

File I/O

IMAQ Vision handles the ability to read and write images to PNG, BMP, JPEG, and TIFF file formats, as well as a series of images in AVI movie format. IMAQ Vision also handles saving additional data, such as calibration information, pattern matching templates, and nondestructive overlay data, with images in the PNG format.

Region-of-Interest Tools

Region-of-interest tools in IMAQ Vision handle creating regions of interest both interactively and programmatically. Region-of-interest shapes that work with IMAQ Vision include points, lines, polygons, rectangles, rotated rectangles, circles, ellipses, and annuli.

Image Manipulation

Image manipulation functions include resample, expand, extract, interlace, symmetry, rotate, shift, unwrap, and 3D view.

Pixel Manipulation

With IMAQ Vision, you can individually manipulate pixels within your image. These functions include the ability to get and set the values of individual pixels or regions of pixels, draw text and shapes onto your image, and convert images to and from array data.

Filters

IMAQ Vision includes a number of filter operations that are very useful for preprocessing your images to improve the quality for image processing. These operations include convolution with built-in and user-defined kernels and lowpass, Nth order, and mean filtering. In addition, there are functions for edge highlighting and detection, such as Sobel, Pruitt, Roberts, and Canny, and a function for computing the normalized cross-correlation of two images.

Image Analysis

IMAQ Vision contains analysis functions to obtain information about the contents of the image and particles in the image. These analysis functions include histogram, centroid, quantify, profiling along a line or region of interest, and computing average pixel intensities along parts or a whole image.

Deployment Engine

The Deployment Engine provides everything you need to install and run IMAQ Vision executable applications at your computer, production floor, and laboratory. The Deployment Engine includes the IMAQ Vision engine, as well as installation and support files. It also integrates easily with the LabVIEW Application Builder, the LabWindows/CVI distribution kit builder, or your own custom installer.

Ordering Information

NI Vision Development Module for
    LabVIEW 777859-03
    LabWindows/CVI...777860-03
    Measurement Studio (for Visual Basic) 777860-03
NI Vision Development Module Deployment
    Engine 778044-01
    License 778044-00

BUY ONLINE!
Visit **ni.com/info** and enter VDM.