

Helping you unravel the secrets of Imaging Software



The choice of imaging software for an application can be a daunting task. These notes are designed to help you make the right choice.

How do I go about selecting the right software package for an application?

This is indeed a difficult question to answer without knowing the camera system you are using but let's try and give a few general hints and advice.

Firstly you must decide what image analysis and processing functions you need for the application before you purchase any part of the system.

The reason is that once you buy a camera and frame grabber you may find your choice is limited particularly if you want to do real time processing. If you have problems deciding on the image processing you need we can help you. We can help customers select the right product for their application by looking at sample images and processing those images so even before purchase they can see the results achievable. This is all part of the application support we can provide. We pride ourselves in doing the best we can to ensure complete customer satisfaction. We can also offer custom tailored software solutions if the standard products do not offer the features you need.

What standard software packages are available from Alrad Imaging and describe their main features and what they are used for?

This is a comprehensive 18 page document so in order for you to find the software most appropriate for your needs quickly we have produced a short introduction index which we hope assists you. As always if you are unsure of the right package to choose or want to discuss your application in detail please call our technical support line 01635 30345 or email full details to imaging@alrad.co.uk. We look forward to hearing from you.

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Time Warp

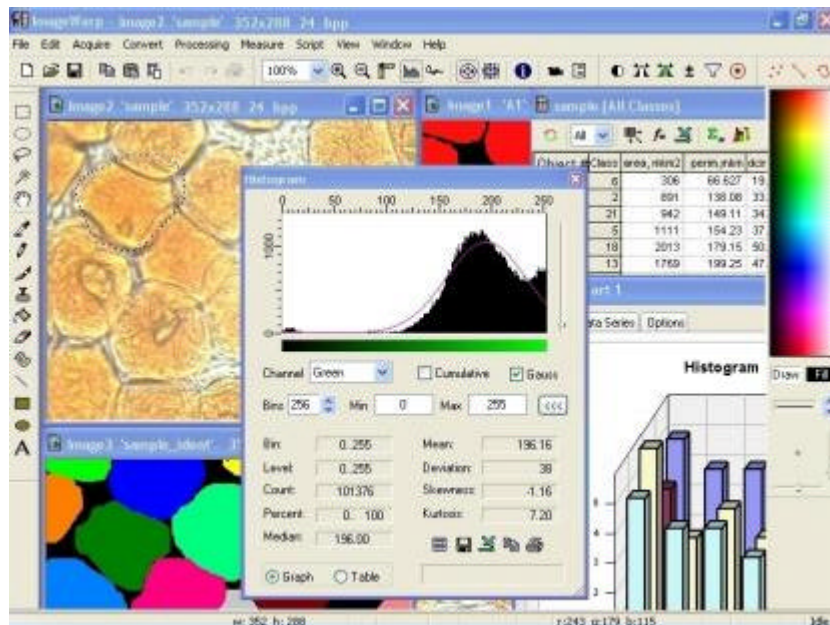
This is a low cost solution for customers wishing to capture a sequence of images either into memory or directly to hard disk. The speed of image capture will depend on the type of camera used and the speed of the PC used. Typically customers use this software for long term recording applications where high frame rate is not so important. Typical applications can be in microscope applications where long sequences are required to show the slow change in the movement of the object and are therefore akin to time lapse recording.

Image Warp

A powerful image processing package which has hundreds of image analysis and processing functions and is exceptionally good value for money particularly for anyone involved in scientific, research or microscopy imaging. This has a full scripting feature, which allows routine analysis to be carried out at the click of the mouse so this is also useful for many industrial applications. A demo version of image WARP is available upon request or can be downloaded from www.imagewarp.com



Summary



ImageWarp is universal image editing, processing and analysis software, which combines the power of graphic development environment, comprehensive image analysis toolset, and programming development techniques.

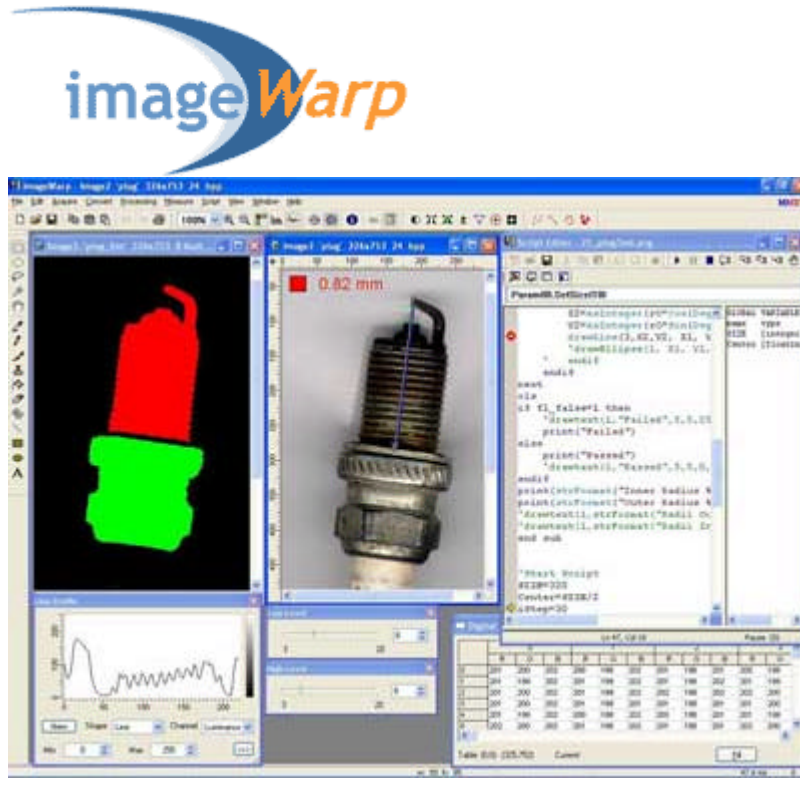
Designed to work under Windows 98/ME and NT/2000/XP, image Warp offers full compatibility with BitFlow imaging hardware and standard video capture devices, hundreds of high-performance image processing and measurements functions, built-in automatic scripting language with VB-like integrated development environment, databases and spreadsheets support, and various graphic representations of output data.

Unlike any other image analysis software, image Warp incorporates graphic editing tools and functions that work with a wide variety of image types including 16-bit, 32-bit and 64-bit (complex) images.

A multiple window interface allows for simultaneous display of static and live images, charts, and measurements for the rapid creation of custom applications and development of new imaging techniques.

Image Warp employs a multithreading processing engine, which provides parallel execution of several functions at the same time and automatic parallelization for systems with multiple CPUs.

Automatic and interactive measurement functions support more than 100 built-in and user-defined geometrical, optical and topological parameters. A number of proprietary processing algorithms and interface innovations make image Warp one of a kind.



Features

- acquisition
- interface
- graphic editing
- processing
- conversion
- geometry, arithmetics and logic
- interactive adjustment and segmentation
- filters
- fourier transform
- morphology
- generating
- calibration
- measurement
- analysis
- programming
- system requirements
- built-in video drivers
- customization



Applications

ImageWarp is being used by customers worldwide for a number of applications in various fields:

- histology and cytology
- morphometry and densitometry
- rontgenology and radiology
- electronic microscopy
- genetics and bioinformatics
- colour analysis
- quality control
- metrology
- gauging and sorting
- fibre analysis
- lab automation

MATRIX Vision Impact. The Image Processing Tools.

MATRIX Vision Impact is a comprehensive library with high performance algorithms for fast image processing. The library offers a software architecture designed for the future with an object oriented design.

OEMs and system integrators can easily use a huge number of functions for acquisition, processing, enhancement and measurement in their own application. MATRIX Vision Impact supports all MATRIX Vision frame grabbers as well as the intelligent PC camera MVcam in an optimum way. Using the library on hardware image processor accelerators is also supported by MATRIX Vision Impact.

The modular concept allows every MATRIX Vision user to work with the powerful basic library free-of-charge. The inexpensive extension modules can be licensed separately. This allows you to use only the modules you actually need in your applications. A hardware dongle is not needed; a MATRIX Vision product is enough to verify the module license. The protection function can be used in your own applications and modules, so you don't need a private protection mechanism.

An essential feature of the new MATRIX Vision image processing software is the availability on different platforms and CPUs. Linux and Windows are supported as operating systems. The library is available for the mvTITAN

grabber family's image processor, too. An extremely interesting feature for power-hungry, real-time applications is the seamless transfer of processing from the mvTITAN's local processor to the host CPU. That means that a performance upgrade using additional mvTITAN boards is easily possible.

Applications

The following industries can make use of the software:

- **Production:** Quality and completeness checks, automation, printed circuit board production and population
- **Drinks Industry:** Filling level checking, label printing checks and deposit bottle return systems
- **Packing and Printing Industry:** Print and blister checking
- **Pharmacy:** Colour and breakage checking
- **Robotics:** Object recognition and movement detection
- **Security:** Video surveillance, movement analysis
- **Medicine:** Endoscopy, biology, scanning electron microscopes, laboratory and particle investigation

Traffic: Vehicle number plate recognition in the car park and on the road

The Impact Base Module is a comprehensive library with about 120 useful functions for

Image acquisition, acquisition of sequences

Buffer allocation and data access

Display of library objects like images, palettes (look-up-tables), profiles and histograms

Drag and draw of Area of Interests (rectangles and lines)

File handling, read or write images in uncompressed BMP and TIFF file formats as well as user defined formats

Handling of three-dimensional datasets

Device handling for frame grabber, camera and scanner support

A huge number of image processing functions

The advanced image processing functions include

Point-to-point operations (arithmetic, binarization, etc.)

Spatial filtering operations (Sobel, Median filter, etc.)

Morphological operations (erosion, dilation, etc.)

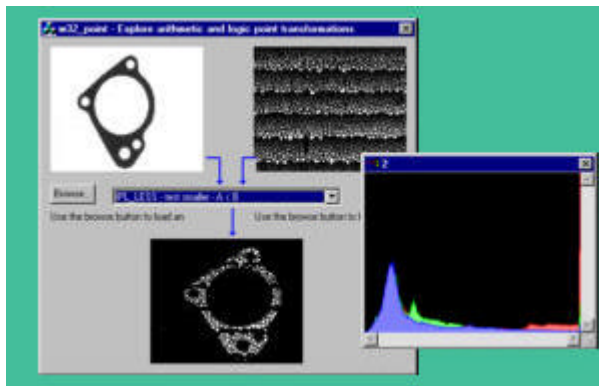
Statistical operations (histograms, profiles, etc.)

Geometric transformations (rotation, scaling, etc.)

Fast Fourier Transformation

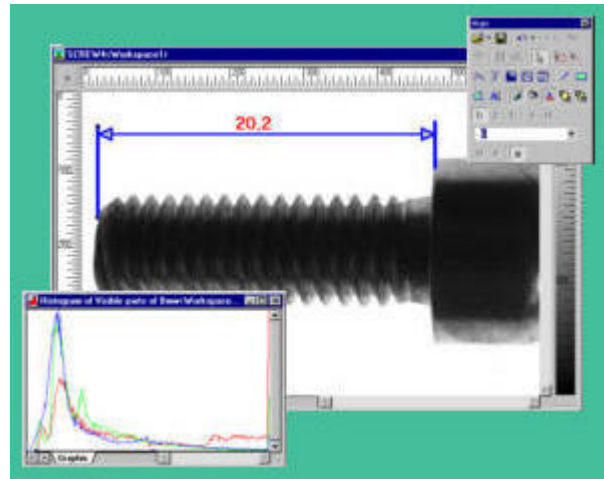
Shading correction

The Impact Base module is absolutely free in combination with a MATRIX Vision frame grabber or intelligent camera.



Impact Go! is an easy-to-use Windows application which allows interactive use of all basic functions of the Impact Base module. It's possible to acquire images or image sequences from your frame grabber device, analyse the images with tools like line profiles, statistical or histogram functions or extract features with spatial tools that isolate Area of Interests (AOI) from the rest of the image.

For image documentation **Impact Go!** includes drawing function with line, rectangle, text and free form overlay objects. This overlay doesn't destroy the image, it is saved in a separate file to allow a later modification of the overlay. The file formats TIFF, BMP, PPM are supported to load and save images. Images and analysis result can be printed to your standard printer.

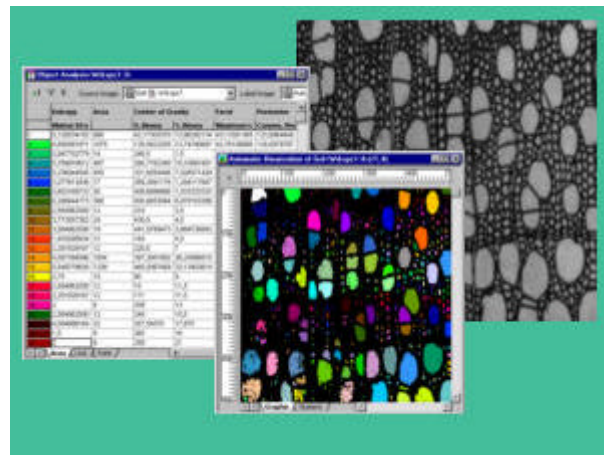
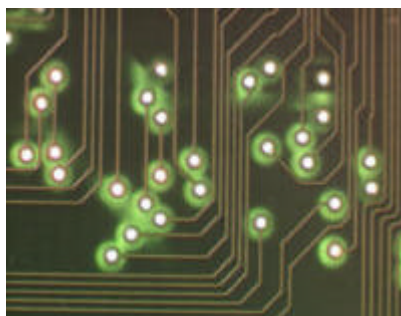


Impact S is a full featured program for digital image analysis with a complete collection of functions for acquisition, processing, improvement, correction and analysis of images. It is a good choice for a wide range of applications such as investigating cells, characterizing material properties, or analysing a diagnostic image.

This program includes all Impact Go! features and allows you to make interactive measurements, automatic count and particle analysis and supports more image file formats.

This tool is also a good choice for industrial system integrators wanting to pre-analyse the images and try out the Impact Base and extended modules of the MATRIX Vision Impact SDK.

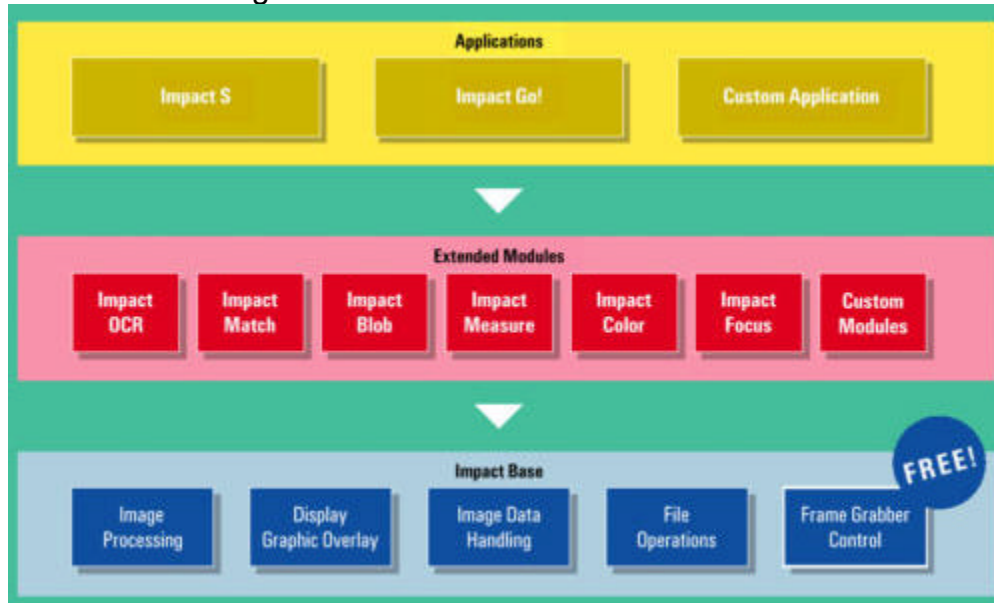
Impact S is easy to use because of its intuitive and easy-to-understand user interface and help system



The Modular Concept

The modular concept allows you to use single modules in your application. You have probably developed a lot of image processing software and you are just looking for a few additional tools. MATRIX Vision Impact can be used in parallel to your own libraries.

This well structured, modular concept also opens the world of smart embedded systems like intelligent cameras, sensors and special image processor based products, for example the mvTITAN frame grabber series or the MVcam intelligent camera



Impact Measure

The measurement module lets you measure the position and angle of edges within grayscale images. The measurement is performed with subpixel accuracy. Edge measurement is one of the most often used algorithms in machine vision applications.

The module includes a flexible edge-detection function to locate edges and pairs of edges in an area of interest automatically.

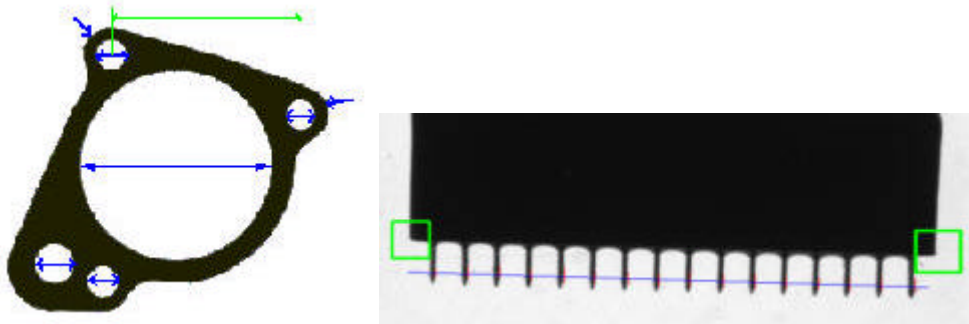
The function searches for all edges or edge pairs in the search window that fulfill the properties given by the parameters

Edge Contrast

Edge Steepness

Edge Polarity

The analysis module then compares these settings with the real values obtained from the edge to be measured and finally calculates a match score that represents the quality of the match.



Impact Blob Analysis

This module provides a set of functions that allow a wide range of measurements on binary image objects. These tools allow sorting out or counting special parts in the image. It can also be used to pre-process the image to find the location and orientation of objects which have to be classified or measured in the next step.

Many object measurement results can be obtained

Perimeter

Area

Center of gravity

Roughness

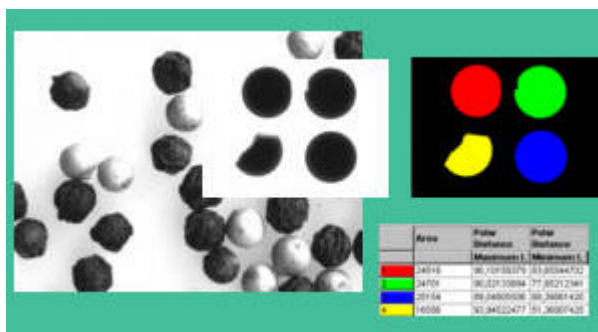
Position of main axes

Object histogram

Feret diameter

Euler number, etc.

Like the other modules, blob analysis is multidimensional. This enables highly advanced measurements, for example tracking the growth or change of objects over time, or calculating volumes in 3D images.



Impact Match

The pattern matching module includes a set of functions to find predefined patterns in images. There are numerous applications for this task such as searching for objects, recognizing parts, and image alignment. To find the location of a specified pixel pattern in arbitrary images the algorithm is robust enough to tolerate varying luminance conditions as well as slight rotations of the pixel pattern.

The search speed can be optimized by the following search parameters:

Search window

Model's centre point

Acceptance level

Certainty level

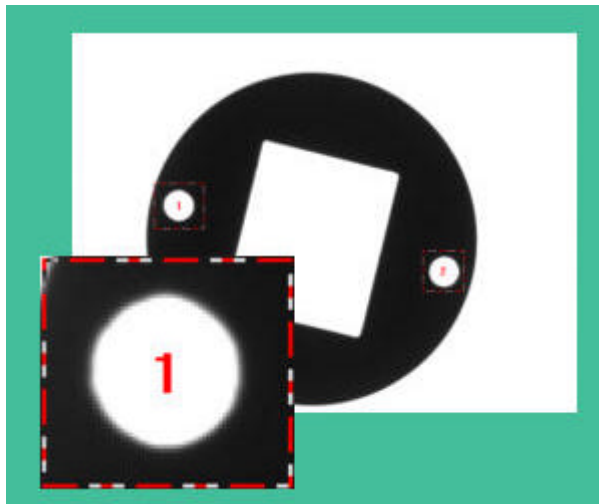
Positional accuracy

Number of Matches

Sub sampling factor

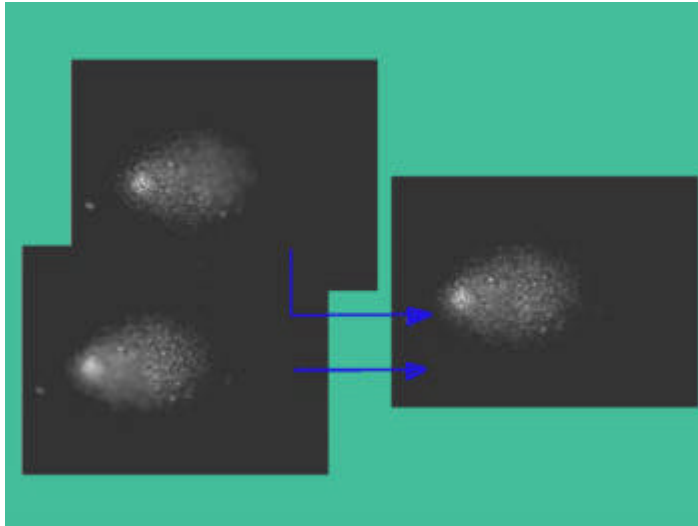
Step width

Presetting model pixel



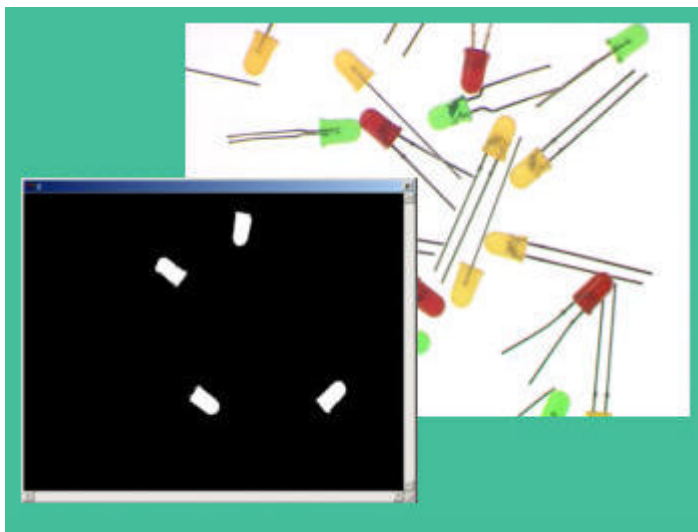
Impact Focus

The auto focus module is an advanced tool to perform auto focus operations. It can be used to move a stage to acquire an optimally focused image or to use multiple, partially out-of-focus images to calculate one in-focus image.



Impact Colour

This module includes colour transformation from RGB images into other colour spaces like HSI, CMY, HSL, HSV or self-defined ones by a colour twist matrix. That is useful for analysing which colour space has the best representation for an object classification.



Impact OCR

The OCR module provides powerful functions for Optical Character Recognition and verification. The module includes image pre-processing, segmentation and classification of characters. The classification allows the assignment of the separated objects to the corresponding ASCII code

The OCR module contains two different methods for classification. One method is even insensitive to rotations so characters can be read in any position.

A Windows application is included for tests as well as for training of new fonts



Image Database

Work on three further modules is in progress. The first of them is an image database module which allows you to organize and catalogue image files. Useful features like user-defined extensions and the possibility to connect to another existing database make this tool very flexible.

Image 3D

A 3D module is under development for industrial, automotive and security applications. Using two cameras you can measure the distance between the cameras and an object. With a single camera you can detect movements in subsequent images.

Image PrintCheck

Last but not least, this new module will make print checks easier.

More to follow ...

The MATRIX Vision **Impact SDK** can be completely installed. The base module is free of charge and usable without any restriction in conjunction with a MATRIX Vision hardware product.

The additional modules can be used as a time-limited demo version. The demo version allows you to evaluate the capabilities of the powerful modules. You can integrate the modules into your application. After 30 days you will get a license expiration message. For further usage of the SDK you need the **Impact Develop** package which allows you to redistribute the extension modules at low additional costs per copy.

Impact S can also be used as a free-of-charge 30 days demo version. The demo version has a few limitations and pops up a demo dialog. For a full version you only need a license key from MATRIX Vision.

Scion Image

Scion Image was definitely designed with basic microscopy imaging in mind. The product is available free of charge with any Scion camera or frame grabber product.

- Windows 95/98/NT port of Scion Image for MacOS
- Extensive support of all Scion frame grabbers
- Display of 24 bit colour images
- Control of on-chip integrating cameras
- Extensive image analysis capabilities
- Image enhancement and annotation support
- Full macro language for task automation
- Available at no charge

Scion Image for Windows is the Windows version of Scion Image, which is in turn a version of the popular Macintosh program, NIH Image, written at the National Institutes of Health. Scion Image may be used to capture, display, analyze, enhance measure, annotate, and output images. Scion Image extensively supports all Scion frame grabber boards, and provides a powerful and complete image acquisition environment.

Scion Image for Windows supports colour and greyscale image capture with Scion frame grabbers. It includes advanced capturing capabilities such as frame averaging and summation, frame sequence capture, and on-chip integration support. All current features of NIH Image have been included.

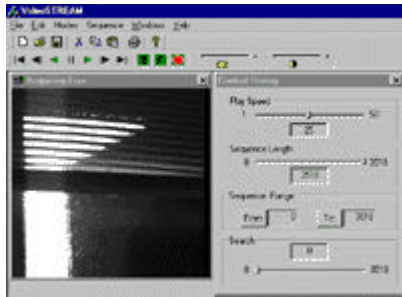
Scion Image is available free of charge. Scion provides full technical support to users of Scion Image.

VideoStream

A high performance image sequence capture package which allows real time capture and playback from many different types of high performance, high resolution cameras.

Video STREAM has been developed by VisionBase to offer a simple to use yet powerful software package to acquire and work with image sequences. Video STREAM simplifies the task of interfacing to advanced high speed progressive scan camera systems from Dalsa and Pulnix

Remote configuration, access and unattended triggered recording make it ideal for production line monitoring or investigating. VideoSTREAM will automatically record and save image sequences on event based triggers.



VideoSTREAM Features

- | | |
|---|--|
| <ul style="list-style-type: none"> ✦ Analog & digital acquisition ✦ Automated triggered recording & saving ✦ Remote configuration and access | <ul style="list-style-type: none"> ✦ Interfaced to a range of frame grabbers ✦ AVI file support ✦ Optional analysis modules |
|---|--|

VideoSTREAM Applications

- | | |
|--|--|
| <ul style="list-style-type: none"> ✦ Motion Capture & Analysis ✦ Machinery fault investigation ✦ Unattended production line fault recording | <ul style="list-style-type: none"> ✦ Product Research & Development ✦ Gait analysis ✦ Sport Studies |
|--|--|

NI Vision Builder Software

We use the NI Vision Builder software for Automated Inspection. This is highly configurable machine vision software allowing us to prototype, benchmark, and deploy applications easily and quickly.

NI Vision Builder for Automated Inspection does not require programming skills, yet is scalable to powerful programming environments such as LabVIEW.

A built-in deployment interface is included so you can quickly deploy your inspection, guidance, and identification applications.

The software also includes abilities to set up complex pass/fail decisions, control digital I/O devices, and communicate with serial devices such as PLCs. We can help customers select the correct procedure for their application by looking at sample images and processing those images so even before purchase so they can see the results achievable.



NI Releases New High-Performance Compact Vision System Optimized for Inspection

National Instruments CVS-1455 Delivers Three Times the Functionality of a Smart Camera

NEWS RELEASE -- Nov. 4, 2003 -- National Instruments today announced the [NI CVS-1455 Compact Vision System](#), which delivers nearly twice the processing power and four times the storage of the NI CVS-1454 Compact Vision System released in July. With this optimized performance, engineers can use the new NI CVS-1455 to dramatically increase throughput of visual inspection applications.

"The NI CVS-1455 Compact Vision System high-performance processor, non-volatile storage, and three IEEE 1394 (FireWire) ports make it well equipped to handle any inspection task, from precise assembly guidance to high-speed packaging inspection," said Tim Dehne, NI senior vice president of R&D. "In the past, engineers struggled to coordinate information and images from several independent machine vision nodes. Now they can integrate inspections into one embedded system without sacrificing performance. In fact, the NI CVS-1455 delivers the performance and functionality of multiple smart cameras."

Performing at 1,436 million instructions per second (MIPS), the NI CVS-1455 delivers more than three times the processing power of a typical smart camera. This speeds visual inspection while giving engineers the power to build applications with multiple cameras without the need for separate processing units, saving both time and money. Engineers can choose from more than 50 IEEE 1394-compliant cameras. The system also includes 128 MB of non-volatile onboard Flash memory -- eight times the storage of a typical smart camera -- so engineers can store more images for offline quality control analysis. In addition, the NI CVS-1455 features 29 digital I/O lines for control and communication with PLCs, relays, Compact FieldPoint and other automation devices.

	NI CVS-1455	NI CVS-1454	Typical Smart Camera
Configurable Software	Vision Builder for Automated Inspection	Vision Builder for Automated Inspection	Available
Programmable Software	Lab VIEW Real-Time	Lab VIEW Real-Time	Not available
Typical Processor Performance	1436 MIPS*	883 MIPS*	60-360 MIPS*
Digital I/O	29 DIO	29 DIO	2-20 DIO
Cameras	up to 3	up to 3	1
Resolution	up to 2,000 x 2,000	up to 2,000 x 2,000	640x480
Frame Rate	up to 100 fps	up to 100 fps	30 fps
Non-volatile Storage	128 MB	32MB	4-16 MB
Base Price	\$3,995	\$2,995	\$3,295

*MIPS: million instructions per second

NI designed the rugged, 4 by 5 by 2.5 in. NI CVS-1455 to perform flawlessly whether aligning wafers in a clean room or inspecting spot welds on a factory floor. It can withstand temperatures ranging from 0 to 55 °C and does not include fans, external vents or moving parts of any kind, enabling it to easily integrate into harsh, industrial environments. The system's high performance, flexibility and ruggedness make it ideal for inspection, alignment, gauging and identification applications.

Engineers can develop their machine vision applications on the NI CVS-1455 using either NI Vision Builder for Automated Inspection or the NI LabVIEW graphical development environment. Vision Builder offers an intuitive point-and-click interface for rapid application development. For more sophisticated, highly customized vision applications, LabVIEW delivers an open, full-featured development environment. The LabVIEW code generation feature in Vision Builder for Automated Inspection gives developers the power to easily migrate to LabVIEW.

About National Instruments

National Instruments (www.ni.com) is a technology pioneer and leader in virtual instrumentation -- a revolutionary concept that has changed the way engineers and scientists approach measurement and automation. Leveraging the PC and its related technologies, virtual instrumentation increases productivity and lowers costs for customers worldwide through easy-to-integrate software, such as the NI LabVIEW graphical development environment, and modular hardware, such as PXI modules for data acquisition, instrument control and machine vision. Headquartered in Austin, Texas, NI has more than 3,000 employees and direct operations in 40 countries. In 2002, the company sold products to more than 25,000 different companies in more than 80 countries around the world. For the past four consecutive years, *FORTUNE* magazine has named NI one of the 100 best companies to work for in America.

Custom software capability

We can also offer custom tailored software solutions if the standard products do not offer the features you need. These custom software solutions are designed to fulfil your requirements exactly with the specification being written in close co-operation with our customers. We offer software support to both end users and OEM customers alike.

We hope this information gives you a good overview of the imaging software we can provide and that we can help you with your future imaging requirements. Please do not hesitate to call us on 01635 30345 or send us an email on imaging@alrad.co.uk.

Also keep an eye on our web site at www.alrad.co.uk and why not add it to your favourites list so you know where come to for all your vision requirements

For more information on any of these products please contact:-

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