



Software

# Matrox Imaging Library (MIL) >>>

Release 8.0 with Processing Pack 4

Field-proven software development toolkit for machine vision, medical imaging and image analysis.



## Key features

- > complete and easy-to-use programming library for image capture, processing, analysis, display and archiving
- > fully exploits Intel® MMX™/SSE/SSE2 technology and Matrox image processing hardware
- > applications easily ported to new hardware platforms
- > processing performed to sub-pixel accuracy
- > multi-processing and multi-threading support
- > available for Microsoft® Windows® 2000, Windows® XP (32-bit), Windows® CE<sup>1</sup> and Linux<sup>2</sup>
- > includes Matrox Intellicam camera configuration utility<sup>3</sup>
- > also includes interactive image processing and analysis utilities<sup>3</sup>
- > flexible run-time licensing
- > free first-year enrollment in maintenance program



## Extensive and highly-optimized imaging library

Matrox Imaging Library (MIL) is a high-level programming library with an extensive set of optimized functions for image capture, image processing (e.g., point-to-point, statistics, filtering, morphology, geometric transformations, FFT and segmentation), pattern recognition, registration, blob analysis, edge extraction and analysis, measurement, metrology, character recognition, 1D and 2D code reading, calibration, graphics, image compression, display and archiving.

### Increased productivity

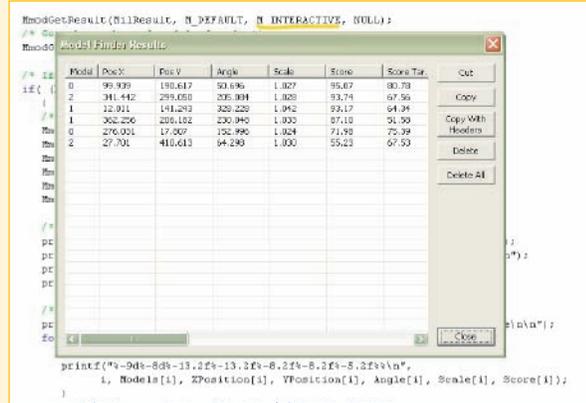
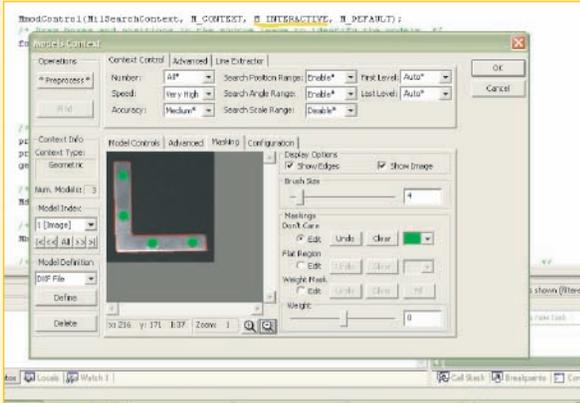
Designed to facilitate development and increase productivity, MIL offers a common C API that supports Matrox Imaging's entire hardware line, and an intuitive and easy-to-use function set. MIL also includes ready-made interactive dialogs<sup>3</sup> for handling file I/O, adjusting function parameters, manipulating image data (e.g., for pattern recognition model and character recognition font definition), and managing results, all geared towards simplifying application development.

### Rapid development

For fast Windows® application development, MIL comes bundled with ActiveMIL<sup>3</sup>, a collection of ActiveX controls (OCX) for managing image capture, processing, analysis, display and archiving. ActiveMIL lets you quickly and easily put together an imaging application with a custom, professional-looking Windows® user interface. Application development consists of drag and drop tool placement with point and click configuration, resulting in substantially less coding. With ActiveMIL, OEMs and integrators save development time by focusing on the imaging task rather than implementing the user interface.



## Increased productivity



MIL simplifies application development with ready-made interactive dialogs for handling file I/O, adjusting function parameters, manipulating image data (e.g., for pattern recognition model and character recognition font definition), and managing results<sup>2</sup>.

### Common API for image capture, processing and display

A common API provides seamless support for the full range of Matrox Imaging hardware, letting you capture images using the frame grabber of your choice. MIL also supports image capture from GigE Vision™ and IICD-based IEEE 1394 a/b<sup>4</sup> cameras. Images are processed using any x86 compatible processor or Matrox image processing hardware, while image display is optimized for Matrox and third-party graphics controllers.

### Reusable application code

Once your application is built, you can move it from one platform to another with little or no changes to the application code. For example, moving an application from one frame grabber to another can be as simple as changing a single line of code.

## Moving from one board to another

```
...
/* Allocate a system */
MilSystem = MsysAlloc(M_SYSTEM_METEOR_II_CL, ...);
...

...
/* Allocate a system */
MilSystem = MsysAlloc(M_SYSTEM_SOLIOS, ...);
...
```

By changing a single line of code, an application using a Matrox Meteor-II/Camera Link can work with a Matrox Solios eCL/XCL.

### Optimum use of hardware resources

Optimized for Intel® MMX™ and Streaming SIMD Extensions (SSE/SSE2), MIL maximizes the power of today's high performance processors such as the AMD Opteron™ and Intel® Xeon™. Certain MIL image processing functions can be offloaded from and even accelerated using Matrox imaging processing hardware with Matrox ASIC and/or FPGA technology. Moreover, MIL is also available to run natively and optimally on Matrox vision processor boards equipped with the *freescale*™ G4 PowerPC™ microprocessor with AltiVec™ technology<sup>5</sup>.

### Simplified system and application management

With MIL, a developer does not require an in-depth knowledge of the underlying hardware. MIL is designed to deal with the specifics of each hardware platform and provides simplified system management and control (i.e., hardware detection, initialization and buffer copy). For example, when grabbing to host memory, MIL transparently allocates a buffer of the appropriate type (i.e., non-paged memory). However, MIL does give developers direct access to certain hardware resources. For example, MIL can provide the physical address of a buffer. MIL also includes debugging services (i.e., function parameter checking, tracing and error reporting) to further aid application development.

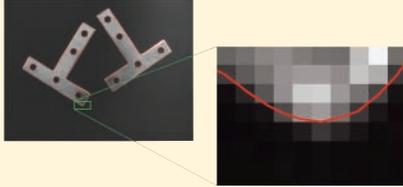
### Data formats

MIL can manipulate data, such as monochrome images, stored in 1, 8, 16 and 32-bit integer, as well as 32-bit floating point formats. MIL can also handle color images stored in packed or planar RGB/YUV formats. Included are commands for converting between data types.

### Sub-pixel accuracy

The imaging industry demands precision. To meet this requirement, MIL's blob analysis, calibration, Edge Finder, Geometric Model Finder, measurement, metrology and pattern matching operations are performed with sub-pixel accuracy.

#### » Sub-pixel accuracy



MIL perform operations with sub-pixel accuracy. For example, Geometric Model Finder has a translational accuracy of up to 1/40th of a pixel.

### Multi-processing and multi-threading

MIL supports multi-processing and multi-tasking programming models. Multiple MIL applications not sharing MIL data or a single MIL application with multiple threads sharing MIL data can run under Windows® or Linux<sup>2</sup>.

MIL provides mechanisms to access shared MIL data and ensure that multiple threads using the same MIL resources do not interfere with each other. These capabilities, coupled with Windows® 2000, Windows® XP (32-bit) or Linux<sup>2</sup>, enable the creation of applications that distribute workload across several CPUs in a multi-processor PC or multi-node Matrox vision processor configuration<sup>5</sup>.

MIL also offers platform independent thread management for enhancing application portability. Moreover, these threads are automatically mirrored and synchronized across platforms when controlling a Matrox Vision processor<sup>5</sup> from the host PC.

### Dependable and flexible image capture

For greater determinism and the fastest response, MIL provides multi-buffered image capture control performed in the operating system's kernel mode. Image capture is thus secured for frame rates measured in the thousands per second even when the host CPU is heavily loaded with tasks such as HMI management, networking and archiving to disk. The multi-buffered mechanism supports callback functions for simultaneous capture and processing even when the processing time occasionally exceeds the capture time.

MIL, in combination with the appropriate Matrox Imaging or supported third-party hardware, enables high-quality image capture from virtually any type of color or monochrome source including standard, high-resolution, high-rate, frame-on-demand cameras, line scanners, slow scan and custom-designed devices.

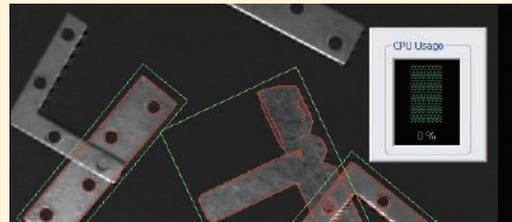
### Saving and loading

MIL supports saving and loading of individual images or sequence of images to/from disk. Supported file formats are TIF (TIFF), BMP (bitmap), JPG (JPEG), JP2 (JPEG2000) and AVI (Audio Video Interleave), as well as a raw format.

### Simplified image display<sup>4</sup>

MIL provides transparent image display management with automatic tracking and updating of image display windows at live video rates. MIL also allows for image display in a user-specified window. In addition, MIL supports live display of multiple video streams using multiple independent windows or a single mosaic window. Moreover, MIL provides non-destructive graphics overlay, suppression of tearing artifacts and filling the display area at live video rates. All of these features are performed with little or no host CPU intervention when using the appropriate graphics hardware.

#### » Non-destructive overlay



MIL performs non-destructive overlay of graphics at live video rates with little or no host CPU intervention.

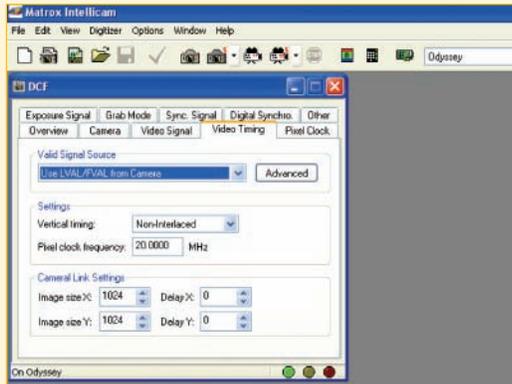
MIL also supports multi-screen display configurations that are in an extended desktop mode (Windows® desktop across multiple monitors), auxiliary mode (monitor not showing Windows® desktop but dedicated to MIL display) or a combination of both. Multi-screen display configurations are achieved using Matrox and/or third-party graphics boards.

#### » Image display management

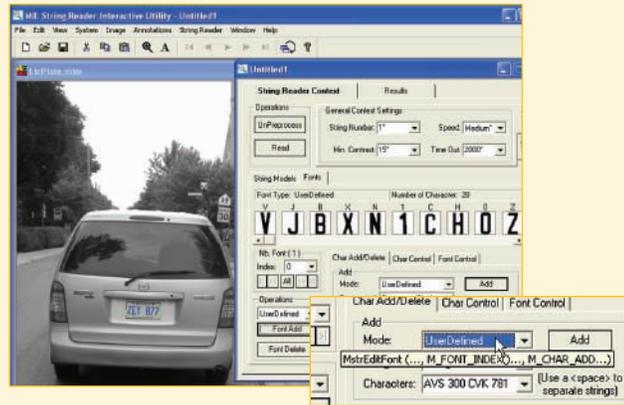


MIL automatically manages multi-screen display configurations.

## »» Matrox Intellicam and interactive processing Windows® utilities



Included with MIL is the Matrox Intellicam frame grabber configuration utility<sup>3</sup>.



Also included with MIL are a collection of interactive Windows® utilities<sup>3</sup> for configuration and experimentation.

### Interactive utilities<sup>3</sup>

MIL includes the Matrox Intellicam frame grabber configuration utility, a Windows®-based program that allows users to interactively and easily configure Matrox image capture hardware for a variety of image sources or simply try one of the numerous ready-made interfaces available from Matrox Imaging. MIL also includes a collection of interactive Windows®-based utilities for each key image processing and analysis tool, which are intended for configuration and experimentation. Each tool directly supports live image capture and processing as well as file I/O for individual or sequences of images. Tooltips over dialog controls provide a convenient cross-reference to actual MIL function calls.

### Comprehensive yet highly accessible documentation

Online help provides developers with thorough yet easy-to-find documentation covering all aspects of MIL. The online help can even be tailored to match the environment in use.

## »» MIL Online Help

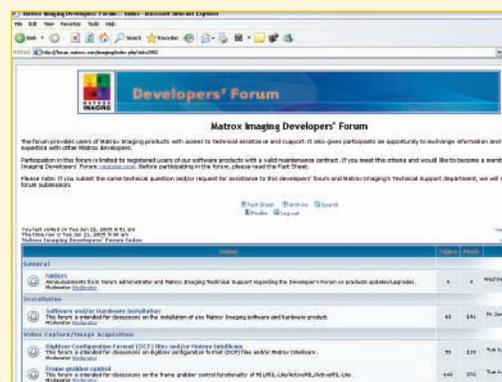


MIL online help includes a User Guide and Reference for a description and syntax of all MIL functions.

### Maintenance program

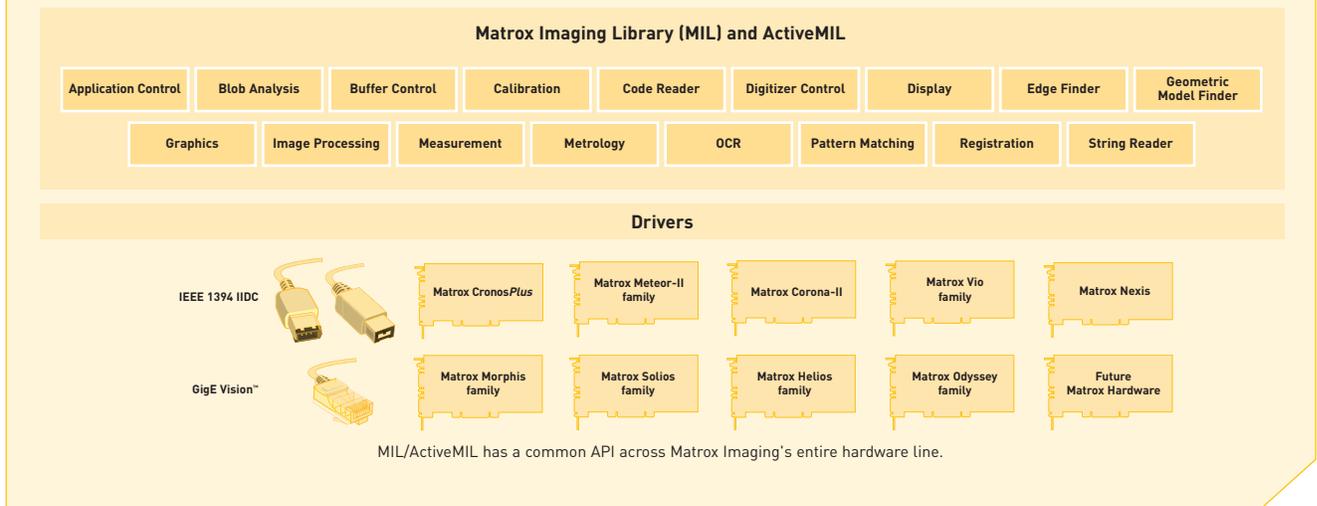
MIL provides registered users automatic enrollment in the maintenance program for one year. This maintenance program entitles registered users to free software updates and technical support from Matrox Imaging. Moreover, registered user have full access to the Matrox Imaging Developers' Forum, an online, moderated community for discussions on all Matrox Imaging products. Just before the expiration of the maintenance program, registered users will have the opportunity to extend the program for another year. For more information, refer to the Matrox Imaging Software Maintenance Programs brochure.

## »» Matrox Imaging developers' forum



Registered users can share technical expertise with other Matrox developers on the Matrox Imaging Developers' Forum.

## » Software Architecture



### MIL/ActiveMIL modules:

#### Image Processing Enhanced!

Extensive set of imaging primitives including point-to-point, statistical, filtering, morphological, geometric transformations, FFT and segmentation.

#### point to point -

- manual or automatic thresholding (binarizing, clipping)
- arithmetic operations: add, subtract, multiply, integer divide, fixedpoint divide (two images or an image and constant), negate, absolute value, copy image (conditional, mask, etc.), clear buffer to a constant
- logical operations: NOT, AND, NAND, OR, XOR, NOR, or XNOR (two images or an image and a constant)
- comparative (minimum/maximum)
- shifting
- LUT mapping
- frame averaging

#### statistics -

- conditional minimum/maximum (including absolute), mean and standard deviation pixel value
- conditional sum (including absolute and squared) of pixel values
- locate certain pixel values
- count differences between two images
- intensity histogram
- 2D to 1D projection
- histogram equalization

#### filtering -

- pre-defined Finite Impulse Response (FIR) filters for edge detection (Laplacian, Prewitt, Sobel, etc.), sharpening (Laplacian) and smoothing
- pre-defined Infinite Impulse Response (IIR) filters (Canny-Deriche and Shen-Casten) for 1st and 2nd derivatives, edge detection, sharpening and smoothing
- control pre-defined or create custom FIR and IIR filters

#### morphological operations -

- pre-defined for erosion, dilation, opening, closing, thinning (skeleton), thickening, "hit or miss", binary matching, zone of influence, distance and labeling
- control pre-defined or create custom morphological operators

#### geometric transformations -

- image flipping (horizontal or vertical)
- image resizing (nearest neighbor or interpolated)
- image rotation (nearest neighbor or interpolated)
- sub-pixel translation
- polar coordinates conversion (from Cartesian to polar coordinates and vice-versa)
- warping using first order polynomial or look-up table (LUT) based method:
  - first order polynomial warping: perspective mapping<sup>5</sup> translation, rotation, scaling, and shearing effects
  - LUT-based warping: perspective mapping, translation, rotation, scaling, shearing and four-corner effects, 2nd and 3rd order transformations (radial, barrel and pincushion lens distortions) and custom transformations

#### FFT -

Transform images from spatial to frequency domain and vice-versa for frequency domain analysis.

- results provided in real and imaginary form or as power spectrum (scaled to display range) and phase (°)

#### segmentation -

Powerful watershed grayscale morphology operator for difficult blob segmentation. Function used in conjunction with other MIL functions to label and/or segment connected blobs.

- generate watershed lines (regular or straight, 4 or 8 connected) and/or labeled catchment basins
- catchment basins determined from extremas (minimum or maxima) or marker image
- adjust minimum variation of and fill catchment basins

### deinterlacing -

Eliminate temporal artifacts from interlaced video sources.

### 3D profiling

Quickly extract a structured light beam or laser line from an image in order to generate the 3D profile of an object.

- extract peaks along columns or rows
- compute average intensity of peaks
- peak position determined to an accuracy of 1/128th of a pixel (depending on setup)
- establish a minimum peak intensity threshold to ignore false peaks due to noise

### Compression/decompression

Compress and decompress monochrome and color images using JPEG or JPEG2000 standard.

- support for lossy and lossless compression modes
- process 8/16-bit per pixel/plane (8-bit only for lossy JPEG)
- handle planar/packed RGB/YUV to:
  - planar RGB/YUV and packed YUV for lossy JPEG
  - planar RGB for lossless JPEG
  - planar RGB/YUV for JPEG2000
- support for image sequences (saved as AVI)
- variable quantization factor (Q-factor)
- customizable JPEG codec
  - select predictor #0, #1 or #2 for lossless mode
  - specify Huffman and quantization tables
  - specify restart markers
- customizable JPEG2000 codec
  - set target image size for lossy mode
  - specify quantization table
  - specify number of discrete wavelet transform (DWT) iterations

### Measurement

Specify or automatically locate reference markers. Find multiple reference markers using a single function call. Perform accurate measurements between markers.

- adjust pixel aspect ratio
- specify markers (points, edges and stripes)
- automatically locate markers (edges and stripes)
- calculate marker: angle, contrast, count, length, line equation coefficients, number of inside edges, polarity, position, position variation, width and width variation
- determine angle, distance and line equation coefficients between markers
- draw various marker characteristics
- save, load or restore a previously saved marker to/from a file or memory

### Metrology

A complete tool for 2D geometric dimensioning & tolerancing (GD&T) applications. Measure and construct geometric features, and validate tolerances based on a template.

- measure finite features (arcs, circles, segments, points and raw data) within specified regions
- construct features (arcs, circles, segments, lines, points, frame and raw data) from elementary parameters or other features
- obtain a feature's elementary parameters (start and end angles, start and end positions, arc and circle radius, line equation coefficients, etc.) and properties (length, perimeter, etc.)
- validate tolerances based on dimensions (min./max. distances and length), positions and shape (angularity, concentricity, parallelism, perpendicularity, roundness and straightness) involving one or more features
- obtain tolerance status (passed, passed with warning or failed)
- reposition (translate, rotate and scale) templates
- calibrate to obtain results in a real-world coordinate system (e.g., millimeters or inches)
- draw features and tolerances
- save reference image with template (i.e., context)
- interactive Windows® utility for experimentation<sup>3</sup> **New!**

### Blob Analysis Enhanced!

Analyze blobs (connected components) in an image.

- set labeling method (individual or groups), foreground, lattice (4 or 8 connected), pixel aspect ratio and timeout interval<sup>5,6</sup>
- identify (label) blobs
- calculate features:
  - from binary: area, bounding box, breadth, chains, compactness, count, perimeter (including convex), elongation, Euler number, Feret (elongation, maximum/minimum angle, maximum/mean/minimum diameter, general), first points, first contact points, intercepts (number of background to foreground transitions), length, hole count, label, number of runs, roughness
  - from grayscale: maximum/mean/minimum pixel value, sum (including squared) and standard deviation of pixel values
  - from binary/grayscale: angle of principal/secondary axis, center of gravity, moments (ordinary and central)
- sort and select blobs by feature
- reconstruct blobs (erase border blobs, extract/fill holes and from seed)
- merge blobs (e.g., reconstitute blobs that straddle adjoining images)
- draw blobs and corresponding calculated features

## Edge Finder

Powerful edge extraction tool used for defect detection, shape recognition and analysis.

- specify image mask
- modify extraction parameters: filter type (Shen-Castan, Canny-Deriche, Frei-Chen, Prewitt or Sobel), mode (recursive or kernel), kernel size (automatic or manual), kernel depth, kernel overscan mode, smoothness, foreground value (black and/or white), accuracy, magnitude type (gradient and square of gradient), threshold (pre-defined or manual) and timeout interval
- adjust construction parameters: gap distance, gap angle, polarity, continuity (favor proximity or minimum curvature), approximation type (none or polygonal) and approximation tolerance (fine to coarse)
- quickly extract and construct object contours (outlines) or thin-line crests (ridges or valleys)
- robust to uneven lighting and noise)
- works with monochrome or color images (color boundaries)
- calculate features: bounding box, center or gravity, convex perimeter, circle fit (center, coverage, error and radius), closure, convex perimeter, ellipse fit (angle, center, coverage and major/minor axis), Ferets (elongation, maximum/minimum angle, maximum/mean/minimum diameter and general), starting point, label, length (fine and coarse), line fit (coefficients and error), moment of elongation (including angle), position, strength (including average), size, tortuosity and first contact points
- calculations performed in fixed or floating point
- accuracy of well over 1/40th of a pixel
- verify timeout status
- sort and select by feature, cropped chain feature, inter-relationship (inside or outside chain or bounding box) and proximity to a specified point
- retrieve feature statistics (minimum, maximum, mean and standard deviation)
- determine closest edge elements to a list of points under various constraints
- draw extracted features and various calculated features
- save, load or restore a previously saved context to/from a file or memory
- save chains and/or edge approximation to an AutoCAD® DXF file
- send extraction results to Geometric Model Finder for pattern recognition (model definition and actual search)
- interactive Windows® utility for experimentation<sup>3</sup>

## Geometric Model Finder

[Protected by U.S. Patent 7,027,651 B2]

Use geometric features (contours) to solve robot guidance, CMP wafer alignment and other challenging applications. Unique algorithm provides exceptional flexibility with unparalleled levels of accuracy and robustness.

- allocate search model manually from a source image, using a pre-defined fiducial (circle, cross, ellipse, line, rectangle, triangle, diamond, ring and square), from an AutoCAD® DXF file or automatically
- specify model mask (don't care, flat or positive/negative weighted regions)
- construct a model from (a) previous model(s)
- select contour filter type (recursive or kernel), adjust smoothness and set minimum threshold for contours
- quickly search and locate a predefined model that is translated, rotated (0° to 360°) and/or scaled (50% to 200%)
- translational accuracy at up to 1/40th of a pixel, rotational accuracy at up to 1/20th of a degree and scaling accuracy better than 0.1%
- accept absence and occlusion of significant contours
- tolerate non-uniform contrast changes (e.g., specular reflections) including full or partial contrast reversal
- quickly search for multiple models and/or occurrences in parallel
- search speed is independent of rotation and loosely dependent on size of model and number of models and/or occurrences
- very quickly search a complex scenery with a limited range of angle and scale
- search from a seeded position
- modify search parameters: model and target coverage, fit error and weight, acceptance and certainty thresholds, number of occurrences, reference axis and angle, warping coefficients, angle and scale range, contour polarity, minimum separation criteria, shared contours, search region, speed, accuracy and timeout interval
- search results: model index, target score, model coverage, fit error, warping coefficients, polarity, number of occurrences, score, position including angle and scale, and timeout status
- save, load or restore a previously saved context to/from a file or memory
- draw various model and occurrence characteristics
- interactive Windows® utility for model definition and experimentation<sup>3</sup>

### Pattern Matching

Use normalized grayscale correlation (NGC) to solve alignment, measurement and inspection applications. Algorithm handles degraded, noisy or out-of-focus images, and uses an intelligent search strategy for maximum speed.

- allocate search model manually or automatically
- define model including "don't care pixels"
- quickly search and locate a predefined model that is translated and/or rotated
- translational accuracy at up to 1/40th of a pixel and rotational accuracy at up to 1/10th of a degree
- modify search parameters: model center, number of matches, acceptance and certainty threshold, search region, speed and accuracy
- search results: score, number of matches and position including angle
- draw various model and occurrence characteristics

### Registration Enhanced!

Optimally transform images from neighboring scenes taken from different vantage points into a single scene from a single vantage point. Quickly transforms new images of the same neighboring scenes taken from the same vantage points using the previously determined transformation.

- handle images that are translated or from different perspectives including scale
- finds the best alignment of the overlapping region common to a neighboring or reference image using a supplied coarse position
- subsections of (as opposed to the whole of) overlapping regions are matched for better robustness to local changes in contrast and intensity
- alignment is performed to sub-pixel accuracy
- supports the conversion of coordinates between the different coordinate systems
- stitch together a series of images of neighboring scenes taken from different vantage points into a single image mosaic
- create a sharper image from a series of images of the same scene from roughly the same vantage point

### 1D and 2D Code Reader Enhanced!

Read/write the more popular 1D and 2D code symbologies.

- support for BC412, Codabar, Code39, Code93, Code128, EAN-8, EAN-13, Interleaved 2 of 5, Pharmacode, Planet, Postnet, RSS, UPC-A and UPC-E 1D code symbologies
- support for DataMatrix (including ECC200), Maxicode, MicroPDF417, PDF417 (including truncated) and QR 2D code symbologies
- handles composite (1D with 2D) code symbologies
- read a single 1D/2D code or multiple 1D codes at once **New!**
- copes with rotated, scaled and degraded codes
- automatically find codes located in complex scenes
- adaptive threshold enables the reading of 1D<sup>7,8</sup> (except Planet, Postnet and RSS) and 2D (DataMatrix, Maxicode and QR) code symbologies in non-uniform lighting conditions
- grade (verify) 1D, 2D and composite codes using International Symbology Specification (ISS)
- save, load or restore a previously saved object to/from a file or memory
- interactive Windows<sup>®</sup> utility for experimentation<sup>3</sup>

### Calibration Enhanced!

Compensate images, positions and/or measurements for non-ideal spatial representation of a camera's field of view and/or objects in an image using linear interpolation.

- compensate for lens distortion (e.g., pincushioning, barreling), aspect ratios, rotation and perspective distortions
- convert data from pixel coordinates to real-world coordinate system and vice-versa (e.g., pixels to inches or millimeters)
- calibration mapping using a simple physical grid, image or a list of points
- support for user-defined Cartesian coordinate system relative to an object or position
- enable Edge Finder and Geometric Model Finder calculations directly in real-world units

### String Reader Enhanced!

Sophisticated feature-based character recognition for challenging applications such as automatic number plate recognition (ANPR). Innovative algorithm is both easy-to-use and robust.

- context-based definition supports multiple string models (reading parameters and constraints) and/or fonts
- allocate fonts semi-automatically (no need to identify individual characters) or using pre-defined fonts (TrueType™ and Postscript™)
- support for Latin characters including accents and punctuations
- manage fonts: normalize character size, adjust character baseline and sort character sets
- control string models: foreground, grammar rules, maximum baseline deviation, minimum/maximum/nominal string angles/aspect ratios/scales, minimum/maximum character angles/aspect ratios/scales, number of strings, string spacing and skew angle
- establish grammar rules: minimum/maximum number of characters per string, character type including digit, lower case and/or upper case letter, or custom list at each position
- adjust overall context settings: minimum contrast, speed, timeout interval, display formatting and character/string acceptance score
- automatically locate (no ROI necessary) and read a string or multiple strings at once (on same or different line)
- handles extreme contrast variations including contrast reversal
- automatically accommodates changes in scale (50% to 200% from reference), aspect ratio (0.5 to 2.0 from reference), rotation ( $\pm 10^\circ$ ), character skew and character angle different from string angle
- reference string aspect ratio and scale adjustable from 0.25 to 4.0 and 25% to 400% respectively
- read results include string (in ASCII or unicode) with angle, aspect ratio, position, skew, scale, size and scores
- draw characters (including bounding box, contour and center) and string (bounding box)
- interactive utility for context definition, troubleshooting and experimentation<sup>3</sup>

### OCR Enhanced!

Template-based character recognition ideal for reading and verifying mechanically generated characters such as wafer serial numbers. Module is capable of reading monospace and proportional fonts. Optimized to read predefined fonts, it can also recognize user-defined fonts.

- allocate predefined (MICR/E-13B, OCR A and B, and SEMI M12-92 and M13-88) or user-defined font
- calibrate font
- locate string that is translated and/or rotated (0° to 360°)
- read unknown string, multiple strings (same and different line) at once and blank character
- verify known string
- read results (string value, position and reading score)
- define valid characters for each position
- specify custom checksum validation
- save or load existing font
- interactive Windows® utility for font definition and experimentation<sup>3</sup>

### Application Control

Provides environment control functions such as error checking, function tracing and default allocation to simplify programming and debugging.

### Data Control

Offers functions for manipulating data (including image) buffers.

- image buffer allocation/deallocation
- region of interest (ROI) definition
- read/write and direct access of data buffers
- support for monochrome and color (RGB and YUV) image buffers
- Bayer filter using bilinear interpolation or adaptive algorithm with support for white balancing, gamma correction and color artifact correction (when using adaptive algorithm).
- save images to disk in standard file formats including TIF, BMP, JPG, JP2 and AVI, as well as a raw format.

### Display Control<sup>7</sup>

Includes functions such as image display, fill, zoom, pan, scroll, output LUT management and graphics overlay control.

- image display in MIL or user-specified window
- non-destructive graphics overlay of live video with no host CPU intervention
- "no-tearing" live image display mode
- support for multi-screen display configurations (extended desktop and/or auxiliary modes)
- VGA to WXGA, NTSC/PAL and custom display formats

### Digitizer Control<sup>7</sup>

Supports control of digitizers (image capture boards).

- single, continuous, asynchronous and multi-buffered grab
- selectable gain, offset, hue, brightness and contrast
- input LUT
- input channel
- scale up and/or down
- trigger and exposure control
- user (auxiliary) I/O bits
- auto-focus using various focus assessment strategies

### Graphics

Set of graphics primitives used to create image annotations.

- draw lines, rectangles, arcs, circles, ellipses and dots with selectable color
- write text with selectable font, size and color

### Supported Environments

- Microsoft® Windows® 2000, Windows® XP (32-bit), Windows® CE<sup>1</sup> and Linux<sup>2</sup>
- ActiveMIL applications developed using Microsoft® Visual Basic® .NET 2003 (managed code) and Visual C++ .NET 2003 (unmanaged code)
- MIL applications for Windows® 2000/XP (32-bit) developed using Microsoft® Visual C++® 6.0 and Visual C++ .NET 2003 (unmanaged code)
- MIL applications for Linux<sup>2</sup> developed using GNU Compiler Collection (GCC)
- MIL applications for Windows® CE .NET 4.2 and 5 (i.e., on Matrox Iris P-Series smart cameras) developed using Microsoft® eMbedded Visual C++® 4.0 and Visual C++ 2005 respectively
- MIL application running natively on Matrox Odyssey vision processors developed using Metrowerks® CodeWarrior® for PowerPC Embedded Systems 6.6

## Ordering Information

### Development Toolkits

Part number	Description
MIL 8 WIN P or U	MIL development toolkit for Windows® 2000/XP (32-bit). Includes CD with MIL, ActiveMIL, Intellicam, Matrox display drivers and online documentation, MIL User Guide manual, ActiveMIL User Guide manual and Parallel or USB hardware key.

### Run-time License Software Keys

Must supply lock code obtained from MIL License Manager application. This unique lock code identifies the target computer system and MIL/ActiveMIL package(s) to license. NOTE: Place 0 in appropriate field (i.e., 'x') if package is not required.

Part number	Description
M8 RT A x x x x x x x 0	Image analysis package. Includes Image Processing, Blob Analysis, Measurement and Calibration modules.
M8 RT M x x x x x x x 0	Machine vision package. Includes Image Processing, Blob Analysis, Pattern Matching (NGC-based), Measurement and Calibration modules.
M8 RT x l x x x x x x 0	Identification package. Includes OCR (template-based) and Code Reader modules.
M8 RT x x J x x x x x 0	Image compression package. Includes JPEG and JPEG2000 codecs.
M8 RT x x x G x x x x 0	Geometric Model Finder package.
M8 RT x x x x E x x x 0	Edge Finder package.
M8 RT x x x x x S x x x 0	MIL interface package (GigE Vision™ and IEEE 1394 IIDC). Required if using a third-party NIC or IEEE 1394 adaptor.
M8 RT x x x x x x C x x 0	MIL String Reader (feature-based OCR) package.
M8 RT x x x x x x x R x 0	MIL registration package.
M8 RT x x x x x x x x Y 0	MIL metrology package.
MIL RT ID P or U	Parallel or USB hardware fingerprint. Replaces Matrox Imaging or Ethernet board as fingerprint used to generate unique system code. MIL 8 RT...0 still required.

### Corporate headquarters:

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## Run-time License Hardware Keys

Part number	Description
M8 RT x x x x x x x x 0 P or U	Pre-programmed Parallel or USB hardware license key that enables appropriate package(s) (see Run-time License Software Keys sections for available choices). Alternative to M8 RT x x x x x x x x 0.

### MIL Maintenance Program

Included in the original purchase price of the MIL development toolkits, it entitles registered users to one year of technical support and free updates of the development toolkit.

Part number	Description
MIL MAINTENANCE	One year program extension.

### MIL Training

Visit Matrox Imaging's website (<http://www.matrox.com/imaging/training/>) for more information on MIL training courses.

#### Notes:

1. For Matrox Iris P-Series smart cameras.
2. Contact local representative or Matrox Imaging for availability.
3. With Windows® 2000/XP (32-bit) edition.
4. For Windows® XP (32-bit) only.
5. Matrox Odyssey vision processors supported through Matrox Odyssey SDK.
6. Not available in Windows® CE edition. Partially available in Linux edition.
7. Hardware permitting.