Imaging Library (MIL)

- SDK for all types of image analysis and image processing
- Optimised functions
- Advanced modules for among others OCR/OCV and Geometric model searching
Overview

Software tools for image analysis, machine vision, medical image processing and video analysis

Matrox Imaging Library (MIL) is an extensive collection of software tools for development of machine vision, image analysis and medical software applications. MIL includes tools for each stage of the process: from feasibility, to the prototype stage, development and finally commissioning.

This toolkit comes with interactive software and functions for image capture, image processing, analysis, annotation, display and archiving. These tools are designed to increase productivity, so reducing the time and effort required for your solution to reach the market.

Image capture, processing and analysis operations have the accuracy and stability required to handle the most demanding applications. These operations are also carefully optimized for speed so as to deal with the time limits imposed by many applications.

Advantages

- Release applications rather than developing underlying tools by utilizing a toolkit with a 15-year history of reliable performance
- Tackle problems with the utmost confidence using tried and tested tools for analyzing, localizing, measuring, reading and controlling
- Utilize the full power of today’s hardware by means of optimizations using SIMD, multi-core CPU ¹, multi-CPU ², GPU ² and FPGA technology
- Simple support for platform such as smart cameras for HPC clusters via a single consistent, intuitive API
- Receive images live from any interface by means of support for analogue and Camera Link ®, GigE Vision ® ², IEEE 1394 IIDC ², RS-422/LVDS and SDI transfer format
- Maintain flexibility and choice by means of support for 32/64-bit Microsoft ® Windows ® and Linux ®
- Make the most of available programming knowledge with support for C, C ++, C # and Visual Basic ®
- Further enhance productivity and reduce development costs by means of training and support from the Matrox team of imaging experts

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Matrox Imaging Library (MIL) and ActiveMIL

Matrox Imaging Library (MIL) and ActiveMIL has a common API across Matrox imaging's entire hardware line.

a. With Processing Pack 3 or greater. Not supported under ActiveMIL.
b. With Processing Pack 3 or greater. ActiveMIL support as of Processing Pack 5.
c. Requires MIL support as of Processing Pack 1.
d. With Microsoft® Windows® 2000/XP editions, which also supports third-party plug-ins.
e. OpenGL not supported except for external display modes.
f. MIL/ActiveMIL, supported provided through Matrox Odyssey EOK.

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Tools

Powerful, tried and tested tools

At the heart of Matrox Imaging Library (MIL) are tools for calibration, image conversion, object localisation, extracting and measuring selected parts, reading character strings and decoding and verifying identifiers. These tools have been painstakingly developed to provide outstanding performance and reliability, and they can be used within a single computer system or distributed across a number of computer systems.

- Pattern recognition
- Feature extraction and analysis
- 1D and 2D measurements
- Colour analysis
- Character recognition
- 1D and 2D code reading and verification
- Registration
- 2D calibration
- 3D calibration and reconstruction
- Image processing primitives
- Compression / decompression
- Fully optimised for speed
- Distributed MIL

About MIL

About MIL development

Since its launch in 1993, MIL has been developed to keep pace with and anticipate new demands from industry. It was developed using a simple, consistent Application Programming Interface (API) that has endured over time. MIL paved the way for the concept of hardware independence, with the same API for different image grabs and platforms. A team of highly qualified and committed computer engineers, mathematicians, software engineers and physicists is continuing to maintain and improve MIL.

MIL is being developed with the help of the industry's best and inputs from users, resulted in improvements on a daily basis. Users are encouraged to evaluate and report on new tools and improvements, so reinforcing and validating future releases. Ongoing MIL development is integrated and tested as a whole on a daily basis.

About MIL SQA

Besides the thorough manual testing carried out ahead of every release, MIL constantly undergoes automated testing during its development. Automated validation, which comprises both systematic and random tests, verifies accuracy, precision, stability and speed for image processing and analysis. The results are compared with the earlier criteria in order to ensure that performance remains consistent. Automated validation is run constantly and simultaneously on hundreds of systems, thereby rapidly giving extensive test results. The systematic tests are carried out on a large database of images which represent a broad selection of actual applications.
Prototype

Interactive tools

ML is supplied with a set of interactive tools to help assess the feasibility of the application and create a prototype. These interactive tools also further increase productivity for application developers.

Matrox Inspector

ML also comes with Matrox Inspector, an integrated image processing environment for 32-bit Windows ®. Matrox Inspector provides a simple user interface with point-and-click access to ML image grabbing, processing, analysis and storage operations.

As well as displaying images, Matrox Inspector shows processing and analysis results as tables and / or diagrams, including development and distribution, which is useful for fine-tuning. The results can be shared with other Windows ® programs such as Microsoft ® Excel ® for further analysis and reporting. The application also gives users the opportunity to compare different operations for accuracy and repeatability. As well as making annotations, users can draw directly in images in order to execute measurements and to enhance and manually segment images. Matrox Inspector works with individual images with or time-based sequences of images stored in ML-supported formats and DICOM.

Matrox Inspector also includes a scripting environment in which developers can record a sequence of manual operations and easily apply them to a series of images. Scripts can be created in Microsoft ® Visual Basic ® for applications (VBA) or with ‘C’-like programming languages. Users can debug scripts using an integrated debugger.

Further processing and analysis tools

ML includes a collection of interactive Windows ®-based tools for each relevant image and analysis tool. Designed for configuration and experiments, each tool supports real-time grabbing and processing, as well as I/O handling for individual images or sequences of images. Tooltips above dialog boxes provide handy cross-references to actual ML functions.

Matrox Intellicam

ML includes the Matrox Intellicam image and frame grabber configuration tool. This Windows ®-based program allows users to interactively configure the grabbing hardware for a range of different image sources, or quite simply to try one of the many complete interfaces accessible from Matrox Imaging.
Development

Complete development environment

In addition to image processing, analysis and archiving tools, MIL includes image capture, annotation and screen functions which form a cohesive API. The API and accompanying utilities are recognised, by the large installed base of users, as helping to facilitate and accelerate software development. As well as image processing, analysis and archiving tools, MIL includes image grabbing, annotation and display functions which form a cohesive API. This API and supplementary tools help to facilitate and accelerate software development.

Portable API

Not only is the MIL C API intuitive and straightforward to use, it is portable as well. It allows applications to be easily moved from one supported video interface or operating system to another, so providing platform flexibility and protecting the original development investment.

Simplified platform handling

MIL also includes debugging services (i.e. function parameter checking, tracing and error reporting), as well as configuration and diagnostic tools. MIL does not require the developer to have an in-depth knowledge of the underlying platform. MIL is designed to handle the specific elements of each platform and provide simplified administration (e.g. identification of hardware, initialisation and buffer copying). MIL gives developers direct access to certain platform resources such as the physical address of a buffer. MIL also includes debugging services (such as the checking of function parameters, tracing and error reporting), as well as configuration and diagnostic tools.

Designed for multitasking

MIL supports multiprocessing and multitasking programming models: a number of MIL programs that do not share MIL data or a single MIL application with several branches sharing MIL data. It includes mechanisms for accessing shared MIL data and ensures that multiple threads using the same MIL resources do not affect one another. MIL also offers platform-independent administration in order to improve portability.

Supported data formats

Commands for efficient conversion between data types are included. MIL can manipulate data such as black-and-white images and save in 1, 8, 16 and 32-bit, as well as 32-bit floating point format. MIL can also handle colour images stored in packed or flat RGB / YUV format. Commands for efficient conversion between data types are included.

Flexible, reliable image grabbing

There have never been so many ways of transferring video: analogue, Camera Link®, GigE Vision®, IEEE 1394 IIDC, LVDS, RS-422, SDI and USB. MIL supports all these interfaces, either directly via Matrox Imaging or third party hardware, or by working together with a third party SDK. MIL works with images taken from practically all types of colour or monochrome camera, including standard, high-resolution, high frame rate, frame-on-demand cameras, line scan, slow scan and custom units.

For faster response, MIL provides multibuffered image grabbing which is executed in the operating system's kernel mode. Image grabbing is assured for image speeds measured in thousands of a second, even when the CPU is working hard on tasks such as HM management, networking and archiving. The multibuffered mechanism supports callback functions for simultaneous grabbing and processing even when the processing time sometimes exceeds the grabbing time.

Save and open images

MIL supports the saving and opening of individual images or a sequence of images to and from disk. File formats supported are AVI (Audio Video Interleave), BMP (bitmap), JPG (JPEG), JP2 (JPEG2000), native (MIM) and TIF (TIFF), as well as a RAW format.

Simplified image display

MIL provides transparent image display administration with automatic tracing and updating of high frequency image windows. MIL also allows image display in a user-defined window. MIL supports live display of several video streams using several independent windows or a single mosaic window. All these functions are executed with little or no effect on the CPU when suitable graphics hardware is used. MIL also supports multiscreen display configurations which are in an extended desktop (i.e. the desktop over multiple screens), auxiliary mode (i.e. the monitor does not show the desktop, but a dedicated MIL screen), or a combination. Multiscreen display configurations are achieved using Matrox and/or third party graphics cards.

Image annotations

MIL includes functions for creating annotations comprising graphics and text. Developers can use custom annotations or display the results of image processing and analyses overlaid on an image.
Documentation, examples and video tutorials
Online help provides developers with extensive assorted documentation. The online help can also be customised for the application environment. An extensive set of sample programs and courses in video form allow developers to get started quickly with MIL.

Commissioning of applications
MIL offers a flexible licensing model for application distribution. Only the components needed to run the program need to be licensed. Licence compliance takes place by means of a hardware key or an activation code. The MIL installation can also be hidden from the end user.

MIL-Lite
MIL-Lite is part of MIL and includes ActiveMIL-Lite, which itself is part of ActiveMIL. MIL-Lite has programming functions for grabbing, annotation, display and archiving. It also includes quick operators for arithmetic, Bayer interpolation, colour space conversion, de-interlacing, temporal filtering, basic geometric transformations, histograms, logic, LUT mapping and thresholding. MIL-Lite is licensed for both software development and commissioning in the presence of Matrox Imaging hardware or a supplementary licence.

Training and support

MIL training
Matrox Imaging regularly offers MIL courses which cover the basic functions of the software environment and the processing and analysis tools. These courses are led by tutors at Matrox head office and at selected locations all over the world. These courses comprise interactive lectures with practical programming exercises. Custom courses designed to meet specific requirements are also available Windows and can be run at the customer's premises. By taking part in MIL courses, users can further enhance their productivity, reduce development costs and get applications to market more quickly.

MIL maintenance program
MIL provides registered users with automatic registration for the maintenance program for one year. This maintenance program provides registered users with free software updates and technical support from Matrox Imaging. Registered users have full access to the Matrox Imaging Developers Forum, an online community for discussions on all Matrox Imaging products. Shortly before the maintenance program expires, registered users will be able to extend the programme for an additional year. For more information, see the Matrox Imaging Software Maintenance Program brochure.

Operating systems

Supported Environments:
Windows
32-bit Windows® XP with SP3 / 7 with SP1 / 8 / 8.1
64-bit Windows® 7 with SP1 / 8 / 8.1
Windows® Embedded Standard 7 (with Matrox 4Sight GP and Matrox 4Sight GPM)
Visual Studio® 2008 with SP1 / 2010 with SP1 / 2012 with Update 1 / 2013 (unmanaged C++, C# and Basic)

Linux
32/64-bit Ubuntu 12.04.3 and 12.04.4 LTS
32/64-bit Red Hat Enterprise Linux 6.4 and CentOS 6.4
GNU Compiler Collection (from particular Linux® distribution)
Links

Try MIL for free for 30 days

New MIL features

Download Datasheet

Application example

White Papers

Customer example

Training

Support & maintenance

Download Area
## Matrox Imaging Library (MIL) 10 Development Toolkits

<table>
<thead>
<tr>
<th>Item number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIL-XWINPU</td>
<td>MIL 10 development toolkit for 32-bit Windows® XP/7/8 and 64-bit Windows 7/8. Includes DVD with MIL, Matrox Intellicam, Matrox Inspector (32-bit), Matrox display drivers and on-line documentation. Also includes one (1) license USB hardware key and MIL Maintenance registration number.</td>
</tr>
<tr>
<td>MIL-XLNX</td>
<td>MIL 10 development toolkit for 32/64-bit Linux. Includes DVD with MIL and online documentation. Also requires MIL-XWINPU.</td>
</tr>
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## MIL-Lite 10 Development Toolkits

<table>
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<tr>
<th>Item number</th>
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<tbody>
<tr>
<td>MIL-LITEXWIN</td>
<td>MIL-Lite 10 development toolkit for 32-bit Windows XP/7/8 and 64-bit Windows 7/8. Includes DVD with MIL-Lite, Matrox Intellicam, Matrox display drivers and online documentation. Also includes MIL-Lite Maintenance registration number.</td>
</tr>
<tr>
<td>MIL-LITEXLNX</td>
<td>MIL-Lite 10 development toolkit for 32/64-bit Linux. Includes DVD with MIL-Lite and online documentation. Also requires MIL-LITEXWIN.</td>
</tr>
</tbody>
</table>

## MIL/Lite Maintenance Program

Included in the original purchase price of the MIL/MIL-Lite development toolkit, it entitles registered users to one year of technical support and access to updates

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<tr>
<td>MILMAINTENANCE</td>
<td>One year extension to the MIL maintenance program per developer.</td>
</tr>
<tr>
<td>LTEMAINTENANCE</td>
<td>One year extension to the MIL-Lite maintenance program.</td>
</tr>
</tbody>
</table>

## MIL 10 Run-Time Licenses/ MIL-Lite 10 Supplemental Licenses

<table>
<thead>
<tr>
<th>Software Licence Keys</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MXRTxxxxxxx000</td>
<td>MIL 10 run-time software license key. The user must supply a lock code generated using the appropriate MIL utility/page. This unique lock code identifies the target computer system and MIL package(s) to license. Note: Combine packages by substituting 0 at the appropriate position x with the appropriate letter or other digit.</td>
</tr>
<tr>
<td>MXRTA000000000</td>
<td>MIL 10 image analysis package. Includes Image Processing, Blob Analysis, Bead Inspection, Measurement and Calibration modules.</td>
</tr>
<tr>
<td>MXRTM000000000</td>
<td>MIL 10 machine vision package. Includes Image Processing, Blob Analysis, Bead Inspection, Pattern Matching (NGC-based), Measurement and Calibration modules.</td>
</tr>
<tr>
<td>MXRT00000000000</td>
<td>MIL 10 10 GPU Processing package. Requires appropriate additional package(s) if used with MIL (i.e., not required for MIL-Lite).</td>
</tr>
<tr>
<td>MXRT00000000000</td>
<td>Distributed MIL/MIL-Lite 10 package for master or slave node</td>
</tr>
<tr>
<td>MXRT00000000000</td>
<td>MIL 10 Geometric Model Finder package.</td>
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<tr>
<td>MXRT00000000000</td>
<td>MIL 10 Edge Finder package.</td>
</tr>
<tr>
<td>MXRT00000000000</td>
<td>Both MXRT01000000000 and MXRT01000000000.</td>
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<tr>
<td>MXRT00000000000</td>
<td>Both MXRT02000000000 and MXRT02000000000.</td>
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<tr>
<td>MXRT00000000000</td>
<td>Both MXRT00000000000 and MXRT00000000000.</td>
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<tr>
<td>MXRT00000000000</td>
<td>MIL-Lite 10 interface (GigE Vision®, IEEE 1394 IIDC and USB3 Vision™) package. Required if using a third-party NIC, IEEE 1394 adaptors or a USB 3.0 port on a third-party PC.</td>
</tr>
<tr>
<td>MXRT00000000000</td>
<td>All MIL 10 packages.</td>
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<tr>
<td>MXRT00000000000</td>
<td>Both MXRT01000000000 and MXRT01000000000.</td>
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<td>MXRT00000000000</td>
<td>Both MXRT02000000000 and MXRT02000000000.</td>
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<tr>
<td>MLRTIDCMC</td>
<td>MIL-Lite run-time USB hardware fingerprint and license storage. Replaces Matrox Imaging hardware as the fingerprint used to generate the unique system code. MXRT...000 still required.</td>
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## Hardware ID Keys

| MLRTxxxxxxx000U       | Pre-programmed MIL/MIL-Lite 10 run-time USB hardware license key that enables appropriate package(s) (see Software License Keys for available selections). Alternative to MXRT...000. |