Powerful smart cameras with an intuitive, versatile and extendable integrated development environment for machine vision applications
Matrox Iris GT with Design Assistant

Powerful, configurable smart cameras

Matrox Iris GT is a line of powerful smart cameras with Matrox Design Assistant, an intuitive, versatile and extendable integrated development environment (IDE). Manufacturing engineers and technicians can easily and quickly configure and deploy machine vision applications on a highly integrated platform without the need for conventional programming. Video capture, analysis, location, measurement, reading, verification, communication and I/O operations as well as a web-based operator interface are all set up within the single IDE.

Benefits

➤ Simplify system integration by using a camera, processor and software development package from a single vendor with over 30 years of industry experience

➤ Reliably handle typical production rates by way of a new powerful embedded Intel® architecture processor running Microsoft® Windows® CE real-time operating system

➤ Conveniently administer, control and monitor application and device through a web-based user interface

➤ Tackle different image resolution, size and speed requirements through a choice of monochrome CCD sensors

➤ Synchronize image capture and processing to the production process using the externally triggered electronic camera shutter

➤ Directly interface to other automation equipment through the integrated digital I/Os, Ethernet and serial ports

➤ Communicate over the factory-floor and enterprise networks by way of an Ethernet interface

➤ Sturdy, dust-proof and washable IP67-rated casing that can be used in a variety of applications

Industries served

Matrox Design Assistant is used to put together solutions for the agricultural, aerospace, automotive, beverage, consumer, construction material, cosmetic, electronic, energy, food, flat panel display, freight, machining, medical device, medical diagnostic, paper, packaging, pharmaceutical, printing, resource, robotics, security, semiconductor, shipping, textile, and transportation industries.
About Matrox Imaging

Founded in 1976, Matrox is a privately held company based in Montreal, Canada. Graphics, Video and Imaging divisions provide leading component-level solutions for commercial graphics, professional video editing and industrial imaging respectively. Each division leverages the others’ expertise and industry relations to provide more innovative timely products.

Matrox Imaging is an established and trusted supplier to top OEMs and integrators involved in the manufacturing, medical diagnostic and security industries. The components delivered consist of cameras, interface boards and processing platforms, all designed to provide optimum price-performance within a common software environment.
Matrox Design Assistant

Matrox Design Assistant is an integrated development environment (IDE) where machine vision applications are created by constructing a flowchart instead of writing traditional program code. In addition to building a flowchart, the IDE enables users to directly design a graphical operator interface to the application.

Application design
Flowchart and operator interface design are performed within the Matrox Design Assistant IDE hosted on a PC running Microsoft® Windows®. A flowchart is visually put together using a step-by-step approach, where each step is taken from an existing toolbox and is configured interactively. The toolbox includes steps for image analysis and processing, communication, flow-control, and I/O. Outputs from one step, which can be images and/or alphanumeric results, are easily linked to the appropriate inputs of any other step. Decision making is performed using a conditional step, where the logical expression is described interactively. Results from image analysis and processing steps are immediately displayed so as to enable the quick tuning of parameters. A contextual guide provides assistance for every step in the flowchart. Flowchart legibility is maintained through the ability of grouping steps into sub-flowcharts.

In addition to flowchart design, Matrox Design Assistant enables the creation of a custom, web-based operator interface to the application through an integrated HTML visual editor. Users alter an existing template using a choice of annotations (graphics and text), inputs (edit boxes, control buttons and image markers) and outputs (original or derived results, and status indicators). The operator interface can be further customized using a third-party HTML editor to add elements like tables.

Matrox Design Assistant can be used with a Matrox Iris GT smart camera or in emulation mode. The latter allows for the design and testing of a flowchart and the creation of an operator interface without the need to be connected to a smart camera. Matrox Design Assistant’s emulation mode is used to enable parallel project work, resulting in greater development efficiency.

Matrox Design Assistant Benefits

- Easily and quickly solve machine vision applications without writing program code using an intuitive flowchart-based methodology
- Tackle machine vision applications with utmost confidence using field-proven tools for analyzing, locating, measuring, reading, and verifying
- Learn and use a single program for creating both the application logic and operator interface
- Maximize productivity by getting instant feedback on image analysis and processing operations
- Get immediate pertinent assistance through an integrated contextual guide
- Communicate actions and results to other automation and enterprise equipment through discrete I/Os, RS-232 and Ethernet (TCP/IP, EtherNet/IP™ and MODBUS®)
- Maintain control and independence through the ability to create custom flowchart steps
- Collaborative and simultaneous application development using the device emulation mode

Why a flowchart?

The flowchart is a universally accessible, recognized and understood method of describing the sequence of operations in a process. Manufacturing engineers and technicians in particular have all been exposed to the intuitive, logical and visual nature of the flowchart.
Create custom flowchart steps

Users have the ability to extend the capabilities of Matrox Design Assistant by way of the included Custom Step software development kit (SDK). The SDK, in combination with Microsoft® Visual Studio® 2005, enables the creation of custom flowchart steps using the C# programming language. These steps can implement proprietary image analysis and processing as well as proprietary communication protocols. The SDK comes with numerous project samples to accelerate development.

Application deployment

Once development is complete, the flowchart and operator interface are downloaded to, and stored locally on, the Matrox Iris GT smart camera. The flowchart is then executed on the smart camera independent of any PC. The operator interface is viewed from any PC using a web browser. Alternatively, the smart camera can be accessed from a stand-alone application running on a PC and created using an application development environment like Microsoft® Visual Basic®.

Matrox Design Assistant maintenance program

Matrox Design Assistant provides registered users automatic enrollment in the maintenance program for one year. This maintenance program entitles registered users to technical support, free software upgrades and an emulation mode key from Matrox Imaging. 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.

Release 2 highlights

- New image analysis and processing steps
  - Blob Analysis
  - Image Processing (image enhancement and transformation)
  - Pattern Matching
  - String Reader (feature-based OCR)
- EtherNet/IP™ and MODBUS® over TCP/IP support
- Sub-flowcharts
- Custom step SDK

Samples, tutorials and training

Matrox Design Assistant includes numerous sample projects and video tutorials to help new developers quickly become productive. Matrox Imaging also offers an instructor-led training course held at Matrox headquarters and select locations worldwide. Refer to the support section at www.matrox.com/imaging for more information.
Integrated development environment (IDE)

Customizable developer interface

The Matrox Design Assistant user interface can be tailored by each developer. The workspace can be rearranged, even across multiple monitors, to suit individual preferences and further enhance productivity.
Operator view

Design a customized operator view

Resulting operator view as seen in a web browser
Image analysis and processing tools

Image analysis and processing

Central to Matrox Design Assistant are flowchart steps for calibrating, enhancing and transforming images, locating objects, extracting and measuring features, reading character strings and, decoding and verifying identification marks. These steps are designed to provide optimum performance and reliability.

Pattern recognition

Matrox Design Assistant includes two steps for performing pattern recognition: Pattern Matching and Model Finder. These steps are primarily used to locate complex objects for guiding a gantry, stage or robot, or for directing subsequent measurement steps.

The Pattern Matching step finds a pattern by looking for a similar spatial distribution of intensity. The step employs a smart search strategy to quickly locate multiple patterns, including multiple occurrences, which are translated and slightly rotated. The step performs well when scene lighting changes uniformly, which is useful for dealing with attenuating illumination. A pattern can be trained manually or determined automatically for alignment. Search parameters can be manually adjusted and patterns can be manually edited to tailor performance.
Pattern recognition (cont.)
Model Finder\(^4\) is a step that employs a patented\(^5\) technique to find an object using geometric features (e.g., contours). The step finds multiple models, including multiple occurrences that are translated, rotated, and scaled. Model Finder locates an object that is partially missing and continues to perform when a scene is subject to uneven changes in illumination; relaxing lighting requirements. A model is manually trained from an image and search parameters can be manually adjusted and models can be manually edited to tailor performance.

Feature extraction and analysis
The Blob Analysis step is used to identify, count, locate and measure basic features and objects (i.e., blobs) in order to determine presence and position, and enable further inspection. The step works by segmenting images, where blobs are separated from the background and one another, before quickly identifying the blobs. Over 50 characteristics can be measured and these measurements can be used to eliminate or keep certain blobs.
2D measurements
The Metrology step is intended for 2D geometric dimensioning and tolerancing applications. The step extracts edges within defined regions to best fit geometric features. It also supports the construction of geometric features derived from measured ones or defined mathematically. Geometric features include arcs, circles, points, and segments. The step validates tolerances based on the dimensions, positions, and shapes of geometric features. The step’s effectiveness is maintained when subject to uneven changes in scene illumination, which relaxes lighting requirements. The expected measured and constructed geometric features, along with the tolerances, are kept together in a template, which is easily repositioned using the results of other locating steps.

Character recognition
String Reader4 is a step for reading character strings that are engraved, etched, marked, printed, punched or stamped on surfaces. The step is based on a sophisticated OCR technique that uses geometric features to locate and read character strings where characters are well separated from the background and from one another. The step handles strings with a known or unknown number of evenly or proportionally spaced characters. It accommodates changes in character angle with respect to the string, aspect ratio, scale, and skew, as well as contrast reversal. Strings can be located across multiple lines and at a slight angle. The tool reads from multiple pre-defined or user-defined Latin-based fonts. In addition, character strings can be subject to user-defined grammar rules to further increase recognition rates.
Image analysis and processing tools (cont.)

1D and 2D code reading

Code Reader is a step for locating and reading 1D, 2D and composite identification marks. The step handles rotated, scaled, and degraded codes in tough lighting conditions. The step can provide the orientation, position, and size of a code.
Image analysis and processing tools (cont.)

Calibration
Calibration is a routine requirement for machine vision. Matrox Design Assistant includes a 2D Calibration step to convert results (i.e., positions and measurements) from pixel to real-world units and vice-versa. The tool can compensate results and even an image itself for camera lens and perspective distortions. Calibration is achieved using an image of a grid or just a list of known points and is performed through a utility web page running on the smart camera.
Image analysis and processing tools (cont.)

**Basic image processing**
Matrox Design Assistant includes the Image Processing step for enhancing and transforming images in preparation for subsequent analysis. Supported operations include arithmetic, filtering, geometric transformations, logic, LUT mapping, morphology and thresholding.

Matrox Design Assistant also includes Edge Locator and Intensity Checker. Edge Locator finds objects by locating straight edges and Intensity Checker is used to analyze an object using image intensity.
**Connectivity**

**Connection to devices and networks**

Matrox Iris GT features a 10/100/1000 Mbit Ethernet interface for connecting over factory-floor and enterprise networks. Communication over these networks is configured through Matrox Design Assistant and can employ the TCP/IP as well as the EtherNet/IP™ and MODBUS® over TCP/IP protocols.

The latter two enable interaction with automation controllers and robots. The Matrox Iris GT can also be configured to directly interact with automation devices through an RS-232 serial interface as well as 8 industrial digital I/Os (4 input and 4 output).
## Compare models

<table>
<thead>
<tr>
<th>Specifications</th>
<th>GT300*</th>
<th>GT1200*</th>
<th>GT1900*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCD sensor*</td>
<td>diagonal 6 mm (1/3”-type)</td>
<td>diagonal 6 mm (1/3”-type)</td>
<td>diagonal 8.9 mm (1/1.8”-type)</td>
</tr>
<tr>
<td>Format</td>
<td>monochrome</td>
<td>monochrome</td>
<td>monochrome</td>
</tr>
<tr>
<td>Make and model</td>
<td>Kodak KAI-0340S</td>
<td>Sony ICX445AL</td>
<td>Sony ICX274AL</td>
</tr>
<tr>
<td>Effective resolution (H x V)</td>
<td>640 x 480</td>
<td>1280x960</td>
<td>1600x1200</td>
</tr>
<tr>
<td>Frame rate</td>
<td>110 fps</td>
<td>22.5 fps</td>
<td>15 fps</td>
</tr>
<tr>
<td>Pixel size (H x V)</td>
<td>7.4 µm x 7.4 µm</td>
<td>3.75 µm x 3.75 µm</td>
<td>4.4 µm x 4.4 µm</td>
</tr>
<tr>
<td>Gain range</td>
<td>0 to 36 dB</td>
<td>0 to 36 dB</td>
<td>0 to 36 dB</td>
</tr>
<tr>
<td>Shutter speeds</td>
<td>34 µs to 1.19 s</td>
<td>58 µs to 2.91 s</td>
<td>88 µs to 3.50 s</td>
</tr>
<tr>
<td>External trigger latency</td>
<td>1.1 µs</td>
<td>1.4 µs</td>
<td>7.2 µs</td>
</tr>
<tr>
<td>External trigger to output strobe delay</td>
<td>1.1 µs</td>
<td>1.4 µs</td>
<td>7.2 µs</td>
</tr>
<tr>
<td><strong>Processing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>1.6GHz Intel® Atom® (Z530)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volatile memory</td>
<td>256MB DDR2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-volatile memory</td>
<td>1GB flash disk</td>
<td></td>
<td></td>
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<tr>
<td><strong>I/Os</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network interface</td>
<td>10/100/1000Mbit Ethernet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serial interface</td>
<td>RS-232</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital I/Os</td>
<td>4 inputs, 4 outputs (including a strobe output), 1 opto-coupled trigger</td>
<td></td>
<td></td>
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<tr>
<td>Current-controlled</td>
<td>0-500 mA in 255 steps for LED illuminators</td>
<td></td>
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<tr>
<td><strong>Mechanical, electrical and environmental information</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>refer to Matrox Iris GT with Design Assistant Installation and Technical Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lens type</td>
<td>C-mount</td>
<td></td>
<td></td>
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<tr>
<td>Connectors</td>
<td>M12-8 pins for Ethernet, M12-17 pins for power and digital I/Os</td>
<td></td>
<td></td>
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<tr>
<td>Weight</td>
<td>0.7 kg or 1.5 lbs</td>
<td></td>
<td></td>
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<tr>
<td>Power consumption</td>
<td>425 mA @ 24VDC or 10 W (typical)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 °C to 50 °C (32 °F to 122 °F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilation requirements</td>
<td>natural convection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certifications</td>
<td>FCC class A pending, CE class A pending, RoHS-compliant, IP67 enclosure (IEC 60529-dust tight and protected against temporary immersion)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Software environment</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PC development tools</td>
<td>Matrox Design Assistant IDE – Matrox Iris Edition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC requirements</td>
<td>Microsoft® Windows XP Professional with Service Pack 2 or Microsoft® Vista, Microsoft® Internet Explorer 7.0, 310 MB hard drive space, 10/100/1000 Mbit Ethernet port, and DVD drive</td>
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</tr>
</tbody>
</table>
Order

**Hardware**

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT300*</td>
<td>Matrox Iris GT smart camera with monochrome 640x480 110 fps CCD sensor, 1.6 GHz Atom CPU, 256MB DRAM, 1GB flash disk. Includes Design Assistant.</td>
</tr>
<tr>
<td>GT1200*</td>
<td>Matrox Iris GT smart camera with monochrome 1280x960 22 fps CCD sensor, 1.6 GHz Atom CPU, 256MB DRAM, 1GB flash disk. Includes Design Assistant.</td>
</tr>
<tr>
<td>GT1900*</td>
<td>Matrox Iris GT smart camera with monochrome 1600x1200 15 fps CCD sensor, 1.6 GHz Atom CPU, 256MB DRAM, 1GB flash disk. Includes Design Assistant.</td>
</tr>
<tr>
<td>GT-STARTER-KIT*</td>
<td>Matrox Iris GT starter kit. Includes power supply, 12mm C-mount lens, Ethernet cable, power cable and breakout board for digital I/Os and RS232</td>
</tr>
<tr>
<td>GT-CBL-PWR/3*</td>
<td>9.8’ or 3m cable for Matrox Iris GT to connect power, RS-232 and I/Os. M12 to open end.</td>
</tr>
<tr>
<td>GT-CBL-ETH/5*</td>
<td>16.4’ or 5m Ethernet cable for Matrox Iris GT. M12 to RJ45 plug.</td>
</tr>
</tbody>
</table>

**Software**

Matrox Design Assistant for Matrox Iris GT flowchart-based integrated environment (IDE) DVD is bundled with every Matrox Iris GT smart camera. Moreover, each Matrox Iris GT smart camera includes a license for the Blob Analysis, Code Reader, Edge locator, Image Processing, Intensity Checker, Metrology, Pattern Matching, calibration, I/O and communication features. Additional features like Model Finder and/or String Reader require the installation of an additional license(s).

**Software Maintenance Program**

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA IRIS MAINT</td>
<td>One year program extension to Matrox Design Assistant for Matrox Iris GT maintenance program.</td>
</tr>
</tbody>
</table>

Endnotes:

1. Microsoft® Windows® XP or Vista® 32-bit editions.
2. Certification pending.
4. Requires a supplemental license.
5. Protected by U.S. Patents 7,027,651; 7,319,791; 7,327,888.
6. Interline transfer progressive scan with square pixels.
7. GT300/M, GT1200/M and GT1900/M models do not include Matrox Design Assistant and require a MIL development package, which is sold separately. Please refer to MIL datasheet for more information.

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