Introducing... Matrox 4Sight

Cost-effective imaging platform a sign of the times

By Kelly Davis

Matrox Imaging, a leading supplier of PC-based vision hardware and software components to OEMs and system integrators, has responded to industry’s needs with its new imaging platform for cost-sensitive machine vision, medical imaging and video surveillance.

Matrox 4Sight is a compact, self-contained platform with the core functionality needed for factory floor inspection, robot guidance, endoscopy machines, video surveillance and many other applications that rely on or can be improved by using digital imaging technology or computer-based vision. Image capture, processing and display, along with networking and general purpose I/O, are all integrated into a small, cost-effective package that has a footprint measuring 8.2 in by 7.25 in (20.828 cm by 18.415 cm).

Matrox 4Sight leverages PC technology to offer high performance without a high price. An x86 compatible processor with Intel MMX™ technology and a PCI peripheral bus are just some of the technologies adapted from the PC world and featured on this platform. Matrox 4Sight runs Microsoft® Windows® NT® Embedded today and will run Microsoft Windows CE® in the near future. The Matrox Imaging Library (MIL) toolkit enables OEMs and system integrators to rapidly create vision systems based on the Matrox 4Sight platform.

A newsletter is born

Matrox Imaging would like to welcome you to the first edition of our newsletter.

Published quarterly, Imaging Insight is designed to provide the latest information on technology, applications and trends in the imaging industry, as well as showcase our hardware and software products.

We hope you enjoy reading Imaging Insight and we welcome your feedback and suggestions for future issues.

Best Regards,

François Bertrand
Director, Sales & Marketing
Matrox Imaging

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Q&A

with Fabio Perelli, Product Manager for Matrox Imaging stand-alone systems
(See page 2)
I.I. : What impact will self-contained imaging platforms like Matrox 4Sight have on the machine vision industry?

F.P. : "Dedicated imaging platforms represent a major step towards a new level of machine vision – where ease of development and deployment, processing power and low cost converge on a single platform. With simple, standard programming environments, such as Microsoft Visual C++", and with processors becoming faster and cheaper, the potential of these self-contained units is far-reaching.

"In more immediate terms, entry-level platforms like Matrox 4Sight will save developers time and money by offering a pre-configured and pre-assembled unit. And, as these devices are expandable and flexible, it's possible to design, test and develop a wide variety of applications using a single, common platform.

"Another advantage of a fully integrated system like Matrox 4Sight is ease of integration – you only have to deal with one manufacturer. A self-contained device also ensures compatibility and due to carefully selected components, the unit's longevity is ensured. As a result, the machine vision, medical imaging and video surveillance industries will greatly benefit from this technology."

I.I. : What circumstances led to the development of Matrox 4Sight?

F.P. : "With this product, Matrox Imaging is taking a different approach to the vision market. Although we are an established frame grabber manufacturer, we saw the need to branch out and address the new trend in dedicated imaging appliances used for developing specific applications. As a result, we are one of the first companies to release this technology and want to be market leaders in this area."

I.I. : What are Matrox 4Sight's key benefits?

F.P. : "Matrox 4Sight is an ideal imaging solution for OEMs and system integrators because of its unique combination of compact size, leading-edge technology, ruggedness, software support and low price. Another key benefit is its expandability – with space for additional PC-104 add-on cards.

"Other technology that makes Matrox 4Sight a powerful imaging platform is its built-in support for IEEE 1394. This next generation high-speed digital serial interface is in place to connect digital video cameras and, eventually, other devices to Matrox 4Sight. As well, the unit provides small, robust and deterministic OS support through Microsoft Windows NT Embedded (today) and Microsoft Windows CE in the future (please see page 4 of Imaging Insight for details on Windows NT Embedded)."

I.I. : What's inside the box?

F.P. : "At the heart of Matrox 4Sight is a small footprint EBX motherboard that hosts all processing, display, networking and I/O functionality. An x86 compatible processor with Intel MMX technology is the processing core for Matrox.
4Sight, with an integrated graphics controller providing display. Up to 128 MB external memory is available for both the CPU and graphics controller. System software can permanently reside on either a flash disk or hard drive.

"Matrox Meteor-II frame grabbers, redesigned for the PC/104-Plus" form factor, provide analog video capture functionality for Matrox 4Sight. These compact modules plug directly onto the motherboard. Multiple frame grabber modules from Matrox Imaging can also be plugged onto the motherboard. The Matrox Meteor-II MPEG compression and decompression module for the Meteor-II PC/104-Plus is also available for the Matrox 4Sight. And, third party modules like motion controllers, modems, etc. can be added to expand functionality.

I.I. : And what's outside the box?
F.P. : "Matrox 4Sight provides a number of communications interfaces. A standard 10/100BaseT Ethernet interface as well as three 400 Mb/sec IEEE 1394 ports provide networking services as well as connectivity to digital cameras. Twenty discreet TTL-compatible digital I/Os with hardware interrupt capabilities are available for controlling equipment such as conveyor belts, strobe lights, part ejectors, alarms, and more. RS-232 serial ports, as well as parallel and PS/2 ports, are present, along with a TV output and standard audio I/O."

I.I. : What software is used to program Matrox 4Sight?
F.P. : "Matrox 4Sight is programmed using the Matrox Imaging Library (MIL), a software development toolkit optimized for Intel MMX technology and available as high-level 'C' functions or ActiveX (OCX) components. MIL gives developers the power to rapidly create applications using today's popular Windows-based development environments. The library offers DEMs and system integrators an extensive set of field-proven, high-level functions for image capture, transfer, processing, pattern matching, blob analysis, gauging, calibration, bar and matrix code reading, OCR, graphics, display and archiving. MIU-Lite, a subset of MIL, that provides image capture, transfer and display control, is also available."

I.I. : What are some examples of industries that will benefit from Matrox 4Sight?
F.P. : "The three markets that will benefit most from Matrox 4Sight are machine vision, medical imaging and video surveillance. In terms of machine vision, a good example is the wirebonding industry. Due to the fact that Matrox 4Sight is so compact and rugged, it can easily be placed inside the wirebonding machine and will handle the stress, heat and other industrial conditions as it checks die alignment and performs final inspection.

"In the field of medical imaging, there is a growing need to capture, record and play back digital sequences, as opposed to just capturing a single image. Developers want to interface with cardiology and ultrasound machines, digitize the sequences they capture, and store them on the local drive, for example. Matrox 4Sight can make this possible in a compact, unobtrusive and low-cost fashion."

"As for video surveillance, Matrox 4Sight's size, flexibility and compact nature will mean easier installation in remote sites. As a stand-alone unit, this device will require little maintenance, and remote communication with the device can take place from around the world – either through an Extranet or the Internet. As well, having intelligence onboard opens up a whole realm of possibilities for surveillance – not only can Matrox 4Sight capture images but it can also detect motion, recognize and analyze images, and send out notification whenever necessary – removing the need for constant human monitoring."

I.I. : What has the response been to Matrox 4Sight and what does the future hold?
F.P. : "Although we only launched Matrox 4Sight recently, developers are already beginning to understand the benefits of this versatile product. We believe this platform has the potential to solve more applications than even originally anticipated and expect the response to our latest product to be great. Matrox Imaging is committed to improving this concept for the future with a new family of stand-alone systems."

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IEEE 1394 is a standard that specifies a digital serial interface and interconnect for consumer electronic devices and computer peripherals. Maintained and revised by the 1394 trade association, with special interest groups for camera and industrial control & instrumentation, it currently supports 100, 200 and 400 Mbits/sec (12.5, 25 and 50 Mbytes/sec) transfer rates.

How does 1394 affect you?
A new generation of industrial/scientific digital video cameras using the 1394 serial link is emerging. Already, there are some area scan cameras available, with more to come. With IEEE 1394, cameras are interfaced with a standard connector and cable design that provides video transmission, camera control and power to the camera over a single cable. In other words, there is no need to use a specialized frame grabber that requires custom cables and software drivers.

How is Matrox Imaging making the 1394 “connection”?
Our latest hardware product, Matrox 4Sight, is 1394-ready and in October 1999, we announced Matrox Meteor-II/1394 – a board which offers the IEEE 1394-to-PCI capability required to exploit this new technology using the PC. As for software, Matrox Imaging will support 1394 digital video cameras with its release of Matrox Imaging Library version 6.1, due in the first half of 2000.

Tech Talk
With Pierantonio Boriero
Product Manager, Matrox Imaging

So what is Windows NT Embedded anyway?
Contrary to what some may think, Windows NT Embedded 4.0 is NOT a new version of Windows NT. Instead, it consists of an authoring tool that allows developers to easily construct a customized NT installation for their embedded products, thereby reducing storage space and cost. This tool enables developers to “hand-pick” elements or features from the complete set found in Windows NT, and install them in the application being developed.

Matrox Imaging’s latest product, Matrox 4Sight – a self-contained imaging platform (see stories on page one and two) – comes pre-installed with a configuration of Windows NT Embedded 4.0. Our designers carefully chose components to meet the requirements of a vast majority of applications. The end result is a pre-configured, low-cost product with a small footprint. If developers using Matrox 4Sight require other components – and therefore a new configuration – they must regenerate an installation using the Windows NT Embedded authoring tool.

A typical way of developing an application in an embedded environment, such as with Matrox 4Sight, is to have a cross-platform set-up using a PC complete with software development tools (i.e., the compiler and debugger). The application is created on the PC and then downloaded onto Matrox 4Sight through an Ethernet link. Once the application is up and running, it can then be debugged remotely from the PC.

In September 1999, Microsoft announced Windows NT Embedded, a software package for original equipment manufacturers (OEMs) building embedded devices. There has been some confusion as to what this package is, does and means for OEMs.

The standard specifies bi-directional communication for device control and native data, asynchronous (guaranteed delivery) and isochronous (guaranteed bandwidth) data streams, peer-to-peer connectivity, plug-and-play operation, hot-plugging, as well as data transmission and power – all on a single cable. Even in its current implementation, there is enough bandwidth available to handle the video transfer demands of typical image resolutions and frame rates.
Matrox Imaging has released its latest version of Matrox Inspector, adding new and enhanced functionality to the already comprehensive feature set of this imaging software.

Matrox Inspector is a field-proven interactive Microsoft Windows application for image capture, processing, analysis, display and archiving. Based on the Matrox Imaging Library (MIL) software development toolkit, Matrox Inspector version 3.0 provides point-and-click access to an extensive set of optimized functions.

**Key features**

This latest release features a Microsoft Visual Basic for Applications (VBA) compatible scripting environment, the ability to create custom dialog boxes for controlling script execution, and interaction with other Windows applications such as Microsoft Excel using OLE automation.

Matrox Inspector 3.0 also includes many enhancements to image capture, display, drawing, file I/O and graphing, as well as blob analysis, pattern matching, and gauging & measurement capabilities. In addition, it incorporates image calibration, FFT, polar coordinates transformation, warping and watershed tools.

Matrox Inspector 3.0 can directly acquire images from a variety of sources using Matrox Imaging hardware such as Matrox Meteor-II, Pulsar, Corona and Genesis-LC frame grabbers as well as the Matrox Genesis vision processor.

**Developers**

Matrox Inspector is designed to meet the needs of MIL developers and end-users alike. MIL users implement this software as a companion tool to facilitate development of their machine vision, image analysis or medical imaging applications. They can quickly build proof-of-concept demonstrations for their systems, enjoying the point-and-click ease in testing their design ideas. Typical application areas include off-line industrial inspection, microscopy, medical visualization, image cataloguing and biological analysis.

**End-users**

Scientists, technicians and engineers, among other end-users, rely on Matrox Inspector to perform and automate image enhancement and measurement tasks. These users benefit from the software’s extensive functionality, as well as statistics gathering and productivity tools. All information is easily exported to other Windows applications for analysis and generating reports.

Matrox Inspector 3.0 began shipping in October 1999 and the package sells for $1495 US (quantity one). The upgrade cost for registered users is $375 (quantity one).


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**Software Corner**

**Matrox Inspector 3.0: tried, tested and new**

This new version of Matrox Inspector allows the user to open single or multi-frame DICOM format files used for storing medical records. As well as reading the files, the user can view (and select) the information tags included in a DICOM file.

**Don’t expire!**

If your MIL, MIL-Lite, or Matrox Genesis Native Library Maintenance Program is expiring within the next couple of months, please do not forget to renew!

As of January 1, 1999, Matrox Imaging stopped accepting lapses in maintenance contracts. Developers who let their programs expire will be required to pay full price for future software updates. A valid maintenance contract is also a prerequisite for customers seeking technical assistance.

Matrox Imaging releases new version of field-proven interactive scientific/industrial imaging software
By Peter Gallon

The problem of ‘voids’ or bubbles within a chip’s package is well known and a constant frustration to chip manufacturers, as is the quest for a satisfactory means of examining the quality of the wire bonding within the packaging. In the manufacturing process, silicon chips are placed onto a substrate using epoxy glue. Voids can form within the glue during placement and these can give rise to gaseous expansion when the chips heat up on being powered and the expansion can distort and crack them.

Just as seriously, the voids partially insulate the chips, leading to delamination, where the chip actually detaches from the substrate. Manufacturers therefore need to know the quantity of voids within the chip package and x-ray has proven to be the only viable means of inspecting a product that cannot be examined without destroying it.

Founded in the early 1980s, California-based X-Tek was originally conceived as a custom-designed facility for micro-focus x-ray systems. Over the past several years, the company has rapidly expanded into volume production of high-quality, high-precision, standard and custom-designed x-ray inspection systems. A few years ago, X-Tek began concentrating its efforts on the burgeoning electronics industry – in particular the packaging of ICs and components. Andy Foster, X-Tek’s Senior Engineer, explains that contrary to popular belief, silicon chips are not susceptible to damage from x-rays as long as they are not powered up when examined.

X-Tek systems are controlled by industrial rackmount PCs, with standard PCI motherboards, running exclusively on Windows NT. The modular nature of X-Tek’s own iXS control software means that Matrox Imaging Library (MIL), a comprehensive development toolbox for image capture and processing applications, is ideally suited to the X-Tek approach. Image processing is therefore kept separate from the manipulator and x-ray control modules.

“We went for a development library rather than an off-the-shelf program, because we needed to bring all the different functionalities together into one package, but still be able to develop them separately ourselves,” says Foster.

Although X-Tek systems currently uses Matrox Pulsar frame grabber boards for image capture, the company is planning a two-tier approach, utilizing Matrox Meteor-IIs for lower-end applications. This will make budget systems as cost-effective as possible, while Matrox Corona boards will be used for more costly, higher-end applications. X-ray emissions are random by nature, which means they create ‘speckled’ images for capture by the frame grabbing board in the PC, so the first processing task is to clean up each image, which is done by acquiring several frames and averaging their contents. Front-end software has been written by X-Tek to create an image capture and processing application, utilizing Matrox Imaging Library, so that brightness, contrast and gamma can be adjusted, while pseudo-3D filters can also be applied to give artificial depth to the view.

Wanted: Exciting application stories!

Are you using Matrox Imaging technology in a PCI-based vision or imaging system? Do you have an interesting story to tell? Then we want to hear from you!

With your permission, your story may end up on the Matrox Imaging web site or we could present it to an industry trade magazine for possible publication.

On our website (www.matrox.com/imgweb/registration/apps/application.htm), you’ll find an initial application story form…just fill this out and we’ll be in touch shortly thereafter. Or simply contact the Editor of Imaging Insight at 514-685-2630 ext. 7970 or Kelly.Davis@matrox.com for more information. We’ll then work with you and industry magazines to get your story published!
Foster explains how X-Tek selected a supplier of image capture/processing software and hardware: “We knew we wanted a frame grabber and an imaging library. Boards from all the leading manufacturers were evaluated, but it proved difficult to make the third party libraries talk to the frame grabbers with software and hardware companies tending to blame each other for the lack of communication.

Somewhat tongue in cheek he adds: ‘With the library and hardware coming from one company, we knew who we could blame if there were problems and it turned out only Matrox was able to offer both products. Basically, integration of the Matrox Pulsar board and MIL has worked very well in terms of getting the image up on the screen and starting to work with it.’ X-Tek is also planning to migrate application development to VBA (Visual Basic for Applications) so its customers can modify code for themselves and integrate their applications with office software suites for automatic report generation.

‘ActiveMIL-Lite has turned out to be a real boon’, Foster comments, “I really see it as a very significant step forward. It’s robust and, in a Visual Basic environment, is easier to handle than MIL. ActiveMIL-Lite is giving us the image processing features we need, in conjunction with the imaging DLL.”

The downturn in the far eastern electronics industry has had little impact on X-Tek’s traditional business because, as Foster remarks, penetration to date for the company’s systems has claimed less than one percent of the overall potential market. Foster therefore sees a huge potential market for x-ray in semiconductor manufacturing. In the past, manufacturers have made high volumes of large-scale integrated circuit chips, simply discarding any that didn’t work. Eliminating chips with physical faults before functional testing reduces costs, as testing is expensive.

Foster believes that the highly competitive nature of the semiconductor industry can only benefit X-Tek, because with margins under so much pressure, maximizing yield is vital. Manufacturers are proving quick to pick up on the benefits of coding in x-ray inspection facilities, both for new fabrications and for existing plants. So with only two other major players in the world, the future looks very bright for X-Tek.

Matrox Imaging is a leading designer and manufacturer of PC-based hardware and software for machine vision, image analysis and medical imaging. Matrox Imaging is one of four divisions of Matrox, a privately-owned company established in 1976 by two electrical engineers – Branko Matic, Chairman, and Lorne Trottier, President. There are over 100 employees now working for Matrox Imaging (part of the over 1,200 employees in total at Matrox). The Imaging division is made up of hardware and software engineers, applications and technical support, sales and marketing. The Imaging division is made up of hardware and software engineers, applications and technical support, sales and marketing.

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Calling all developers!

On-line since January 1999, Matrox Imaging Developers’ Forum is a corner of cyberspace where registered users of our products can exchange information and share experiences with fellow developers. This valuable on-line resource also gives forum subscribers an additional way of reaching our technical support team to discuss non time-critical issues.

Subscribing to the forum is fast and easy. Eligible participants simply go to the Support Center on Matrox Imaging’s home page (www.matrox.com/imaging) and complete the on-line subscription form. Within two business days, participants – equipped with a validated forum name and password – are ready to be heard!

Interested in learning more about the Matrox Imaging Developers’ Forum? Email imaging.info@matrox.com.

Stop the presses...

We’ve enhanced our on-line News Room to better serve media, customers, sales representatives and other visitors to the Matrox Imaging website. Improvements include easier access to up-to-date and archived press releases, technical articles and application stories, plus our new Image Portfolio, Event Spotlight, Awards Page and Search Engine. Check out our new Making Headlines section!

Multilingual websites

Not only do we have an international presence here “on earth” but also in cyberspace! We have created two international Matrox Imaging websites – one in German and one in French – and are presently working on sites for Italy and Japan.

Graphics cards

Our MIL/MIL-Lite software is optimized to work with the Matrox Graphics Inc. Millennium Series G400 and G200 graphics cards. For more information on these products, go to www.matrox.com/mga/home.htm or to purchase a card directly, head to http://shop.matrox.com/.