Matrox Imaging announces version 6.1 of its award-winning software development toolkit for machine vision, medical imaging and image analysis – Matrox Imaging Library (MIL). This high-level programming library offers developers an extensive set of optimized functions for image capture, transfer, processing, analysis and display.

Designed to facilitate development and increase productivity, MIL offers a common API that supports the entire line of Matrox Imaging hardware – including the new Matrox Orion frame grabber and Meteor-II/1394 adapter board. It also offers an intuitive and easy-to-use function set, as well as a choice of programming environments for Microsoft Windows 98, Windows NT 4.0 and Windows 2000. MIL 6.1 comes bundled with ActiveMIL, a collection of ActiveX controls for managing image capture, transfer, processing, analysis and display. ActiveMIL fully integrates into Microsoft Visual Basic or Visual C++ and rapid application development environments.

New and enhanced functionality

The JPEG Software Codec, which performs baseline (lossy) or lossless compression/decompression on monochrome and color (RGB) images, has been enhanced to perform 400 percent faster than the previous MIL version, and offers more flexibility and image fidelity than before. With the MGA G400 graphics controller, MIL 6.1 also enables non-destructive graphics overlay of live video with no host CPU intervention and can eliminate tearing artifacts present during live video display. In addition, MIL 6.1 includes new symbologies in its Bar & Matrix Code Module – Datamatrix (ECC200), PDF417, BC412 and CODABAR.

For information on MIL pricing and availability, call 1-800-804-6243 or email: imaging.info@matrox.com.
“1394-ready”

What does it mean and what should you know?

By Kelly Davis

The latest version of Matrox Imaging Library (MIL) software development toolkit (version 6.1) includes a driver for IEEE-1394 DCAM. Does this allow any 1394 device to work with our hardware? No. Then what exactly does it mean? To answer this question, let’s start from the beginning...

The standard


The DCAM protocol

1394, also commonly known as Firewire, is a standard with a growing number of protocols. For different 1394 device “classes” there are different communication protocols, such as IEC 61883 (professional digital audio/video), SBP-2 (storage, scanners, printers, etc.), HAVi (consumer digital audio/video) and HICP (electronic instrumentation and industrial control devices). The 1394 protocol we currently support is DCAM, the specification for industrial/scientific digital video cameras. Why do we support it? The 1394 standard is currently leading the industry movement from proprietary digital interfaces to standard high-speed digital serial busses. To allow any 1394 device to work with our hardware? No. Then what exactly does it mean? To answer this question, let’s start from the beginning...

1394 sends a large amount of data across channels in packets, not in one lump sum. Each packet transfer has its own bandwidth requirement, albeit a small one. Therefore, although the raw image bandwidth of the camera(s) may well be within the 400 Mps bandwidth budget, users must add the overhead bandwidth caused by the packet transfer.

Dedicated channels

Another quirk in the 1394 design that users should be aware of is 1394 sends signals along a reserved isochronous channel. This mode of communication guarantees a certain amount of bus time for dedicated channels every 125µs (8,000 isochronous cycles per second). Only one device may send data on a particular channel and, although there can be more than one channel, rapid switching cannot take place between them. Once established, these channels are always reserved, whether they’re being used or not, and this can be limiting for certain applications. 1394 will address this limitation by providing more bandwidth in the near future.

Stay tuned to Imaging Insight for new IEEE-1394 developments. If you have any technical questions you would like to pose to Tech Talk, please email us at: k.davis@matrox.com or call 1-800-804-6243 ext. 7970.

Applications

Vision

API

MIL

Device Drivers

MIL Driver for 1394

Bus Driver

1394 Bus Driver

Hardware

Meteor-II/1394

4Sight
The recent introduction of a PCI version of Matrox Imaging’s latest frame grabber, Matrox Orion, meets a significant demand from users of industrial and previous-generation PCs which do not have an AGP interface. Matrox Orion for PCI allows these users to take advantage of this cost-effective and feature-rich frame grabber which supports standard color/monochrome video capture and provides leading-edge graphics performance using the award-winning MGA G400 graphics controller.

**Standard video capture**

Matrox Orion can capture standard analog composite (CVBS) and Y/C in NTSC/PAL formats, and composite RS-170/CCIR video formats. It also includes discrete analog-to-digital converters for capturing component RGB in NTSC/PAL video formats. A separate trigger input is also provided for synchronizing video capture to external events.

Matrox MGA G400 graphics

Matrox Orion features an award-winning graphics controller from Matrox Graphics Inc., a leader in PC graphics technology. The MGA G400 boasts an impressive feature set including two independent CRT controllers. On Matrox Orion, the primary CRT controller handles the main (VGA) display output, while the second CRT controller handles secondary (TV) display output. As well, the MGA G400 provides Matrox Orion with non-destructive graphics overlay of live video without host CPU intervention, as well as arbitrary video scaling.

**Independent secondary display**

Matrox Orion supports a second display output that is independent of the primary display resolution. For example, the main display can run at 1024 x 768 showing the user-interface and video window, while the secondary display runs at NTSC/PAL resolutions showing contents of the video window in full screen. This feature is essential for any application that requires a high-resolution display while simultaneously recording video using a VCR. As well, the secondary video output can be synchronized to the video input to avoid tearing artifacts.

**Key features**

- PCI or AGP form factor
- composite, S-Video and RGB NTSC/PAL video capture
- composite RS-170/CCIR video capture
- 8 video inputs
- arbitrary video scaling
- trigger input
- VGA display up to 1280 x 1024
- non-destructive overlay of graphics on live video
- separate and independent composite, Y/C and RGB NTSC/PAL video output
- NTSC/PAL video output can be synchronized to video input
- 32 MB graphics/video buffer
- available software includes Matrox Imaging Library (MIL), ActiveMIL, MIL-Lite/ActiveMIL-Lite and Inspector
- supports Microsoft Windows NT 4.0 and Windows 2000

For information on Matrox Orion pricing and availability, call: 1-800-804-6243 or email: imaging.info@matrox.com

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For anyone other than a physician or radiologist, 2D prenatal ultrasound images are usually ultra difficult to decipher – “is that our child’s head, hands or feet?” A recent breakthrough in 3D ultrasound diagnostic imaging is about to change all of that. BioMediCom – a company based in Jerusalem, Israel – recognized the need for improved ultrasound imaging and responded with BabyFace™ – an “add-on” technology that maintains conventional 2D ultrasound scanning practices while offering 3D volumetric representation at the touch of a button.

Doctors and radiologists in the field of diagnostic ultrasound imaging conveyed to us the strong urge of parents-to-be to ‘see’ their babies in a realistic form, rather than trying to decipher the inherently noisy 2D images,” explains Dr. Hillel Rom, who led the software development for the BabyFace™ project.

This technology not only offers aesthetic benefits but also the potential for reduced diagnostic times and greater accuracy in prognoses. “3D imaging provides the ultrasound professional with a tool to view various organs and tissues in a completely new way. The technology has potential for more accurate measurements and more reliable abnormality detection – which of course has great clinical importance,” says Rom.

BabyFace™ is comprised of a unique data acquisition transducer, advanced 3D visualization software and a miniature computer. The system fully integrates with most existing 2D ultrasound systems used in hospitals and clinics around the world, and it does not interrupt the normal scanning procedure in any way during the diagnostic routine.

How does it work? The 2D images are captured directly from the conventional ultrasound system using the transducer and transferred to the BabyFace™ miniature computer system. A unique motion tracker within the transducer gives positional data on the captured 2D images. This data enables accurate 3D-volume reconstruction and high-quality visualization using the robust BabyFace™ 3D software. The user can view the image in 2D and 3D immediately after acquisition, at the same time. Three-dimensional observation of a particular region of the 2D image simply requires pressing a button to activate the BabyFace™ user interface.

The transducer

An advanced motion-tracking sensor is integrated into a standard ultrasound transducer – developed in collaboration with Colorado, USA-based Sonora Medical Systems Inc. – that can be connected to conventional ultrasound systems. With this integrated sensor, there are no mechanical restrictions imposed on the diagnostic procedure and no susceptibility to electro-magnetic interference.

"The 2D images are captured through the video output of the ultrasound scanner, and then acquired by a frame grabber in the miniature computer," explains Rom. "Concurrent with the grabbing, the positional data on the relative orientation of the images are transferred to the computer from the sensor. This data is synchronized in the computer using our software, resulting in an accurate 3D-volume reconstruction."
BabyFace™ uses the Matrox 4Sight integrated imaging platform for its host computer requirements. The computer surrounds, says Soferman.

or organ of choice from its images and isolate the tissue to overcome the speckled nature of ultrasound imagery. Our processing techniques tend to be futile on ultrasound imagery. “Due to the physical phenomena inherent in the process, ultrasound images have noise in the form of speckles. Traditional image processing techniques tend to be futile on ultrasound imagery. Our unique segmentation tools are able to overcome the speckled nature of the images and isolate the tissue or organ of choice from its surroundings,” says Soferman.

The software

According to Dr. Ziv Soferman, BioM edicom's Chief Scientist who invented the image processing algorithms encompassed in BabyFace™, the major challenge in developing this technology was to produce high-quality 3D renderings of noisy ultrasound images. “Due to the physical phenomena inherent in the process, ultrasound images have noise in the form of speckles. Traditional image processing techniques tend to be futile on ultrasound imagery. Our unique segmentation tools are able to overcome the speckled nature of the images and isolate the tissue or organ of choice from its surroundings,” says Soferman.

Segmentation

BioM edicom's image processing algorithms assist the user in isolating the region of interest (ROI) using a semi-automatic segmentation method guided by an input contour provided by the user in one image. The system takes this input contour (which surrounds the ROI) and fits it to the actual image edges. The resulting corrected contour serves as the template for the next image, and the system proceeds to segment all other captured images automatically. In order to avoid contour drifts, the user can interrupt the segmentation at any point in time and manually correct the boundaries.

“Due to the physical phenomena inherent in the process, ultrasound images have noise in the form of speckles. Traditional image processing techniques tend to be futile on ultrasound imagery. Our unique segmentation tools are able to overcome the speckled nature of the images and isolate the tissue or organ of choice from its surroundings,” says Soferman.

Visualization

While this segmentation process occurs, the data is transferred to the software's visualization environment – comprised of a set of visualization tools that provide high-quality renderings and allow for interactive manipulation of the volume.

To achieve high quality and visualization speed, a classic “Ray Casting” approach is used. Rays are cast from the viewpoint through the image plane into the 3D-volume, thereby accumulating the voxel values located along the ray, explains Soferman.

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The future of BabyFace™

BioM edicom – incorporated in 1998 – is currently installing the Beta version of BabyFace™ in a series of carefully selected test sites, with product release due in the summer of 2000.

“Our plans for the near future are to add measurement capabilities to BabyFace™. This could be important for many medical applications,” says Rom. “Further applications in the areas of cardiology and general radiology, based on BabyFace™, will follow in years to come.”
Unlike most vendors in the imaging hardware and software industry, Matrox Imaging’s products are manufactured in-house at Matrox’s state-of-the-art facility in Montreal, Quebec. Last year, this facility saw a 100 percent increase in volume and, as a result, the company invested close to $4 million US in the facility - $3 million US to add a brand new batch processing line and $1 million US to upgrade one of the two existing surface mount lines.

"Essentially, we have doubled the capacity of our facility and will continue to look at ways of increasing output," says Manufacturing Director Jocelyn Beaudry. "Last fiscal year, we shipped 8,000 products per month and so far this year we are shipping twice that amount per month - and only running at 75 percent of our full capacity."

Making this kind of investment demonstrates Matrox Imaging’s long-term commitment to the industry, says Director of Sales and Marketing François Bertrand. "Having an in-house production facility ensures the highest quality control for our products, the flexibility to adapt to our customers’ specific requirements, and a guaranteed stream of Imaging products coming down the line."

The facility has four lines in total. There is one batch processing line which is reserved for medium-volume items such as the Matrox Meteor-II frame grabber or MGI graphics boards. This fast assembly line can produce 40 boards per hour and requires a lead-time of only one day. There are also two surface mount (SMT) lines – one of which has been upgraded by replacing two machines with those twice as fast. The fourth line is reserved for products not requiring SMT technology.

The activities of these production lines are coordinated through an innovative software tool package, says Beaudry. "We developed a paperless system 18 months ago which culminated in a unique software package. These tools are used on the production floor to track products throughout the various stages, inspect products right on the line, instruct operators on how to assemble boards, and much more. Each employee can access this information at any time. This automation has helped our operation immeasurably."

To manufacture 200 Meteor-II boards, it takes eight hours from start to finish, according to Manufacturing Director Jocelyn Beaudry (pictured above). The SMT line is prepared, which takes about 45 minutes, and the frame grabber is sent to a printer machine which deposits solder paste onto the board through a stencil. Then it is passed to the MV2V chip shooter (also pictured above) which assembles smaller components (like resistors and capacitors) at a rate of 36,000 per hour.

The home court advantage
Matrox Imaging’s production facility doubles its capacity

By Kelly Davis

To manufacture 200 Meteor-II boards, it takes eight hours from start to finish, according to Manufacturing Director Jocelyn Beaudry (pictured above). The SMT line is prepared, which takes about 45 minutes, and the frame grabber is sent to a printer machine which deposits solder paste onto the board through a stencil. Then it is passed to the MV2V chip shooter (also pictured above) which assembles smaller components (like resistors and capacitors) at a rate of 36,000 per hour.
The board then moves along to the MPAV2, or fine pitch machine, where accuracy is more the concern than speed. This machine moves around the board and checks parts before placing components like BGA and memory chips at a rate of 8,000 components per hour.

Then the board is soldered in a “reflow oven” in 10 stages which follow a preset temperature profile. The board is warmed up slowly to the melting point. The entire reflow process takes seven minutes per board.

That is the end of the SMT line. The board then moves into the through-hole assembly stage which is all done manually. Parts are soldered onto the board and then carefully inspected.

The in-circuit machine is then used to individually verify each circuit on the completely assembled board.

Specialized tests take place, diagnostics are done and boards re-worked if necessary. The Meteor-IIs are then ready to be packaged and shipped.

It's show time!

See Matrox Imaging and our representatives at the following trade shows...

- **SEMICON/West '00**
  - San Jose, California
  - July 12-14, 2000

- **Swiss Automation Week**
  - Basel, Switzerland
  - September 5-8, 2000

- **The Vision Show (AIA)**
  - San Jose, California
  - October 3-5, 2000

- **FinnTec**
  - Helsinki, Finland
  - October 3-6, 2000

- **Vision '00**
  - Stuttgart, Germany
  - October 18-20, 2000

- **The Real Time/Embedded Show**
  - Detroit, Michigan
  - November 14, 2000

- **Kemia**
  - Helsinki, Finland
  - November 15-17, 2000

- **RSNA**
  - Chicago, Illinois
  - November 26-December 1, 2000

Need Tickets?

To receive complimentary trade show passes, please contact:

- **North American shows**
  - Matrox Imaging Marketing
  - 1-800-804-6243 ext. 7638

- **European shows**
  - Matrox VITE Limited
  - +44 (0) 1753 665511

For more information on these shows, head to our website at:

http://www.matrox.com/imgweb/whatnew/trade.htm
Ciao Italia!
Matrox Imaging Italian website goes live

In an effort to better serve our European customers, Matrox Imaging has created an Italian version of its website, located at www.matrox.com/imaging/it/. Visitors to the Italian site can expect to find the same product and company information, services, news and other items found on the English, French and German sites.

"As a global company with offices in France, Germany, United Kingdom, Hong Kong, USA and sales representatives in more than 20 countries, we will continue to address our customers’ needs through multilingual websites. We plan on adding a Japanese site to our current multilingual versions," says Matrox Imaging webmaster, Josie Martino.

New application note online
Optimizing video digitization for the Matrox Corona and Meteor-II/Multi-Channel

Optimizing a video signal for digitization depends on several factors such as the frame grabber’s design and the characteristics of the video signal itself (i.e., total peak-to-peak voltage). By amplifying the signal and adjusting the reference levels of the analog-to-digital converter, one can make optimal use of the digitizer’s dynamic range.

Our new application note, available at www.matrox.com/imaging/prod/corona/, provides an in-depth description of how to control the variable gain amplifier and digitizer references of the Matrox Corona and Meteor-II/Multi-Channel frame grabbers.