inspect
America

Spring **2022**
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Embedded Vision

**Technology – Products –
Market Overview**

Partner of · edge ai + vision **ALLIANCE** · emva european machine vision association · VDMA Machine Vision · VISION

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The Future is Embedded

Hardly any other topic is currently moving the machine vision world like embedded vision. Only artificial intelligence can keep place here, although it is often used in connection with embedded vision. In short, when people say machine vision, they increasingly mean embedded vision solutions. If you are wondering how this market is actually developing, you will find the answers on page 7 of this first issue of inspect America.
The embedded vision market overview there also looks at the spectrum within the embedded system landscape, from entry-level smart cameras to high-performance system-on-modules.
For even more input on embedded vision, with AI or without, don't miss the Embedded Vision Summit, taking place May 16–19 in Santa Clara, California. More than 100 presentations, over 60 exhibitors and 1,000 attendees promise to answer all questions about embedded vision and to efficiently network experienced users and interested parties. For more information, please read the preliminary report and the exciting interview with Jeff Bier, President of the organizer Edge AI and Vision Alliance. If you don't have a ticket yet, you can buy one right here: https://embeddedvisionsummit.com/passes

I hope you enjoy reading this first issue of inspect America.
See you at the Embedded Vision Summit.

Best regards
David Löh
Editor-in-chief of inspect

Contents

Embedded Vision Summit with over 100 Presentations

Preview of the Embedded Vision Conference

Since 2012, the Embedded Vision Summit has been the leading conference and trade fair for practical computer vision and AI applications in machine vision. This year's conference, which will again be held in person in Santa Clara, California, boasts 55 exhibitors and 100 presenters. More than 1,000 machine vision experts are expected to attend.

The Embedded Vision Summit will take place May 16–19 in Santa Clara, California. More than 100 presentations on embedded vision and deep learning technologies and tools will be offered. In addition to product and technology presentations, case studies and exciting panel discussions will liven up the program. Moreover, 55 exhibitors will present their new developments as well as more than 100 application examples at the accompanying trade exhibition, which will cover all the technical and business aspects of computer vision, deep learning, AI and related technologies.

The Embedded Vision Summit is organized by the Edge AI and Vision Alliance. They expect just over 1,000 product and application developers, business leaders, and users, all focused on artificial intelligence at the edge.

Workshops on AI in the Edge

New in 2022 is the Edge AI Deep Dive Day, a series of workshops focused on specific topics in AI in the edge domain.

The keynote speaker for the Embedded Vision Summit 2022 will be Dr. Ryad Benosman, a leading leading expert in the field

See the full image   Close the full image

Images: Edge AI and Vision Alliance

of neuromorphic sensing and computing. Benosman is a professor at the University of Pittsburgh and an associate professor at the CMU Robotics Institute. In his keynote "Event-based Neuromorphic Perception and Computation: The Future of Sensing and AI", he will explain the fundamentals of bio-inspired, event-based image sensing and processing approaches, explore their strengths and weaknesses, and show that bio-inspired image processing systems have the potential to significantly outperform traditional visual AI approaches. ■

Embedded Vision Summit

Date: May 16–19, 2022

Venue: Santa Clara Convention Center, Santa Clara, California

https://embeddedvisionsummit.com

"The techniques, technologies and applications have advanced tremendously since 2019"

Interview with Jeff Bier, Founder of the Edge AI and Vision Alliance and Organizer of Embedded Vision Summit

Upfront the Embedded Vision Summit, David Löh, Editor-in-chief of the machine vision magazine inspect talked with Jeff Bier, organizer of the embedded event in California about the Summit, the industry, and trends in embedded vision.
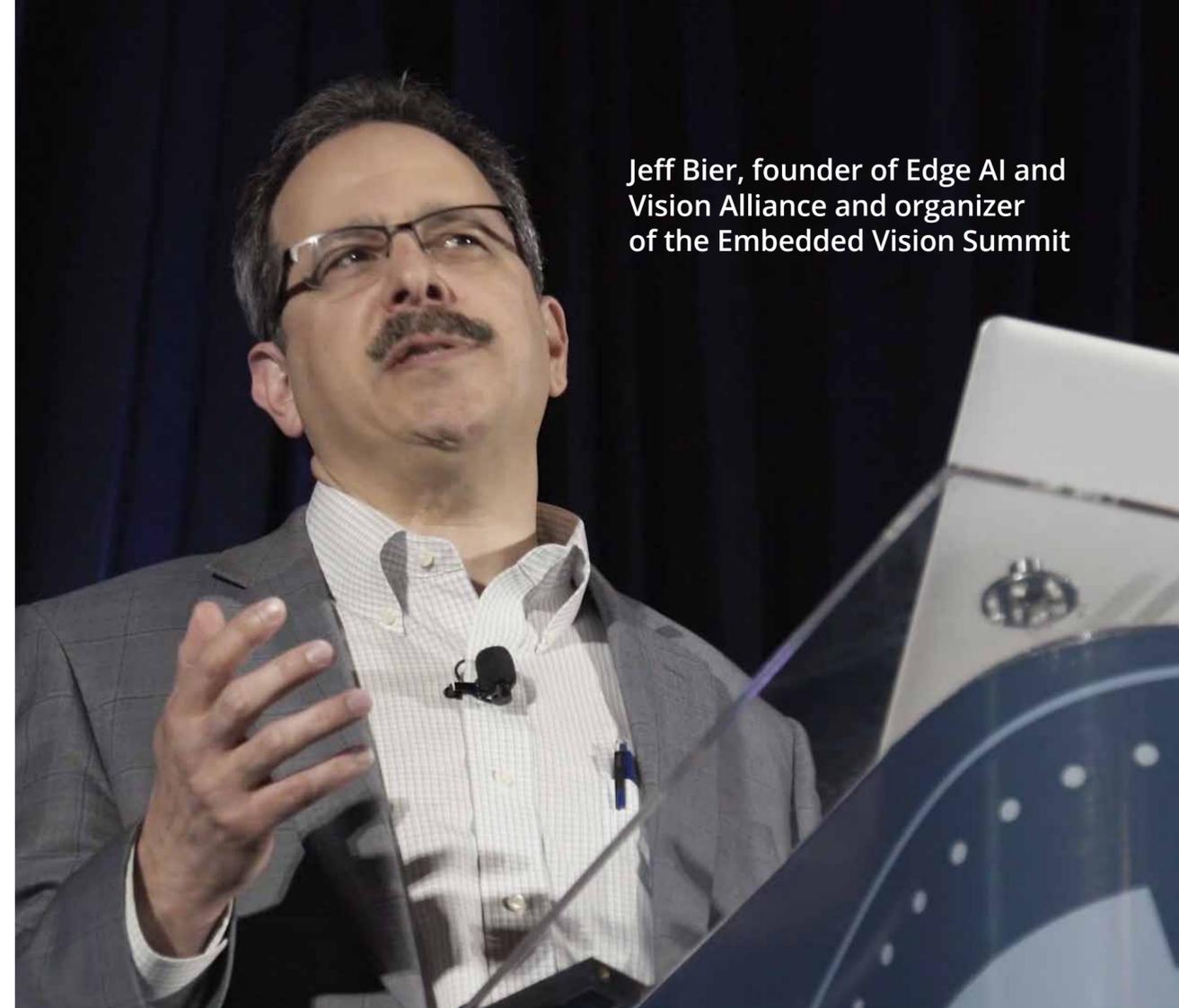
Jeff Bier, founder of Edge AI and Vision Alliance and organizer of the Embedded Vision Summit

As president of the engineering consulting firm BDTI (Berkeley Design Technology, Inc.) Jeff Bier founded the Edge AI and Vision Alliance, the former Embedded Vision Alliance, in 2011, which has more than 100 member companies today, and organizes the Embedded Vision Summit since 2012. This year's event is special, because it's the first for three years. "The techniques, technologies, and applications have advanced tremendously since 2019," says Bier. Besides that he expects over 1,000 participants, who can listen to around 100 lectures and visit a good 60 exhibitor stands. For those who are not planning to come yet, there is more information and the possibility to register here: https://embeddedvisionsummit.com

Inspect: What do you think is different to the last on-site Embedded Vision Summit in 2019?
Jeff Bier: Three years is a long time in our field. The techniques, technologies, and applications have advanced tremendously since 2019. The 2022 Embedded Vision Summit will showcase impressive new applications, innovative building-block technologies and leading-edge techniques – many of which are new compared to 2019.

What can visitors expect?
Bier: The entire focus of the Embedded Vision Summit is providing system and application developers with the practical knowledge and connections they need to successfully incorporate embedded vision into their products. The two main elements of the Summit are the

Besides the lectures and the exhibition networking is one of the key reasons to visit Embedded Vision Summit.

conference program with over 100 lectures and the exhibits with more than 60 booths this year. This carefully designed, high-quality program has enabled the Summit to consistently achieve a 98 percent approval rating from attendees which we are very happy about. The actual list of sessions can be found on our website.

Similarly, the exhibits are mainly focused on building-block technologies like processor, algorithms and software tools which system and application developers can use to build their solutions. You can see the current list of exhibitors also online.

What are the highlights of the Embedded Vision Summit?

Bier: The biggest highlight in my eyes is the perfect size: The Summit is large enough to provide a wide range of session topics and exhibitors, and plenty of opportunity to make new professional connections – but small enough

so that an attendee can make very efficient use of their time, and have plenty of opportunities for 1:1 conversations with other attendees. But in terms of topics and technologies, some of the highlights of this year's Summit include:

· Neuromorphic (bio-inspired) sensing and processing: the future of perceptual AI?

· Low-code/no-code edge ML development: Arguably, a shortage of skilled engineers is the main bottleneck to developing edge computer vision/machine learning solutions to solve many real-world problems. Are low-code/no-code development tools the answer? Many companies think they are at least part of the answer, and there's lots happening in this space.

· MLOps: Implementing processes to more efficiently and reliably develop and deploy ML-based applications.

· Combining multiple sensor types for perceptual AI: Humans and other creatures utilize a variety of senses, while most of today's systems get by with just one (or one at a time). What are the advantages and challenges of incorporating audio as well as video into a perceptual AI system?

· Making deep neural networks more reliable.

· Making edge computer vision and machine learning ubiquitous: Rapid progress on better processors and tools, enabling edge CV and ML to be deployed even in very power- and cost-constrained devices, and enabling cloud-like performance in edge devices.

Now comes the Corona question: What do participants need to consider in terms of hygiene and safety?

Bier: We are of course monitoring Covid trends closely and adjusting our public health protocols as the situation evolves. At present, the main points of our plan are:

· Attendees must be vaccinated

· Masks are encouraged and provided

· Hand sanitizer will be free and everywhere

Additionally, we have a color-coding scheme on badges which every attendee can signal to other attendees in a simple way whether they are comfortable with close contact.

Please find the complete interview on https://www.wileyindustrynews.com/en/news/techniques-technologies-and-applications-have-advanced-tremendously-2019

Embedded Vision Summit

What you need to know

When: May 16–19, 2022

Where: Santa Clara Convention Center, Santa Clara, California, USA

What to expect: 100+ Sessions, 60+ booths, 1,000 attendees

Latest information/register:

https://embeddedvisionsummit.com

All images: Edge AI and Vision Alliance

Embedded Vision Will Dominate the Machine Vision Market

Key trends, forecasts and vendors

Embedded vision systems have clear advantages: Image acquisition and processing happen in the same place, smart cameras make integration easy as pie. It is not for nothing that the market has been growing massively for years. Current figures show that this trend is continuing. So will classic image processing become obsolete at some point?

Closer, faster, more direct. These are attributes that distinguish embedded vision from classic image processing. And at the same time, they are the reasons for its rapid rise in recent years. Because embedded systems promise to solve the image processing task better, because the camera does not have to send the data first over sometimes quite long paths through the plant, because the user saves a powerful industrial PC, and because the image processing system can thus become less complex and possibly less expensive.

Embedded Vision Market Continues to Grow Strongly

It's no coincidence that the embedded vision market has been growing strongly for years. And there is

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no end in sight: for the years 2021 to 2028, analysts from Grand View Research expect an average annual growth rate of 12.3 percent in their study "Computer Vision Market Size, Share & Trends Analysis Report". By comparison, according to the report by Market Research Stats, the global image processing market as a whole will grow by five percent annually over the same period.

Traditional image processing, including peripherals such as in-dustrial PCs, still accounts for the lion's share with 56 percent (in 2020, according to Grand View Research). From today's perspective, however, it seems clear that this will not remain the case. Jeff Bier, Founder of Edge AI and Vision Alliance, for example, explains in an interview (see pages 5/6 in this issue) "as the range of deployed vision applications grow, other classes of systems will vastly outnumber PCs".

Embedded vision systems also enable autonomous robots, which are increasingly being used on factory floors – although not as android.

Click through the image gallery

Image: Arseny Togulev/Unsplash

Industrial PCs remain important for imaging applications

Still, as Jeff Bier adds, "PCs and their close cousins have some real advantages for the applications where they fit the performance, cost, power consumption and I/O requirements". Because sometimes it has to be the high-performance PC. In addition, the higher integration costs of an individual embedded system compared to a PC-based machine vision system with standardized image processing libraries (familiar to the developer) must first be offset.

Smart camera vs. individual embedded vision system

However, smart cameras make this transition easier. They are primarily designed for easy integration and accommodate optics, lighting, data processing, and interfaces in the housing. The obvious disadvantage is that the user is dependent on the particular configuration fitting his application. It is therefore true that these systems are more suitable for simpler image processing tasks, despite the growing range on offer.

The comparatively low integration effort is bought here with restrictions in flexibility. The best-known manufacturers include SVS-Vistek, Matrix Vision, Basler, Automation Technology, Imago, IDS, B&R, and more.

At the other end of the spectrum are the embedded vision systems based on System on Chips (SOC) or System on Modules (SOM). Here the user has the greatest freedom to tailor the system to his needs, whether he relies on Nvidia's Jetson platform or Intel's Realsense technology, whether GigE-Vision or Mipi as the interface, whether FPGA or graphics card as the image processing center. Everything is freely programmable, and only as large and heavy as the application requires. However, the integration effort is incomparably higher than for smart cameras.

Suppliers of embedded vision systems or system components include Vision Components, Flir, Hema Electronic, Ximea, LMI, and more. ■

AUTHOR
David Löh
Editor in chief of inspect

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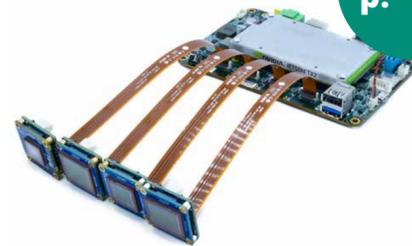www.WileyIndustryNews.com

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New Products II

Compact Camera now Available with Senswir Sensors

Image: Allied Vision

Allied Vision's Alvium 1800 camera series is now also available with Sony's InGaAs Swir sensors. The new models of the 1800 series with USB 3 Vision or CSI 2 interface can be used with the Senswir sensors in a wide spectral range from 400 to 1700 nm. The Alvium 1800 U/C-030 features the IMX991 sensor with VGA resolution, while the Alvium 1800 U/C-130 offers SXGA resolution with the IMX990.

Alvium 1800 Swir cameras feature a compact design, low power consumption and low weight, making them a solution for compact OEM systems used in embedded and machine vision applications.

The core modules are optionally available with a USB3 Vision or MIPI CSI-2 interface with GenICam -compatible function control. With industry-standard hardware and optimized drivers, they enable a plug & play feeling when setting up image processing applications beyond the visible spectrum, regardless of whether they are based on a PC or an embedded system.

All models of the Alvium camera series can be operated at housing temperatures from -20 to 65 °C. They are therefore also suitable for applications with changing operating conditions, such as in outdoor imaging.
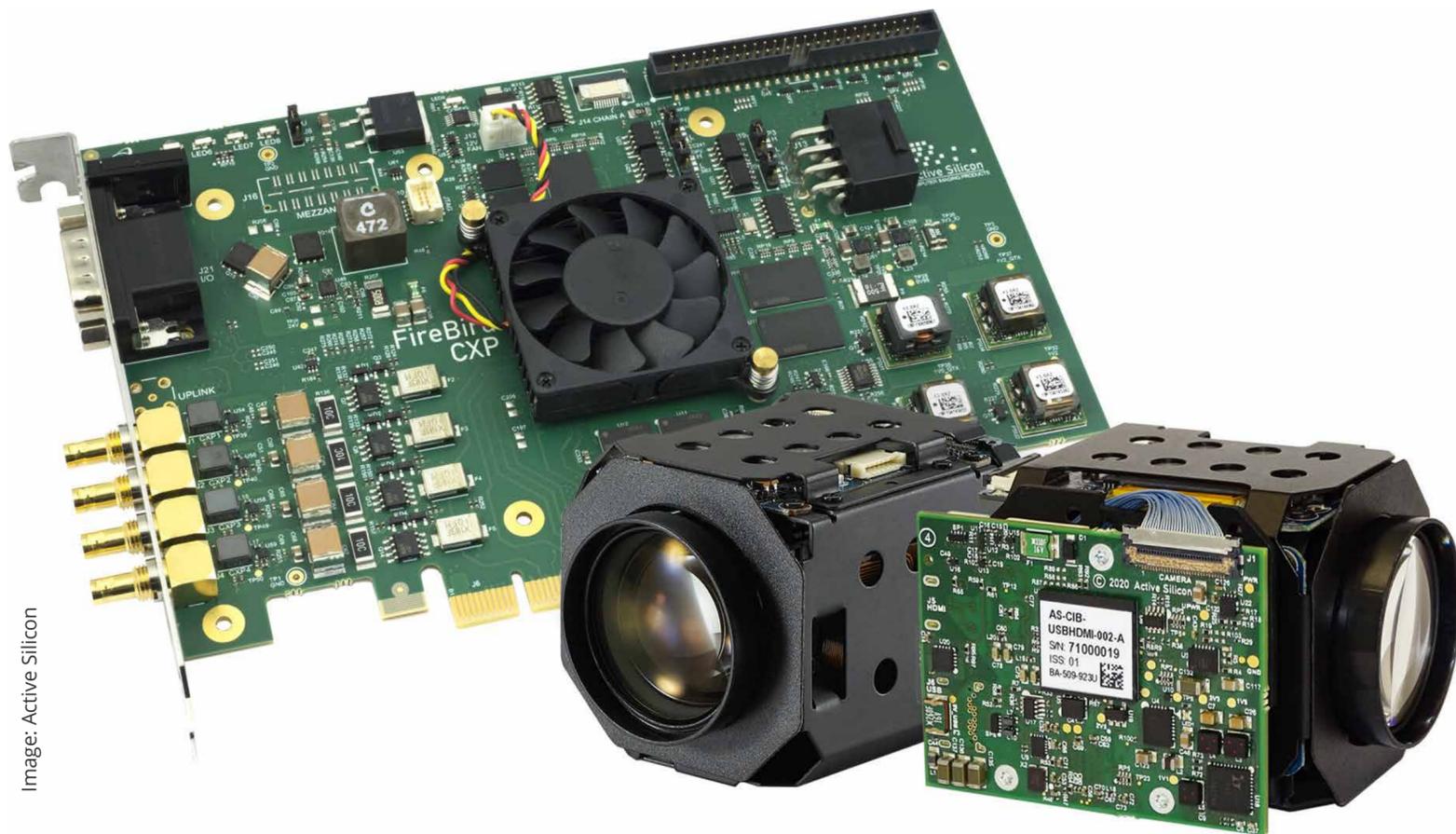
IP Networking Capability for Autofocus Zoom Cameras

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Image: Active Silicon

Active Silicon launch their first IP/Ethernet autofocus zoom camera, bringing IP networking capability to their Harrier line of cameras and interface cards. The numerous applications for the IP cameras range from networked surveillance to industrial inspection. For example, the Harrier 10x AF Zoom IP Camera with Tamro - MP1010M-VC offers a lightweight and compact 1080p camera solution suitable for remote surveillance, traffic and transportation, robotics and remotely operated vehicles (ROVs).

The advantages of IP cameras include the cost-effective cable solutions with ranges of up to 100 m, easy connection to standard PCs and Ethernet infrastructures and a standardized camera control interface (ONVIF).
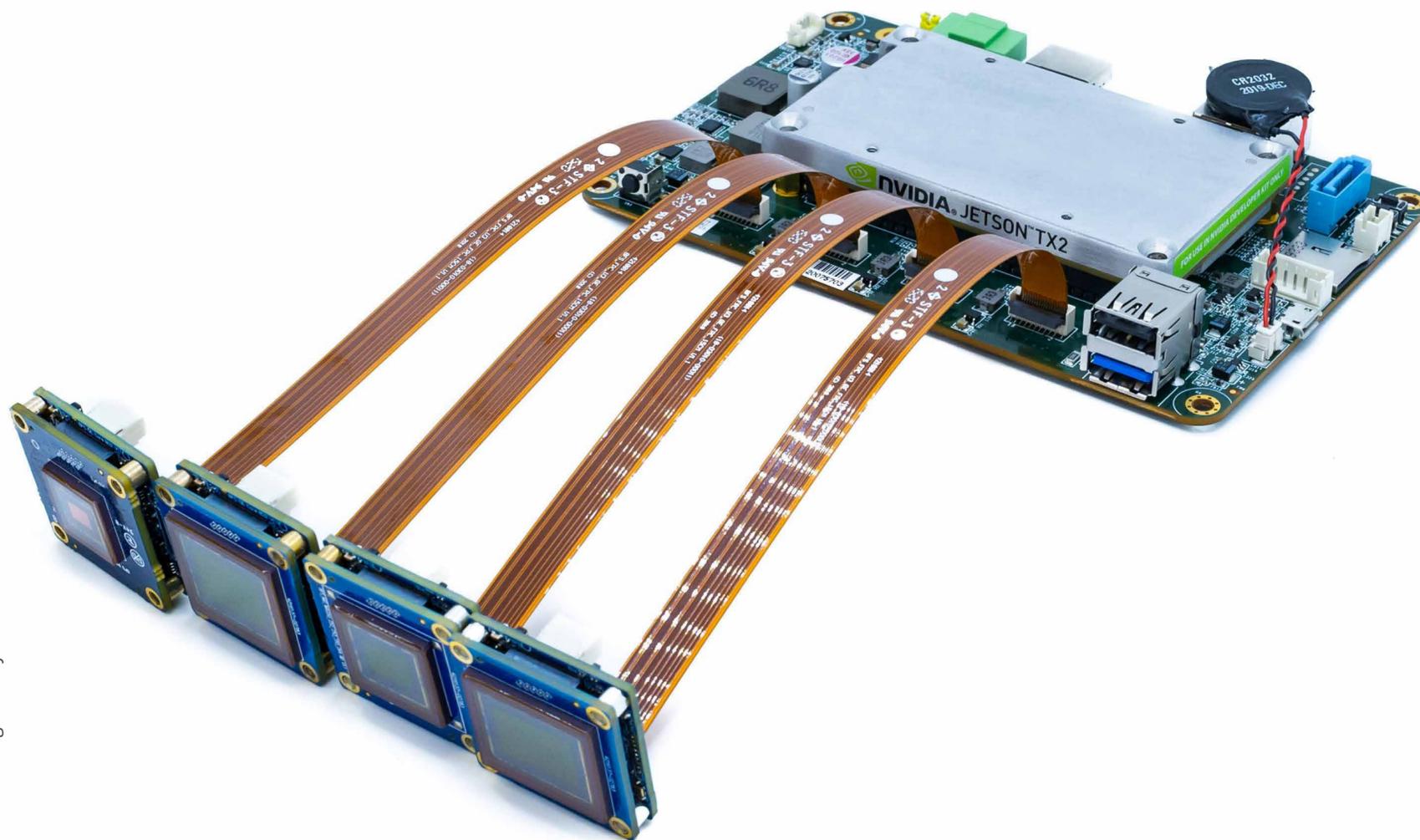
Carrier Board for Embedded Vision

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Image: Teledyne Flir

Teledyne Flir introduces the Quartet TX2 carrier board. It enables four USB3 board cameras to be streamed simultaneously with full bandwidth. This carrier board with TX2 is suitable for space-constrained applications as it does not require peripherals and host systems. The Spinnaker SDK is already pre-integrated in the embedded solution. The Quartet TX2 carrier board combines power and data transmission via one cable per camera – for a footprint of 138 × 92 × 18.2 mm. Integrators can now design compact vision systems with the TX2 module, allowing a powerful Single Board Computer (SBC) to be integrated into space-constrained vision systems. In addition, the Nvidia Jetson Deep Learning hardware accelerator enables a complete decision-making system to be installed on a compact circuit board.

Event Logging Tool for Frame Grabbers

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Image: Matrox Imaging

[Matrox Imaging](#) has published [Gecho](#). This is an event logging tool for [Matrox Rapixo CXP frame grabber](#). Matrox Gecho helps developers optimize image capture and ensure proper performance. The utility logs ingestion activities so users can troubleshoot ingestion errors and measure latencies and execution times to identify performance bottlenecks.

The new event logging utility strengthens the capabilities of Matrox 's established suite Rapixo CXP frame grabbers. These quad, dual and single-input CoaXPress 2.0 frame grabbers support data rates of up to 12.5 Gbit/s (CXP-12) per connection and offer Power-over-CoaXPress (PoCXP) support. Certain models can also distribute image processing loads across multiple computers using a data forwarding feature.

Four Times Faster Machine Vision

Image: B&R

B&R has increased the execution speed of a number of machine vision functions. With a new quad-core processor and just-in-time compiler, vision tasks run up to four times faster than before. Machine builders can use it to significantly increase the throughput of their machines – without using expensive vision PCs.

With the latest Steady version of the Halcon library, the B&R vision system now also has a just-in-time compiler (JIT). The program code to be executed is already cre-ated with the compiler when the application is loaded and not only interpreted at runtime.

In the case of multi-core vision algorithms, the advantages of the new smart sensor version with a quad-core processor also come into play. The higher computing power makes it possible, for example, to almost halve cycle times in matching applications.

Edge Computer for Demanding Machine Vision

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Image: Gidel

With a bandwidth of up to 20 Gb/s, Gidel's new embedded computer has been developed for demanding image processing applications. It combines an Nvidia Jetson Xavier NX processor with Gidel's powerful frame grabber technology for real-time acquisition and processing of large amounts of image data.

With two 10GigE and two Camera Link 80-bit (DECA) connections, Fantovision 20 has high-bandwidth camera interfaces and is therefore suitable for high-resolution, high-frame-rate applications and multi-camera systems.

The ultra-compact computer combines an Nvidia Jetson Xavier NX System on Module (SOM) for image processing and AI algorithms with an Intel Arria 10 FPGA with Gidel's powerful image acquisition, processing and compression.

Integrated Smart Vision System

Image: NET

NET has introduced an integrated smart vision system. Due to Xilinx's system-on-chip design with CPU and FPGA on one chip, high and efficient system performance is achieved. With the Xilinx Vitis software tools, users can use the FPGA resources for powerful neural networks as well as for conventional image processing in real time.

NET's Open Camera Concept also enables commercial image processing libraries such as Halcon, MIL or Adaptive Vision to be used, as well as Open CV or other open-source software tools. Several configuration options are available: image sensors, system performance with different FPGA sizes, OEM systems for customer-specific adaptations, various interface options for system integration.

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Cameras with a Detached Sensor Head

Image: Ximea

After the successful introduction of the Sony Pregius S sensors in the xiC and xiX camera series, these series were expanded to include a further developed housing model in which the sensor housing could be spatially separated from the camera electronics: cameras with a detached sensor head.

With this structure, the full sensor specifications of the Pregius S sensors are achieved without having to enlarge the cameras. In addition, the separation of the sensor head has decisive advantages for the image quality due to the spatial separation.

After the Pregius S sensors, Ximea also offers the new housing concept with larger sensors such as Sony's IMX411 with 151 Mpix, the IMX 455 with 61 Mpix and the IMX461 with 101 Mpix.

GPU-Driven Data Processing for any Multi-Sensor Network

Image: LMI Technologies

LMI Technologies announces the official launch of the Gomax NX Smart Vision Accelerator. This is a high-performance, fanless, embedded device that can accelerate any Gocator sensor or multi-sensor network in data-intensive applications. Execution and power is provided through the Gocator web browser interface. No industrial PC or controller is required for GPU-accelerated data processing. Gomax NX improves real-time data processing, minimizes cycle times and increases overall inspection performance. Suitable applications for acceleration with Gomax NX include multi-sensor ring scanning, robotic weld inspection, or electric car-battery foam inspection.

High-Speed Camera on the Next Level

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Image: Emergent Vision Technologies

Emergent Vision Technologies introduces the 10MP HZ-10000-G camera, the latest in its award-winning line of Zenith 100GigE cameras. Through the 100GigE QSFP28 interface, the camera can reach 1000 fps.

Available in both monochrome and color versions, the camera features Gpixel's GSPRINT4510 CMOS image sensor — a 10MP, 22.9 mm CMOS image sensor with 4.5 x 4.5 µm pixel size. Both GigE Vision and GenICam compliant, the camera reaches 1000 fps in 8-bit mode and 810 fps in 10-bit mode.

In addition to the HZ-10000-G camera, the Zenith 100GigE camera series comprises the 21MP HZ-21000-G, the 65.4MP HZ-65000-G, and the 103.7MP HZ-100-G.

All Emergent Vision Technologies cameras provide low CPU utilization, low latency, low jitter, and ultra-high data/frame rates, with standard accessories and cabling options to cover any length. Additionally, GigE Vision cameras can be synchronized with IEEE 1588 PTP.

Module for Demanding Applications

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Image: Framos

Framos extended its Sensor Module Ecosystem with the FSM-IMX678. This module has the IMX678 CMOS image sensor from Sony Semiconductor Solutions and can be used for testing and validation in solutions designed for security and Smat City, low-light applications in industry, AGV, and logistics drones. FSM-IMX678 is suited for projects in medical industry, microscopy, Augmented/Virtual Reality.

The 8.4 Megapixel image sensor with its 2.0 µm pixel size is built on Sony's Starvis 2 technology. The IMX678 offers more improved high dynamic range, with better low light and NIR performance than its predecessor, the IMX334. The new 1/1.8" sensor's optical format is compatible with popular M12/S-mount lenses and delivers smooth 4K/60 FPS via its MIPI CSI-2/D-PHY interface.

Framos now offers Sensor Module development kits for various processor development boards. With the interchangeable components of the Embedded Vision Ecosystem, vision engineers and developers can quickly and easily connect these components to develop their products from concept to production.

Heavy-Duty Lens Series

Image: Fujifilm

Fujifilm presents the Fujinon HF-XA-1F series for demanding applications. The series features Fujifilm's Anti Shock & Vibration technology and has a rugged mechanical design with no moving parts inside the lens. The focus is adjusted with the special C-mount and its nut and counter nut system. Users can adapt the iris to their needs by exchanging the screw-locked iris plate. This ensures the highest possible optical stability and durability, even under harsh conditions.

The new Fujinon HF-XA-1F series is suitable for image sensor sizes from 2/3" to 1/1.2" and resolutions up to 5 Megapixel resulting in 3.45 µm pixel sizes, which is the core of the industrial machine vision market. It is available in five focal lengths ranging from 8 mm to 35 mm.

Greater Precisioning with Shortwave Infrared Range Camera

Image: Lucid Vision Labs

Lucid Vision Labs announced the launch of the new Atlas Swir IP67-rated 1.3 MP and 0.3 MP cameras. The Atlas Swir is a GigE PoE+ camera featuring wide-band and high-sensitivity Sony Senswir 1.3 MP IMX990 and 0.3 MP IMX991 InGaAs sensors, capable of capturing images across both visible and invisible light spectrums, and boasting a miniaturized pixel size of 5 µm. The camera's capability of imaging on the short-wavelength infrared light spectrum opens a world of industrial applications with greater precision in fruit inspection and sorting, packaging, IR microscopy material sorting and more. The camera is equipped with integrated single-stage thermoelectric sensor cooling (TEC1) for superior image quality and extended operating temperature range. Its compact Factory Tough design offers IP67 protection, Power over Ethernet (PoE+) and provides protection against shock, vibration, water, dust, and electromagnetic interferences.

It features Active Sensor Alignment, a compact 60 x 60 mm size, M12 Ethernet and M8 general purpose I/O connectors for a robust connection, industrial EMC immunity and a wide ambient temperature range of -20 °C to 50 °C.

The Atlas is a GigE Vision and GenICam compliant camera capable of 1 Gbps data transfer rates and allows the use of standard CAT5e and CAT6 cables up to 100 meters.

Software update for AI Training Software

Image: IDS Imaging Development Systems

Several new features are now available to users of the all-in-one embedded vision system IDS NXT ocean. This includes multi-ROI ("Region Of Interest") for AI-based object detection and the option of using different neural networks for different ROIs in one image via the vision app. There are also binning, line scan mode and performance and configuration improvements.

With the Microsoft Azure cloud services, IDS Imaging Development Systems supports another hoster for the AI training software IDS NXT lighthouse in addition to AWS. Users in IDS NXT lighthouse can start training their own neural network directly – even without prior knowledge of deep learning or camera programming.

Regional Structures Ensure Availability of Performance Camera Series

Image: SVS-Vistek

With the industrial cameras of the FXO series, SVS-Vistek has an alternative in its program that guarantees short-term availability due to the strong regional structure of partners and suppliers as well as a high in-house production depth.

The FXO cameras are based on Pregius S image sensors from Sony's IMX54x series. Images can be generated from small 2.74 µm pixels with global shutter, and their dynamic range is typically 72 dB. FXO models are available with resolutions from 5 to 24.5 megapixels and frame rates from 30.4 to 124 fps.

In addition to standard features such as ROI, LUT and binning, advanced features such as SVS-Vistek's Color Transformation Control feature provide powerful options in the field. This allows the conversion of color spaces for better color reproduction to display images according to human color perception. In addition to ready-made conversion matrices for the standardized light temperatures D50, D65, TL84 and A, users can also define their own conversion matrices and thus adapt the color rendering to specific lighting situations. As an FPGA-based feature, the changed color representation runs in real time in the camera's firmware without any loss of time.

Logimat 2022: Embedded Vision System Detecting Reflective Warning Clothing

Image: Vision Components

In addition to smart components, sensors and imaging technologies for OEM intralogistics projects Vision Components presents the emitrace driver-assistance system from Retenua which is designed for demanding industrial environments.

The fully autonomous driver-assistance system that detects reflectors on high-visibility clothing, calculates the 3D position and speed of people and triggers an alarm to the driver if an accident threatens.

The emitrace sensing and processing unit is typically installed at the rear of industrial vehicles and connects to an optoacoustic signaling device in the driver's cabin. No other devices are necessary. Optionally, if coupled with the vehicle control system, emitrace can even directly initiate braking. It is available as an OEM component for logistics applications.