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January/February 2019

VISION focus

Delivering the latest news from the Imaging and Machine Vision markets

AI system learns to diagnose and classify intracranial hemorrhage

Image courtesy MGH.

VISION Focus Newsletter 2019

The **VISION Focus Newsletter** sends a targeted message directly into the inbox of key decision makers from the imaging and machine vision markets.

VISION Focus Newsletter enables you to promote the latest products, show attendance and establish your company brand as an essential business partner. The **VISION Focus Newsletter** will push traffic directly to your website and encourage direct engagement.

VISION Focus Newsletter 2019 - online dates   ● 24th January   ● 19th April   ● 8th August   ● 25th October

For more information contact Rob Fisher on (0)117 905 5330 or email: rob.fisher@optics.org

VISION focus

SPIE.

If you're going to San Francisco

Welcome to the latest issue of VISION Focus, the quarterly digital magazine that covers all aspects of vision and imaging, produced by the team that brings you optics.org. An editorial focus of this issue is Photonics West 2019 in San Francisco, where the optics.org editorial and sales teams will be reporting on and meeting the industry to produce the Show Daily newspaper. We also present an extensive review of the vision sector's biggest bi-annual expo VISION in Stuttgart, Germany.

In 2019, SPIE's Photonics West, at the revamped Moscone Center in San Francisco, will play host to an estimated 23,000 registered attendees, 1,350 exhibitors, and see presentations of more than 5,200 papers. Along with 14 professional-development sessions and 70+ courses covering everything from Laser Sources to Photonic Therapeutics and Diagnostics, the event also hosts the largest job fair for optical engineering.

Key topics in this issue of Vision Focus include a report on how artificial intelligence is helping to diagnose and classify intracranial hemorrhage medical issues; a team of investigators at Massachusetts General Hospital has developed a system based on AI to rapidly diagnose brain hemorrhages and determine the best treatments.

ams and Qualcomm are co-developing an "active stereo camera" for mobile 3D apps. The proposed solution is intended to enable cost-reduced 3D biometrics, facial scanning and imaging from cell phones.

On the business side of vision, big players Stemmer and Cognex have both reported healthy revenues; Stemmer's record annual revenue was up 14% to over €100M while Cognex enjoyed its second-best quarter but warned that the Chinese market is cooling.

Nikon is working with Velodyne Lidar in a $25M deal that will see the Japanese camera giant collaborate to combine precision optics technology with Velodyne's sensors. Roper is selling its scientific imaging brands to Teledyne. This $225M deal sees Princeton Instruments, Lumenera, and Photometrics transfer to the owner of sensor firm e2v.

At Vision 2018, Sony presented an "evolutionary" suite of cameras and software. Its Imaging & Sensing Solutions division is supporting manufacturing, non-manufacturing and entertainment sectors with "smart" vision. Also at the Stuttgart show, it was revealed that the vision industry saw record sales growth through 2017. But reporting agency Germany's VDMA warned of a 2018 slowdown, again due to China cooling on mobile phone production.

Finally we present an extensive round-up of some of the new systems and products launched at VISION's biggest ever exhibition to date.

If you are attending the BIOS show, please come and visit us on booth 8841 and at Photonics West it's booth 841. Hoping to see you in San Francisco.

Matthew Peach, Contributing Editor
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This Issue

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plus the latest product launches from within the industry

Publication and Editorial Schedule 2019/20

April/May Issue
- Bonus Distribution: **SPIE Defense+Commercial Sensing, CONTROL, Stuttgart 2019**
- Editorial Focus: aerospace and defense applications, associated research and development
- Published in advance of DCS *(Defence & Commercial Sensing)*, 14th – 18th April 2019

June/July Issue
- Bonus Distribution: **Laser World of Photonics, SPIE Optics+Photonics and European Machine Vision Forum**
- Editorial Focus: optical components, academic research, software applications.
- Published in advance of Laser World of Photonics, 24th - 27th June 2019

September/October Issue
- Bonus Distribution: **EMVA Embedded Vision Forum Europe,**
- Editorial Focus: opto-electronic systems, applications in sensing and manufacturing.
- Published in advance of EMVA Embedded Vision Europe, 24th – 25th October 2019

January/February Issue 2020
- Bonus Distribution: **SPIE BiOS, Photonics West, SPIE Medical Imaging**
- Editorial Focus: industrial applications, sensing, biomedical analysis and treatments.
- Published in advance of BiOS, 2nd - 3rd Feb, Photonics West, 4th Feb - 6th Feb, SPIE Medical Imaging, February 2020
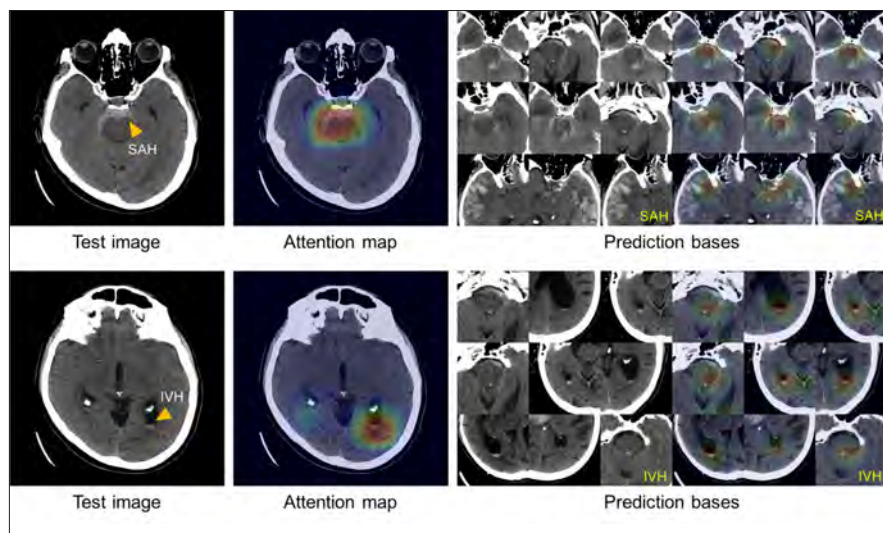
AI system learns to diagnose and classify intracranial hemorrhage

Mass. General Hospital-developed system can help support decisions based on CT brain scans. *Matthew Peach reports.*

A team of investigators working at the Massachusetts General Hospital (MGH) Department of Radiology has developed a system using artificial intelligence to rapidly diagnose and classify brain hemorrhages and to provide the basis of its decisions from relatively small image datasets. They say that such a system could become "an indispensable tool for hospital emergency departments evaluating patients with symptoms of a potentially life-threatening stroke, allowing rapid application of the correct treatment". The team's report has been published in the journal Nature Biomedical Engineering.

While ever-increasing computational power and the availability of big datasets have improved machine learning – the process by which computers analyze data, identify patterns and essentially teach themselves

Massachusetts General Hospital is the largest teaching hospital of Harvard Medical School and a biomedical research facility located in Boston, Mass.

Image courtesy MGH.

The MGH system's ability to explain its diagnosis of subarachnoid (left above) and intraventricular (left below) hemorrhage by displaying images with similar appearances (right) from an atlas of images used to train the system.

Credit: Hyunkwang Lee and Sehyo Yune.

how to perform a task without the direct involvement of a human programmer – important obstacles can prevent such systems from being integrated into clinical decision making.

These include the need for large and well annotated datasets – previously developed imaging analysis systems capable of duplicating the performance of a physician were trained with more than 100,000 images – and the "black box" problem, the inability of systems to explain how they arrived at a particular decision. The US Food & Drug Administration requires any decision support system to provide data allowing users to review the reasons behind its findings.

"It is paradoxical to use the words 'small data' or 'explainable' to describe a study that used

deep learning," commented Hyunkwang Lee, a graduate student at the Harvard School of Engineering & Applied Sciences, one of the two lead authors of the study. "However, in medicine it is especially hard to collect high-quality big data. It is critical to have multiple experts label a dataset to ensure consistency of data. This process is very expensive and time-consuming."

Co-lead author Sehyo Yune, MD, of MGH Radiology adds, "Some critics suggest that machine learning algorithms cannot be used in clinical practice, because the algorithms do not provide justification for their decisions. We realized that it is imperative to overcome these two challenges to facilitate the use in health care of machine learning, which has an immense potential to improve the quality of and access to care."

To train their system, the MGH team began with 904 head CT scans, each consisting of around 40 individual images, that were labeled by a team of five MGH

neuroradiologists as to whether they depicted one of five established hemorrhage subtypes, based on the location within the brain, or no hemorrhage.

Improved accuracy

To improve the accuracy of this deep-learning system the team – led by senior author Synho Do, PhD, director of the MGH Radiology Laboratory of Medical Imaging and Computation and an assistant professor of Radiology at Harvard Medical School – built in steps mimicking the way radiologists analyze images. These include adjusting factors such as contrast and brightness to reveal subtle differences not immediately apparent and scrolling through adjacent CT scan slices to determine whether or not something that appears on a single image reflects a real problem or is a meaningless artifact.

Once the model system was created, the investigators tested it on two separate sets of CT scans – a retrospective set taken before the system was developed, consisting of 100 scans with and 100 without intracranial hemorrhage, and a prospective set of 79 scans with and 117 without hemorrhage, taken after the model was created. In its analysis of the retrospective set, the model system was as accurate in detecting and classifying intracranial hemorrhages as the radiologists that had reviewed the scans had been. In its analysis of the prospective set, it

AI system learns to diagnose and classify intracranial hemorrhage

proved to be even better than non-expert human readers.

To solve the "black box" problem, the team had the system review and save the images from the training dataset that most clearly represented the classic features of each of the five hemorrhage subtypes. Using this atlas of distinguishing features, the system is able to display a group of images similar to those of the CT scan being analyzed in order to explain the basis of its decisions.

"Rapid recognition of intracranial hemorrhage, leading to prompt appropriate treatment of patients with acute stroke symptoms, can prevent or mitigate major disability or death," said co-author Michael Lev, MD, MGH Radiology. "Many facilities do not have access to specially trained neuroradiologists, which can require non-expert providers to determine whether or not a hemorrhage is the cause of a patient's symptoms. The availability of a reliable, 'virtual second opinion' – trained by neuroradiologists – could make those

A radiologist studies body scans at Mass General Hospital.

providers more efficient and confident and help ensure that patients get the right treatment."

Co-author Shahein Tajmir, MD, MGH Radiology commented, "In addition to providing that much needed virtual second opinion, this system also could be deployed directly onto scanners, alerting the care team to the presence of a hemorrhage and triggering appropriate further testing before the patient is even off the scanner.

"The next step will be to deploy the system into clinical areas and further validate its performance with many more cases. We are currently building a platform to allow for the widespread application of such tools throughout the department. Once we have this running in the clinical setting, we can evaluate its impact on turnaround time, clinical accuracy and the time to diagnosis."

Matthew Peach, Contributing Editor, optics.org

Stemmer and Cognex both report healthy revenues

Stemmer's record annual revenue up 14% to over €100 million; Cognex has second-best quarter but warns China market is cooling.

Vision systems giant Stemmer Imaging has just published its 2017/2018 annual report, which reveals that the company generated what it calls "record-breaking" trading figures over the past financial year (to 30 June). Revenue climbed by 14% to €100.63 m (€88.30 m in 2016-2017). Stemmer said it had exceeded the €100 m revenue mark for the first time in its history. Adjusted operating earnings increased by 46.5 % to €11.1m.

Adjusted consolidated earnings before interest and taxes were €8.9 m, described as "considerably higher" than the previous year's figure of €5.8 m. Including income tax expenses of €1.25 m, consolidated net income totaled €7.7 m (previous year: €4.4 m).

Stemmer's report said that growth "on the whole was chiefly driven by persistently high demand for machine vision solutions and automation components". The market's development is reflected by the further rise in incoming orders, which increased by 15.6% to €106.93 m during 2017/2018 (€92.5 m in 2016-2017).

Stemmer's own machine vision software called Common Vision Blox, has also seen rising demand. The company also grew by acquisition: Data Vision (machine vision), which was acquired in Q3, 2017/2018 and consolidated into Stemmer since February 2018, "is being integrated successfully", the company added. "The Dutch company has already contributed around €1.7 million to revenue and €0.14 m to EBITDA."

The annual report continued, "For Stemmer Imaging, the 2017/2018 financial year was primarily shaped by the successful IPO at the end of February 2018, from which the Group generated gross issue proceeds of €51.0 m.

"A portion of the funds raised has already been profitably invested beyond the reporting period. This includes the acquisition of the French distributor Elvitec in July 2018 and the investment in the software provider Perception Park in October 2018. Perception Park is a provider of hyperspectral imaging software.

Primed for acquisitions

Stemmer also stated that it currently has cash and cash equivalents totaling €51.8 million "The company is therefore able to act flexibly if opportunities arise with regard to potential acquisition targets."

The cooperation agreed with the Chinese Nanjing Inovance Industrial Vision Technology in August 2018 is an important strategic success on the path to international expansion. By

cooperating closely with this subsidiary of Shenzhen Inovance Technology, Stemmer is also expanding into the dynamically growing automation market in China."

Lars Böhrnsen, CFO, commented, "The 2017/2018 financial year will go down forever in Stemmer's history. Starting with our IPO and followed by international expansion, our performance to date has now resulted in a new record year and revenue in excess of €100 million.

"We are convinced that we will reach our targets with our innovative products and our more than 30 years' experience in the machine vision market."

Looking ahead, the company's Management Board commented that it expects increased revenue growth compared to the previous year, a slightly higher gross margin and a slight rise in the EBITDA margin.

Cognex reports results for Q3

Another vision systems giant albeit with a slightly different profile, Cognex, has also just announced generally positive financial results for trading in its third quarter of 2018.

Image: Stemmer.

Camera action: Stemmer is Europe's largest imaging technology provider.

Dr. Robert Shillman, Chairman of Cognex, commented, "Our results for Q3-18 were very good. We reported the second-best quarterly revenue, net income and earnings per share from continuing operations in our company's 37-year

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Stemmer and Cognex both report healthy revenues

history. These results were surpassed only by our spectacular performance in last year's third quarter, which was driven by exceptional growth across our business, particularly in our largest end market—consumer electronics."

Robert Willett, CEO, added, "We accomplished significant company objectives that are expected to set us up for long-term growth. These include successfully implementing our new Enterprise Resource Planning (ERP) system and passing a number of key product development milestones."

However, looking ahead, Willett cautioned, "While we are pleased with our Q3-18 results, slower spending trends that we are experiencing in China have reduced our revenue outlook for Q4-18."
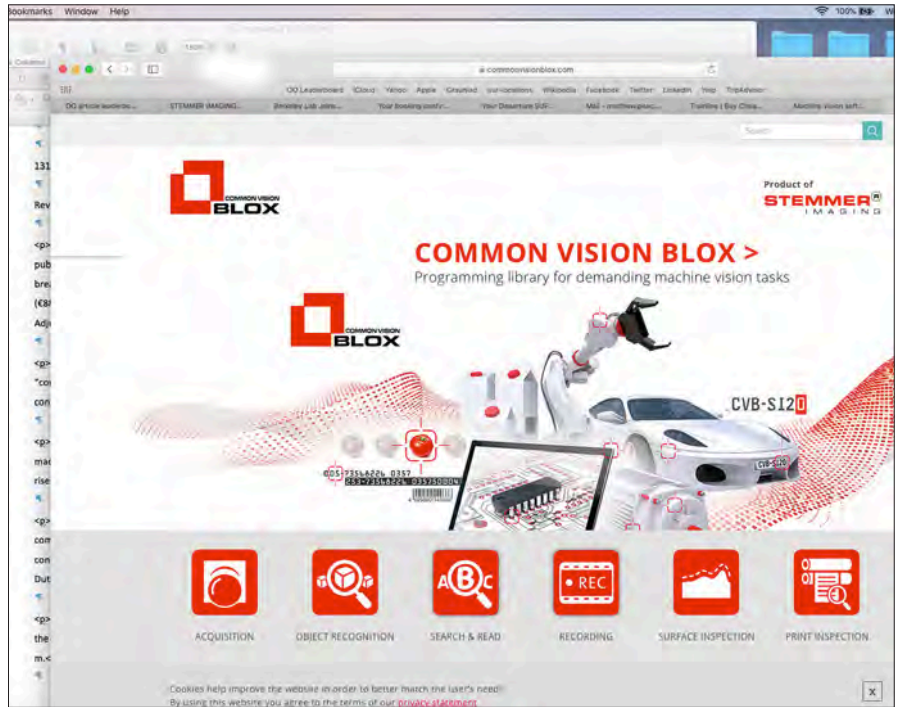
Stemmer's own machine vision software called Common Vision Blox, has also seen rising demand.

In a separate statement, Cognex announced that its Board of Directors declared a quarterly cash dividend of $0.05 per share, payable on November 30, 2018 to all shareholders of record at the close of business on November 16, 2018.
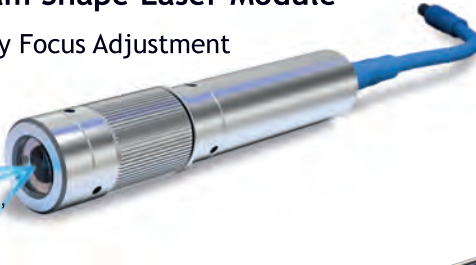
Mike Hatcher, Editor in Chief, optics.org
http://optics.org/news/9/10/51

ams and Qualcomm to co-develop 'active stereo camera' for mobile 3D apps

Proposed solution intended to enable cost-reduced 3D biometrics, facial scanning and imaging from cellphones.

ams, a developer of high-performance sensors, and Qualcomm subsidiary Qualcomm Technologies have announced a joint plan to develop a 3D depth-sensing camera solution for mobile phone applications. These would include 3D imaging and scanning and, in particular, biometric face authentication.

With ams' VCSEL light sources and optical IR pattern technology incorporating mass-production-proven wafer level optics and Qualcomm's Snapdragon Mobile Platforms, the companies are intending to create what they call "a reference design for a cost-attractive, active 3D stereo camera solution for Android-based mobile phones."

Purposes of the platform solution could include front-facing applications that require advanced 3D imaging, such as the standard of face recognition required for secure online payments as well as other functions such as dynamic-depth facial scanning.

"Qualcomm Technologies is committed to providing active depth camera solutions for our customers," commented Keith Kressin, senior vice president, product management, Qualcomm Technologies. "We're excited to be working with ams on the development and commercialization of this reference design with the goal of bringing these depth sensing solutions to consumers."

Alexander Everke, CEO of ams, said, "ams provides the full range of IR illumination devices specifically designed to address the three 3D technologies Active Stereo Vision, Structured Light and Time-of-Flight.

"Utilizing this leading capability together with Qualcomm Technologies' mobile application processors for active stereo camera solutions is an exciting opportunity. We want to enable fast time-to-commercialization and broad-based availability of high-quality 3D sensing solutions for Android-based smartphones and mobile devices, and this is a step towards this goal."

ams launches 'slimmest' proximity/color sensor module

In related news, ams has also announced the introduction of a 1.44mm-wide fully integrated color/ambient light/proximity sensor module, which has the ultra-slim package footprint required by the latest narrow-bezel mobile phone industrial designs (see above).

The company commented that the module will "enable manufacturers to better optimize automatic disabling of smartphone touch screens during calls and the adjustment of screen brightness to ambient conditions for more comfortable and lower-energy smartphone use."

Matthew Peach, Contributing Editor, optics.org
http://optics.org/news/9/11/33

Image: ams.

ams's latest proximity/color sensor module will enable security-focused facial recognition.

Nikon allies with Velodyne Lidar

$25M investment will see Japanese camera giant collaborate to combine precision optics technology with Velodyne sensors.

Laser-based sensor specialist Velodyne Lidar has revealed a new strategic investor in the form of the global optics giant Nikon.

California-based Velodyne, which is engaged with several car manufacturers on the development of autonomous vehicles using its lidar equipment, says that as well as providing $25 million in funding Nikon is discussing a "multifaceted business alliance".

Aside from its household-name status as a leading camera brand, Nikon sells high-specification industrial equipment including lithography tools for semiconductor wafer patterning, microscopes, and ophthalmology tools.

Velodyne said that the companies would aim to combine Nikon's optical and precision technologies with Velodyne's sensors, including collaboration in technology development and manufacturing.

"Velodyne believes the relationship will advance the timeline for manufacturing and mass production of lidar for the autonomous and advanced safety global market," added the firm. "The companies share a futuristic vision of advanced perception technology for a wide range of applications including robotics, mapping, security, shuttles, drones, and safety on roadways."

Early mover advantage

One of the early movers in automotive lidar, Velodyne attracted venture investment of $150 million in summer

Image: Velodyne Lidar.

Velodyne's lidar 'puck' sensors feature as many as 128 laser sources operating at 905 nm to scan their surrounds.

2016 – with the likes of Ford and Chinese search engine firm Baidu among its backers. Its puck-shaped sensors have been regularly seen on prototype and concept self-driving vehicles under development by top-tier car firms.

Since that funding round dozens more rivals have emerged, many focusing on higher-end sensors based around longer-wavelength sources (operating at 1550 nm) than the 905 nm lasers that Velodyne has typically deployed in its products.

Despite relying on lasers that are significantly more expensive to produce, proponents of the longer-wavelength approach say that because of more relaxed eye-safety regulations they can

use far higher power levels – meaning higher-definition scans and longer ranges.

Velodyne points out that the higher power is also needed partly because of the significantly higher water absorption experienced at the longer wavelength.

Unlike many of its rivals, Velodyne also sells its sensors into a variety of other applications, for example geographical mapping, security, logistics, and unmanned aerial vehicles.

David Hall, the firm's founder and CEO, said of the Nikon deal: "Velodyne is creating a network of powerful alliances supporting the global autonomous vehicle industry. One hundred years ago, optics and camera technologies like Nikon's helped people to see better. Now, the basis of those technologies is helping computers see."

Established in late 2015, Velodyne Lidar now employs 550 people – many at its so-called "megafactory" in San Jose. Other sites include a research and development laboratory in Oakland, and offices in China and Germany.

Mike Hatcher, Editor in Chief, optics.org

http://optics.org/news/9/12/37

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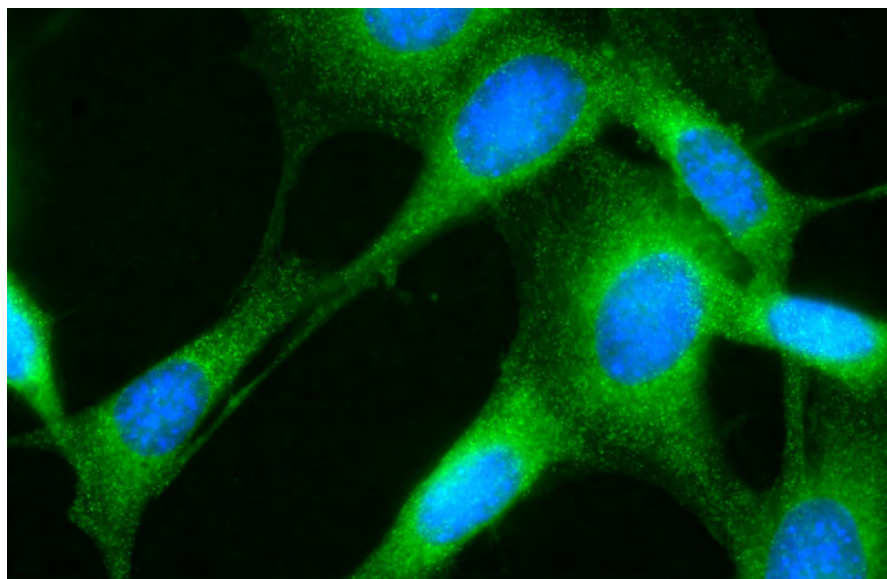**SPIE.**

Roper sells scientific imaging brands to Teledyne

$225M deal sees Princeton Instruments, Lumenera, and Photometrics transfer to owner of sensor firm e2v.

Teledyne Technologies has agreed a deal to buy the scientific imaging businesses currently belonging to Roper Industries.

The $225 million cash deal, expected to close in early 2019, will see well-known photonics brands including Princeton

biology imaging using fluorescence and chemiluminescence.

Lumenera primarily provides rugged USB-based customized cameras for markets such as traffic management, as well as life sciences applications.

Single-molecule microscopy utilizing one of Photometrics' "Prime 95B" scientific CMOS cameras. This image shows human bone osteosarcoma epithelial cells, imaged at 60x magnification with Cy3-labeled RNA, and a DAPI-labeled nucleus.

Credit: Bin Wu, Department of Biophysics and Biophysical Chemistry, School of Medicine, Johns Hopkins University.

Instruments, Photometrics, and Lumenera make the switch, along with some others.

The businesses concerned provide a range of imaging solutions, primarily for life sciences, academic research and customized OEM industrial imaging solutions.

Princeton Instruments and Photometrics manufacture state-of-the-art cameras, spectrographs and optics for advanced research in physical sciences, life sciences research and spectroscopy imaging.

Key markets for the high-end cameras and related equipment include materials analysis, quantum technology and cell

Once part of Teledyne, they will fall under the same corporate umbrella as sensor manufacturer e2v Technologies and camera firm Dalsa. Teledyne bought e2v in March 2017 for approximately $790 million.

Changes at Roper

NYSE-listed Teledyne's CEO Robert Mehrabian said in a company release: "These scientific imaging businesses have similar capabilities and are highly complementary to Teledyne's products and markets.

"Teledyne is a company committed to science and discovery. We are a key partner to high-technology businesses, government

agencies and academic institutions across the globe.

"Princeton Instruments and Photometrics will provide Teledyne new products serving life sciences customers and markets, while Teledyne will offer Lumenera greater opportunities in the industrial domain."

Roper CEO Neil Hunn, appointed in August to replace long-time chief Brian Jellison, described Teledyne as an "ideal home" for the various businesses, and their customers and employees. The Sarasota, Florida, company will bolster its cash position with the proceeds from the transaction. Its balance sheet showed cash and equivalents of $363 million as of September 30, alongside $4.4 billion in long-term debt.

Gatan sale; refinance

Back in June Roper had indicated a likely new direction with its $1.1 billion all-cash acquisition of the financial software company PowerPlan. Two months later it sold $1.5 billion in unsecured loan notes, partly to repay a maturing $500 million loan accruing interest at a rate of 6.25 per cent.

Roper is also in the process of selling its electron microscope division Gatan to the analytical equipment firm Thermo Fisher, although that $925 million cash deal is now subject to further review by the UK's Competition and Markets Authority.

In its latest financial results, for the three months ending September 30, Roper reported total sales of $1.32 billion – of which the medical and scientific imaging division that includes the brands being sold to Teledyne contributed $380 million.

For that period, the medical and scientific imaging business unit posted an impressive operating profit of $133 million, or 32.3 per cent of sales.

• Several of the divisions involved in the Teledyne transition will be showing off their latest products at the forthcoming SPIE Photonics West technology exhibition, taking place at the Moscone Center in downtown San Francisco in early February.

Princeton Instruments is showcasing its "BLAZE" high-speed spectroscopy cameras, featuring enhanced near-infrared sensitivity, while Photometrics is highlighting new scientific CMOS cameras, and Lumenera is launching a rugged 29 megapixel camera for industrial use.

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Radiant Vision Systems, LLC

NIR Intensity Lens measures near-infrared light sources used for 3D sensing

The Near-Infrared (NIR) Intensity Lens system from Radiant combines a Fourier-optic lens with 16-megapixel CCD imaging radiometer for precise characterization of NIR-emitting light sources used for facial recognition and other 3D sensing applications. The system captures angular data to ±70 degrees in a single image to efficiently measure radiant intensity across the distribution, and analyzes structured light patterns produced by diffractive optical elements (DOE).
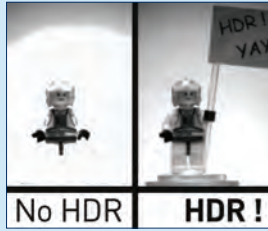
- Measure near-IR LEDs and lasers
- Capture light across ±70 degrees
- Output extensive DOE statistics
- Qualify facial and gesture recognition technology

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Pixelink a Navitar Company

New HDR and Polarization Camera Models with Sony IMX Pregius CMOS Sensors

Pixelink has expanded their USB3 Vision industrial camera line with new HDR and polarization models.

The PL-D757 and PL-D753, featuring Sony 3rd generation IMX420 and IMX421 sensors, capture and combine dual ADC images into a single hybrid HDR image directly on camera – making them ideal for HDR imaging applications such as moving parts inspection.
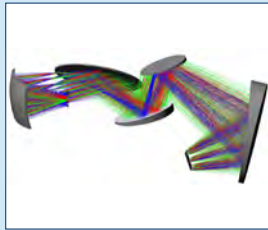
The PL-D755-POL polarization machine vision camera, featuring Sony's IMX250MZR image sensor with pixel-level quad polarization filter technology, offers broader visual detection and characterization capabilities of material properties over conventional monochrome sensors.

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Vision 2018:

Sony presents evolutionary suite of cameras, software

Imaging & Sensing Solutions division supporting manufacturing, non-manufacturing and entertainment sectors with "smart" vision systems.

At the Vision expo in Stuttgart, Germany, Sony's Imaging & Sensing Solutions division (ISS) showcased its latest ranges of cameras for medical and surveillance apps, embedded vision-friendly systems, polarizing cameras and augmented reality solution known as Mitene.

Arnaud Destruels, Marketing and Marcomms Manager Europe for Sony ISS.

Arnaud Destruels, Marketing and Marcomms Manager Europe for Sony ISS described the company's range as "an evolutionary development, which now ranges from cameras through software to applications."

New at Vision is the 4K FCB Global Shutter CMOS XC and UMC ranges, which are targeting surveillance and medical applications; and the Camera-Linked Gigabit Ethernet v MV cameras up to 12 M pixel." Here we are using the newest family of Sony sensors," said Destruels.

"With the evolution of Sony consumer cameras we wanted to provide a B2B version of the consumer camera s at up to 20MP, which are very interesting for UAV and 3D scanning applications. This latest development was based on a consumer model, which conventionally have only a six months to 12 month lifespan, so we are developing a B2B version with a three-year lifetime."

The B2B market is not only about manufacturing it's also for non-manufacturing applications such as medical, surveillance and military. Sony ISS's 20MP Camera Link-enabled camera is said to be the first to operate at 13 fps.

Collaboration

Destruels continued, "We have formed a collaboration with Edmund Optics in their new telecentric lenses. The camera collects a 2D image and the software can builds an estimated 3D image. It is a virtual 3D image but effectively based on the resolution of the 2D image with a reduced time of analysis for such purposes as product quality verification."

One of the hot topics at this year's Vision expo was Embedded Vision (EV), so what is Sony doing in this respect? Destruels commented, "Considering EV, for Sony our aim is not to provide a finished solution but to support our customers and partners with the means towards developing an EV systems, such combined with an Nvidia board, which is the effective PC.

"The point here is that Sony ISS can support our customers wishes to develop an embedded vision system and we are talking about the general need for AI and deep learning to enable that. There are a lot of other suppliers saying that they have developed complete EV/AI/DL systems already. But at Sony we like to be pragmatic and not to be pretentious."

Destruels remarked that, in fact, Sony already operates its own EV systems in some of its factories but added that these are not yet on the market as full packages. "These are really a work in progress. We are not naïve. We think that some camera manufacturers are very arrogant when they say that they have developed comprehensive EV systems," he said.

Polarized cameras

Also on display was Sony ISS's "Polar Sense" brand of polarized cameras which have two particular applications that Destruels believes will both find good market reaction. Nowadays, in

applications it is also important to provide not only the camera but also the software design kit (SDK).

"The first market is traffic control because this camera can see through windscreen reflections and software will automatically measure the number of occupants, for example for road tolling," he said. The second market is glass manufacturing – such as for mobile handset screens. Destruels added, "in this industry, the makers use MV cameras to understand the glass processes, especially the stresses applied during manufacture. Here, our SDK can crate a specific app to measure and evaluate stress in the glass."

Mitene – look at me
Last but not least was the 4K Mitene system, launched in Japan, China and
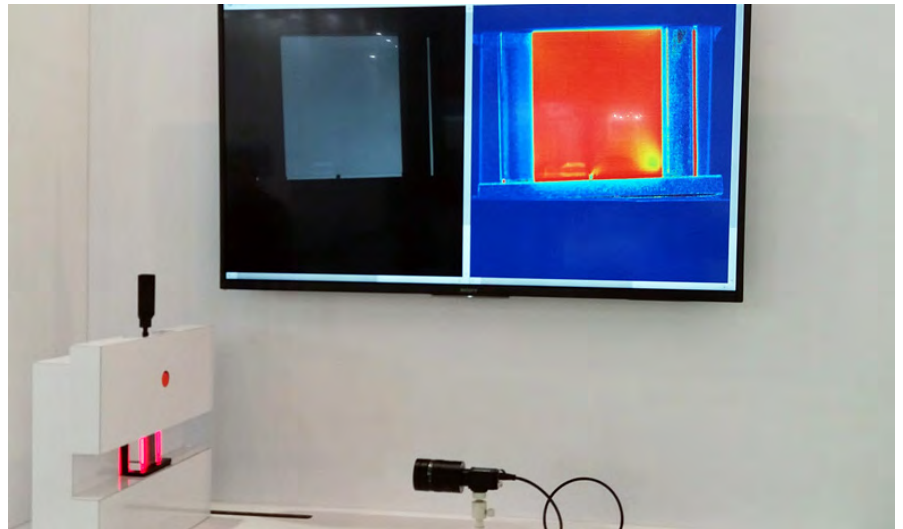
Stress test: Polarized cameras have applications in road tolling and glass manufacture.

Photo: Matthew Peach, optics.org.

the US in 2017, and now scheduled to launch in Europe in 2019. Mi-te-ne (Japanese for "look at me") is essentially an interactive digital signage platform that expands traditional displays with functional "eyes" and "intelligence" using augmented reality AR technology. Viewers and the surroundings can become part of the display in the form of a real-time, audio-visual, interactive experience.

Destruels concluded, "this development demonstrates the evolution of Sony from hardware products to AR-based applications and our shift towards content and entertainment. We are supporting industry but also manufacturing, non-manufacturing, entertainment and you need smart vision systems for all of these."

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SPIE.

Vision 2018:

Industry enjoys record 2017 sales growth

But VDMA warns of 2018 slowdown due to China cooling on mobiles; limiting factors of staff and component shortages. *By Matthew Peach in Stuttgart*

The VISION 2018 press conference panel Dr. Klaus-Henning Noffz, Amélie Brübach, Florian Niethammer and Barbara Weizsäcker.

Photo: Matthew Peach, optics.org.

At ViSION 2018, in Stuttgart, Germany, today's opening conference revealed the industry's latest figures, market development (and limiting factors) and hot trends of Europe's machine vision industry. Furthermore, the winner of the 2018 VISION Award was named as Photoneo.

Dr. Klaus-Henning Noffz, CEO of Silicon Software and Chairman of the Executive Committee of the VDMA Machine Vision Association, gave a generally upbeat update on the state of the machine vision industry, with a particular focus on Germany's activities over the past two years and the VDMA's expectations of this sector going forward.

"The business of the European machine vision in 2017 enjoyed record sales levels," commented Noffz. "European growth rates over the past three years have been plus 10 percent in 2015, plus 11 percent in 2016, and plus 16 per cent in 2017."

The main driver for the 2017 surge, which saw Germany's own MV sales growth hit a record 17.5%, has been demand from China's hitherto booming mobile phone manufacturers. However Noffz added that he expected Europe's MV sales growth to be zero percent for 2018 "because China would no longer be investing so heavily in that sector." For 2019 Noffz said he expects the industry to "get back on the growth course."

'Hurdles'

Then Noffz moved on to what he called a "regrettable subject" – that is, hurdles to further sector market development. He identified two factors that were limiting the MV industry's growth potential in Germany, which could also apply elsewhere: a shortage of engineers with appropriate skills and training; and a shortage of the right sorts of components, described as "an increasing problem for German machinery manufacturers".

In a more positive mood, he then considered trends and chances. "Machine vision systems are a key component for Industry 4.0, the modern approach to manufacturing, which embraces virtual-physical systems, IoT, cloud computing and cognitive computing."

Considering challenges facing MV systems developers Noffz listed standards on the application level, the development of so-called "seeing machines" and new application concepts such as "vision everywhere", "embedded vision" and one of the pre-announced buzzwords of this edition of the VISION expo: "deep learning" for vision, expected to stimulate further growth.

Bigger than ever

Amélie Brübach the VISION show organizer from Messe Stuttgart, then gave an update on the state of the event. "This is the leading world trade fair for machine vision with new record figures in 2018 in terms of both the number of international exhibitors and first-time participants," she said.

"This year, for example, there are 472 exhibitors from 31 countries presenting their products and services, up from 440 in 2016. The proportion of international exhibitors has also now risen to 60 per cent, with main exhibiting countries being USA (44 companies), China (35) and France (27)."

Florian Niethammer, VISION Project Manager, added, "This result clearly reflects the positive development of the machine vision industry. Plus the large number of first-time exhibitors, at 25% of the total, is also an indication of the current dynamism of the MV industry. This fits nicely with our motto this year, which is Be Visionary."

The matchmaking initiative Business Beyond Borders (BBB), which is cooperating with VISION for the first time in 2018, facilitates cross-border networking of companies within the increasingly internationalised industry. Funded by the European Commission, the measure primarily supports small and medium-sized

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enterprises and clusters in their search for international business partners and in the development of new markets.

Barbara Weizsäcker, General Secretary of EMECA and the European Exhibition Industry Alliance, explained, "VISION is one of ten trade fairs in strategically relevant future industries, in Europe and worldwide, during which the BBB programme supports participating companies in their internationalisation efforts."

VISION Award winner

The winner of this year's VISION Award, presented by Imaging & Machine Vision magazine, was named at the conference as Photoneo. Its new PhoXi 3D Camera is said to be the highest resolution and highest accuracy area based 3D camera available. It is based on Photoneo's patented

Image: Photoneo.

VISION winner: Photoneo's new PhoXi 3D Camera.

technology called Parallel Structured Light implemented by a custom CMOS image sensor.

The developer says this "novel approach" makes it the most efficient technology for high resolution scanning in motion. The key features of Parallel Structured Light include: scanning in a rapid motion – one frame acquisition, 40 m/s motion possible;

10x higher resolution and accuracy with more efficient depth coding technique with per pixel measurement possible; no motion blur resulting from its 10 µs per pixel exposure time; and rapid acquisition of 1068x800 point-clouds and texture up to 60 fps.

Matthew Peach, Contributing Editor, optics.org
http://optics.org/news/9/11/6

Vision 2018:

New launches round-up

optics.org reviews a selection of some of the new systems and products launched at Stuttgart's biggest vision expo to date. *By Matthew Peach*

Instituto Tecnológico de Informática

The Instituto Tecnológico de Informática, based in Valencia, Spain, is making the first public presentation of its Zero Gravity 3D system, which it says is "the industry's most versatile machine vision inspection system". Applications include three-dimensional surface reconstruction with textural analysis, as well as surface defect detection, be it a scratch, stain, crack, corrosion or geometric alteration.

Instituto Tecnológico de Informática's Zero Gravity 3D system.

ITI's proprietary imaging process means the geometry and entire surface of even highly complex components can be captured from 360 degress with no blind spots. The system launches an object vertically into an imaging chamber to precisely capture it from multiple angles at the top of its flight. This process will allow manufacturers to run multiple types of components for analysis in a single batch, and to easily switch components being captured without mechanical reconfigurations.

The technique has successfully completed proof-of-concept testing and is now undergoing commercialisation for a 2019 market launch. The developers say that the proof-of-concept technology has been tested running at 50 parts per minute with a single linear actuator, or 80 parts per minute in a dual-actuator imaging capture device change.

Sergio Navarro, head of advanced industrial vision systems at the ITI, commented, "Most machine vision systems inspect a part's surface only, with the component being held by a manipulator or mounted on a guidance system. This limits the analysis to only a particular segment of the 3D geometry or requires mechanical changes for each new batch, which must also be free of mixtures of different parts. Our Zero Gravity 3D not only solves these limitations, it offers a versatility as yet unknown in the industrial inspection area."

Edmund Optics

Edmund Optics has introduced its Techspec MercuryTL Liquid Lens telecentric lenses. These integrated lenses combine the imaging performance of a telecentric lens with the flexibility of a liquid lens, which makes it suitable for gauging, measurement, and placement applications requiring quick depth of field adjustment.

Edmund Optics: Techspec MercuryTL Liquid Lens telecentric lenses.

The telecentric lenses eliminate parallax errors and combine this functionality with a liquid lens, which electronically controls the focus. The liquid lens is used to focus the telecentric lens, changing its curvature.

This integrated design allows users to rapidly adjust the working distance, while maintaining telecentricity, distortion, and image performance over the entire working distance range.

The integrated liquid lens provides quick autofocus capabilities, is ideal for machine vision, and offers the ability to rapidly focus on objects, whereas standard telecentric lenses cannot adjust focus as fast. Four models offer a range of primary magnifications, ranging from 0.15x to 0.75x.

Framos Group

Framos Group has launched its Embedded Vision (EV) Ecosystem range, which is designed "to ease imaging development". Designed for a modular approach to EV, the range includes sensor modules, board adapters and processing board adapters to enable a smooth transition from concept to final design.
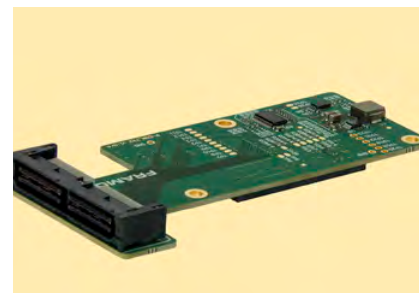
Framos's "Embedded Vision" ecosystem.

This EV ecosystem works as a mix-and-match tool kit paving an accelerated way building vision products. André Brela, Product Manager, explains the concept thus: "Vision engineers and developers can quickly create a proof of concept, and then evolve it by porting the IP, schematics and board design files into their end product."

"Based on a flexible platform, this range provides capabilities to evaluate a sensor and its performance on various processor boards, as well as develop connection and logic components to put all vision-based building blocks together."

Framos's FSM series of sensor modules is made of pre-existing Sony and ON Semi sensors placed on a PCB with a standardized connector with proper circuit conditioning to rapidly get a sensor up and running. Modules also can be oselected with a lens mount and a matching lens.

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Xenics

Xenics, a developer of advanced infrared detectors, cameras and customized imaging solutions covering SWIR to LWIR regions. At VISION 2018 it is showcasing the Manx series, a new range of InGaAs-based linear cameras. Also on show for the first time is the Wildcat 640, an area-scan InGaAs camera series set for release in 2019. The upcoming Wildcat 640 series will image at speeds up to more than 200 Hz, making it suited for applications such as quality control, laser spot detection, and low light imaging.

The Manx series of InGaAs linear cameras are based on the XLIN-FC, an in-house developed linear detector. The Manx is a high-performance short-wave infrared camera providing high speed and quality line scan imaging. It achieves line scan rates of about 400 kHz, which the developer claims "outclasses the state-of-the-art by a factor of 2.5, becoming the fastest linear SWIR camera available in the world."

Fraunhofer IPMS

The Fraunhofer IPMS-developed MEMS Scanning Mirrors are either resonantly or quasi-statically operated for the deflection of light in extremely compact systems. Applications range from reading barcodes and data codes, through 3D metrology, to laser projection and spectroscopy. In addition to resonant scanners, quasi-static micro-scanners are also presented.
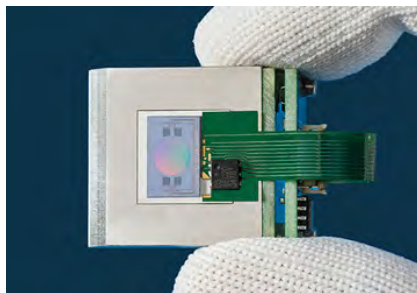
Fraunhofer IPMS: MEMS scanning mirrors.

The developers commented, "With its QSDrive Scan Kit, ResoLin Evaluation Kit, the Fraunhofer IPMS is now offering the opportunity for cost-effective and flexible testing of statically-deflectable MEMS-

scanning mirrors for applications that so far could not be satisfactorily implemented with commonly used resonant micro-scanners."

The IPMS's new micro-lenses are based on electro-active organic materials. Their functional principle is based on the displacement of liquids in etched silicon chambers and the driving element here is an integrated electrostrictive polymer actuator of high deformation.

The tunable micro-lenses could be integrated in a zoom objective or autofocus system for a camera in a cell phone or could find usage in many other application fields such as medical and industrial imaging, optical systems for laser beam manipulation and lab-on-a-chip applications for cell manipulation and detection.

Vision Components

Vision Components new proprietary ambient light suppression technology enables measurements with laser profilers under ambient light conditions of up to 100,000 lux. This is a new feature for its intelligent VCnano3D-Z laser profiler series.

Vision Components: 3D-Z laser profiler.

The high ambient light immunity results from a high-intensity laser, combined with extremely short exposure times. The blue laser has a wavelength of 450 nm and is rated class 2. The new laser scanner series is suitable for applications, especially for metallic surfaces.

Based on a Xilinx Zynq SoC, the embedded vision systems can be configured for additional tasks besides generating 3D profiles. Vision Components has programmed the internal FPGA of the SoC module to calculate the 3D point cloud. This leaves the powerful 2 x 866 MHz ARM processor as a freely programmable resource to handle application-specific machine vision tasks.

Vision Components also premiered its new MIPI camera modules at this year's VISION. The ultra-compact boards support the MIPI CSI-2 specification. They are available with different image sensors as determined by the customer. The miniature cameras can be manufactured and integrated into various platforms for mobile and distributed applications such as autonomous driving, UAVs, "Smart City", medical technology, and laboratory automation.

Allied Vision

Allied Vision welcomed visitors to its booth with the slogan "Rethink Embedded Vision" showing a clear focus on industrial embedded vision. The first models of its new Alvium Camera Series, were the company's highlight.
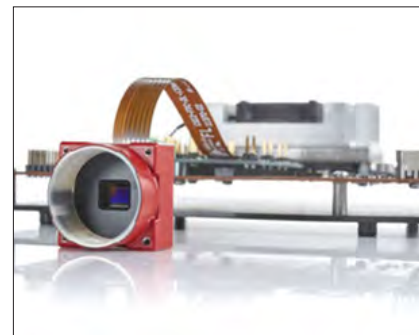
Allied Vision's Alvium cameras.

This camera platform addresses the limitations associated with current camera modules for embedded applications, the company stated, "because it offers system designers a previously unknown level of freedom."

Powered by the proprietary Alvium Technology, a system-on-chip designed by Allied Vision, the camera series ("1500" with a MIPI CSI-2 interface and "1800" offering both MIPI CSI-2 and USB3 Vision standards) deliver industrial performance to embedded vision. With a large selection of current sensors, intelligent power management and cost-optimized design, the new camera series combines the advantages of classic machine vision cameras with new embedded sensor modules, said the company.

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Opto Diode

Opto Diode has announced the AXUV20HS1, a high-speed, 5mm2 Circular Photodiode designed for high-speed detection of low-energy electrons or X-rays. The device features electron detection to 200 eV. The high-speed detector has a typical rise time of 3.5 ns. Storage and operating temperatures range from -10°C to 40°C (ambient) and from -20°C to 80°C in nitrogen or vacuum environments.
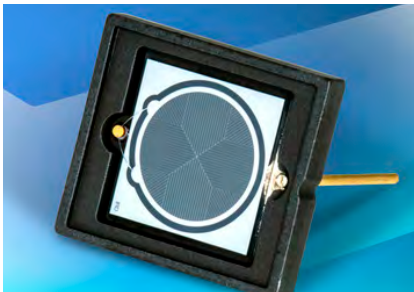
Opto Diode's Circular Photodiode for radiation detection.

PCO

High-end scientific camera specialist PCO's new pco.edge 4.2 is is equipped with a scientific CMOS sensor, which it says "provides crisp images and precise measurements". It can be optionally upgraded with a water cooling system.

PCO's edge 4.2 features a scientific CMOS sensor.

This camera system is designed for users who require highest quantum efficiency, 16 bit dynamic range, high frame rates, long exposure times and extremely low readout noise. Camera Link HS means uncompressed and secure data transfer.

PCO commented, "When our established pco.edge series is combined with modern back illuminated (bi) sensor technology, the result is our pco.edge 4.2 bi. The flexible cooling system allows the use of air or water to cool the sensor down to -25 °C. At this temperature, the dark current is reduced to 0.2 e-/pixel/s."

Inspekto

Inspekto has launched the S70, described as an "atonomous machine vision system". The S70 offers quality assurance capabilities in a practical package designed for any handling method, product type and material.


Inspekto CEO Harel Boren explains the operation the S70 "atonomous MV system". The S70 offers quality assurance capabilities in a practical package designed for any handling method, product type and material.

The developers say that the S70 system can be installed in 30 to 60 minutes. CEO Harel Boren commented, "This system offers a user interface designed to be installed directly by the shop-floor employee. This means that no systems integrator is required at any step of the short set up process, and at any time later.

The S70 enables manufacturing plants to install it at any point on a production line, and even move it from one line to another, at any time in the future, within minutes."

Inspekto describes itself as, "a German company with Israeli DNA"; it is already supported by a range of industrial businesses from across the Germany-Austria-Switzerland region. During beta stage of development, the company installed its system in the plants of leading industrial manufacturers, in countries including in Germany, Italy, France and Austria.

Specim

After many years of intensive scientific research by Finland's VTT Technical Research Centre, Specim's founders designed the first professional hyperspectral spectrographs and imagers.
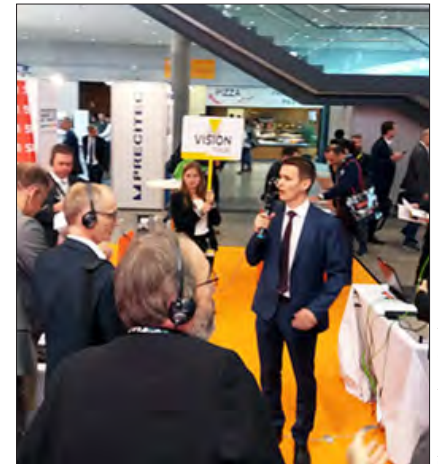
Specim CEO Tapio Kallonen describes how his FX hyperspectral imaging cameras enable users to add precise and reliable chemical identification to their vision and sorting systems.

These spectrographs were developed in close collaboration with NASA to meet the requirements of the most advanced applications in remote sensing.

Specim's hyperspectral imaging FX cameras enable users to add precise and reliable chemical identification to their vision and sorting systems.

New CEO Tapio Kallonen commented, "Compared to traditional color and shape-based sorting, chemical identification will increase the value in the sorting results in many cases, such as waste processing and recycling; food and agricultural product processing; and in the mining industry by reducing energy consumption and waste by more efficient separation or ore and side rock."

The FX cameras can reveal much more than traditional color and filter cameras or point spectrometers. They can be integrated into quality control and sorting processes to enhance their capability in product inspection and process analytics. Non-invasive, real-time inspection replaces visual inspections and time-consuming lab tests. Kallonen added, "For example, the FX10 can be used to determine whether apples are ripe or if they have bruises. And if you want to know the sugar level on berries or potatoes, however, you will need the FX17."

Vision 2018: New launches round-up

Lumimax

Lumimax's high power LED Lighting is designed for use in the food and beverage industry. Industrial machine vision is now making 100% quality inspections possible for packaging types that include preforms, glass bottles, tube bags, labels, screw caps, bottle caps and deep-draw formed aluminium or plastic pots.

The Lumimax portfolio, which includes Bar, Area, Ring, Dark Field, Spot, Dome and Coaxial Lighting, as well as high-performance Flood Lights, can be used to generate optimum lighting solutions for a range of applications.

At this year's Vision expo, iiM AG is presented its LightGuide technology in a new format as part of its Lumimax range: thanks to an optimised housing design, the LG2020/FL and LGCB2020/FL series can be deployed even where conditions offer only a smalle space for installations.

Imaging Development Systems

Imaging Development Systems (IDS) demonstrated the potential of its new IDS NXT system. This vision application-based industrial camera platform is now

IDS's vision application-based industrial camera platform.

expanded by the IDS NXT Rio and Rome ranges and is available with additional sensors and communication interfaces.

For the first time, IDS has integrated neural networks with self-learning algorithms within some of these models. In the field of 3D vision, the company also presented its Ensenso XR, the first stereo camera from this series, which can calculate 3D point clouds itself. Furthermore IDS is offering novel focusable USB 3.1 Gen 1 board level industrial cameras with liquid lens control, together with concept studies of 10 Gigabit Ethernet cameras, and uEye concept studies with polarization sensors.

The company also plans to integrate Power-over-Ethernet (PoE), which means that a separate cable for the power supply is no longer required. The models could be particularly interesting for applications that could only be operated at a reduced bandwidth due to the limited bandwidth of standard GigE cameras.
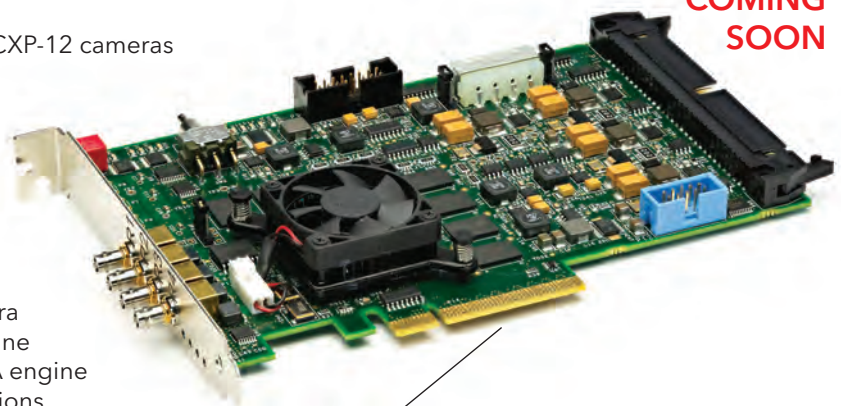
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