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January/February 2017

VISION focus

Delivering the latest news from the Imaging and Machine Vision markets

New hyperspectral imaging developments drive "dimensional evolution" of machine vision industry – see page 4
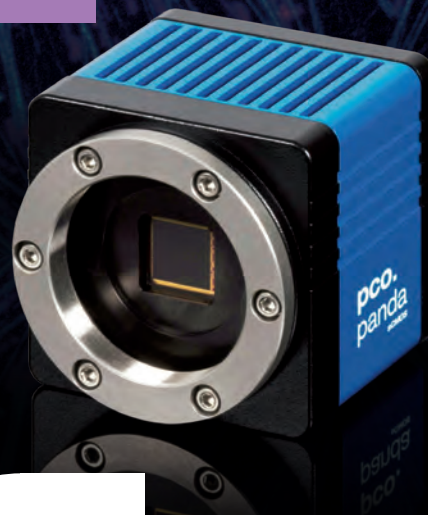
Image: Vision Components / Messe Stuttgart.

SPIE.

Way out West

Photonics West 2017 is the world's largest multidisciplinary event focused on photonics technologies. Every year over 20,000 people attend the conference and exhibition in the heart of San Francisco to discover what is new in the diverse fields of photonics, optics and laser research and to experience the latest devices and systems – including innumerable cameras and machine vision solutions.

Besides the thousands of exhibitors on the show floors and presentations on every aspect of the industry in the conference sessions, there are experts on hand to explain what is driving today's technology markets including: state-of-the art medical technologies, the Internet of things, smart manufacturing and Industry 4.0, autonomous vehicles, scientific research, communications, displays, and other solutions powered by photonics.

Within this latest issue of Vision Focus we present a selection of brand new developments and applications spanning thermal, hyperspectral and embedded imaging technologies *(page 4)*.

The vision industry is big business as exemplified by the recent £620M Teledyne buyout of e2v *(page 6)*. Now the North American defense, aerospace and industrial instrumentation firm set to expand its offering for imaging with a range of sensors.

Photonics West attendees of recent years will have seen more and more applications based on smart phones. Now Finnish research organization VTT has created a hyperspectral iPhone camera; users can monitor health, environment and diverse situations by using this full-spectrum cell phone *(page 7)*.

We also report that US-based G2 Technologies has deployed a Teledyne-Dalsa camera system to identify material defects in its car upholstery factories, achieving productivity improvements and cost savings *(page8)*. Furthermore, the significant positive impact of the automotive industry on the market for photonics and imaging technologies is analyzed on page 10.

And there is yet more news of innovation and business growth in the worlds of pico-projectors and 3D machine vision. Read all about it here – and then witness it on the show floor and in the conference halls of Photonics West.

Enjoy the show – and enjoy **Vision Focus**!

Matthew Peach, Editor

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Publication and Editorial Schedule 2017/18

April/May Issue 2017
- Bonus Distribution **SPIE Defense+Commercial Sensing**
- **Editorial Focus:** aerospace and defense applications, associated research and development
- Published in advance of DCS *(Defense & Commercial Sensing)*, 11th – 13th April 2017

June/July Issue 2017
- Bonus Distribution: **Laser World of Photonics** - Germany
- **Editorial Focus:** optical components, academic research, software applications.
- Published in advance of Laser World of Photonics - Germany, 26th – 29th June 2017

September/October Issue 2017
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- Published in advance of Electronica, 8th – 11th November 2017

January/February Issue 2018
- Bonus Distribution **SPIE BiOS + Photonics West**
- **Editorial Focus:** industrial applications, sensing, biomedical analysis and treatments.
- Published in advance of BiOS, 29th Jan – 1st Feb 2018 and Photonics West, 30th Jan – 1st Feb 2018

Disruptive forces in the air at Stuttgart's Vision show

Thermal, hyperspectral and embedded imaging technologies make talking points in Germany.

The latest incarnation of Messe Stuttgart's now-biennial Vision Show in late 2016 indicated that innovations from the photonics sector are set to push industrial imaging into a wider range of applications – with embedded imaging and Industry 4.0 unsurprisingly proving to be pivotal themes.

"The future belongs to embedded vision," is how the German industrial camera firm Basler chooses to describe the trend, and during a panel discussion in Stuttgart its marketing chief Arndt Bake was joined by many of the big names in machine vision to outline the likely future of the technology.

Bake said that the much lower cost point of embedded vision – where software is incorporated within the image sensor – would greatly widen the scope of the technology. The trade-off is that more time and money needs to be spent at the developmental stage than with conventional machine vision, but the much larger volumes involved ought to yield a higher return.

The presence on that panel of major logic chip designer ARM Holdings, in the form of its VP of embedded marketing Richard York, surely indicated the enormous potential of the market for embedded vision. York sees applications in a number of parallel markets, for example retail logistics, which would represent almost entirely new sectors for machine vision beyond the traditional factory setting.

One particular challenge under discussion was the relative difficulty of programming field-programmable gate arrays (FPGAs), devices seen as powerful for dealing with the complexities of an embedded system but requiring specialist programming skills.

Embedded vision conference

Shortly after the Vision show, Mannheim-based Silicon Software picked up on the theme with the release of a new "Embedder" extension for its VisualApplets developer platform. Said to render FPGAs inside cameras and sensors freely programmable, it has the ability to realize individual image processing applications as often as desired and to port them onto other devices.

With new applications such as those outlined in the Stuttgart panel discussion and in the Industry 4.0 sector envisaged, Silicon Software managing director Klaus-Henning Noffz claimed: "Silicon Software's embedded concept puts manufacturers in the position where they can set up a compatibility layer on their own on the FPGA of an image processing device. This allows them to graphically program the device flexibly, relevant to the project at hand, and as often as they want with VisualApplets, with no use of hardware description language."

In fact, such is the positive momentum in embedded vision that Messe Stuttgart is to host a new event dedicated to the sub-topic in autumn 2017. The first European Embedded Vision Conference is scheduled to take place 12-13 October.

Aside from the embedded theme, Stuttgart was notable for the prevalence of thermal and hyperspectral solutions - not least because the infrared imaging giant FLIR Systems had revealed its plan to acquire Point Grey Research shortly ahead of the event, in a deal worth just over $250 million.

In the hyperspectral domain, Stemmer Imaging described this technology as a "dimensional evolution" of machine vision, outlining applications in forensic science, food sorting and also food security. Stemmer's tools have even been used to classify meat according to tenderness and animal source, identifying the spectral signatures of different fat and protein molecules in the meat.

Over on the Teledyne Dalsa exhibition stand, there were examples of hyperspectral applications in recycling, as well as optical phenomena like polarization being used to check for birefringence and stress in optics quality control. The Canadian company also showed how earlier difficulties with fiber-optics in machine vision have been overcome, with this technology expected to become more widely deployed in the future.

Photo: Messe Stuttgart.

Basler's chief marketing officer Arndt Bake (far left) and Richard York (ARM's VP of embedded marketing, third from right) discuss embedded machine vision technology in Stuttgart last November.

A snake-eyed unicorn?

Further blue-chip presence on the show floor came courtesy of new exhibitor Bosch and logic giant Intel, and not just because of the latter's recent acquisitions of machine vision firm Movidius Technologies, Russian vision software specialist Itseez, and artificial intelligence specialist Nervana Systems in recent months.

Those on the look-out for a tech "unicorn" in the relatively staid world of machine vision may have had their head turned by Chronocam – an Intel-backed startup hailing from Paris, France, with a potentially disruptive take on image interpretation inspired by human and animal visual processing.

In Stuttgart, Chronocam's CEO Luca Verre told Vision Focus that the company's technology exploits some two decades of research to deliver what he describes as "redundancy suppression". In plainer language, it means that – like certain snakes - Chronocam's custom CMOS photodetectors respond quickly to any changes in a sequence of captured images, rather than capturing the entire scene over and over again.

The detector's reaction time is said to be on the order of a few microseconds, meaning that a moving "image" of close to a million frames per second is theoretically possible, once an "event" has triggered the imaging system's algorithms into action.

Verre adds that the technology works particularly well in conditions of high glare – suggesting potential future uses in automotive imaging for self-driving cars, and going some way to explaining the presence of Robert Bosch, Nissan and Renault among Chronocam's impressive list of backers.

The key to it all is in the custom design of the CMOS pixel, says Verre, along with special algorithms that are designed to identify significant changes rather than fill endless memory banks with high-resolution images of the same field of view. "[We're] re-thinking computer vision as a stream of events," is how Verre describes the approach. And while many in the Vision crowd will have been familiar with the technological concept, the CEO says an initial skepticism in the firm's ability to turn that technology into meaningful business is now changing as Chronocam engages with customers while racking up the venture capital dollars.

Autonomous driving might represent the potential high-reward future for Chronocam, but in the nearer term robotics is emerging as the key application sector. In settings where there is not a critical need for constant full-frame imaging, the inherently more efficient approach to machine vision should offer a compelling combination of frame speed, dynamic range and low power consumption.

At the moment Chronocam's product output is limited to some revenue-generating but relatively simple cameras, with genuine deployment of the technology in a robotics applications tipped by Verre to be in place by the end of 2017. Meanwhile, the company is using some of its $15 million venture investment to hire as it looks to scale to around 50 employees and eyes new office locations in Asia and the US.

Mike Hatcher is a contributing editor to optics.org.
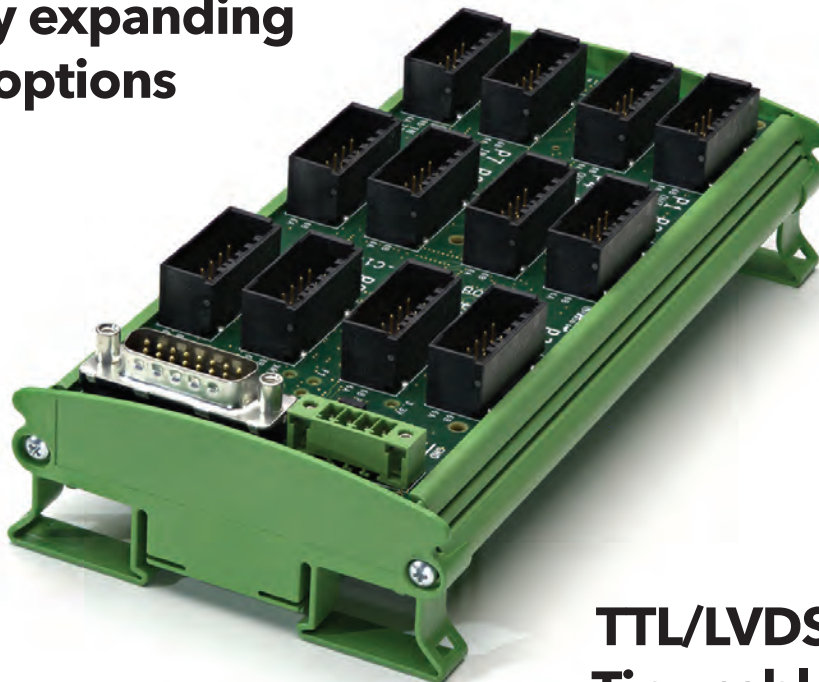
e2v accepts £620M Teledyne bid

North American defense, aerospace and industrial instrumentation firm set to expand its offering for imaging with complementary sensor product line-up.
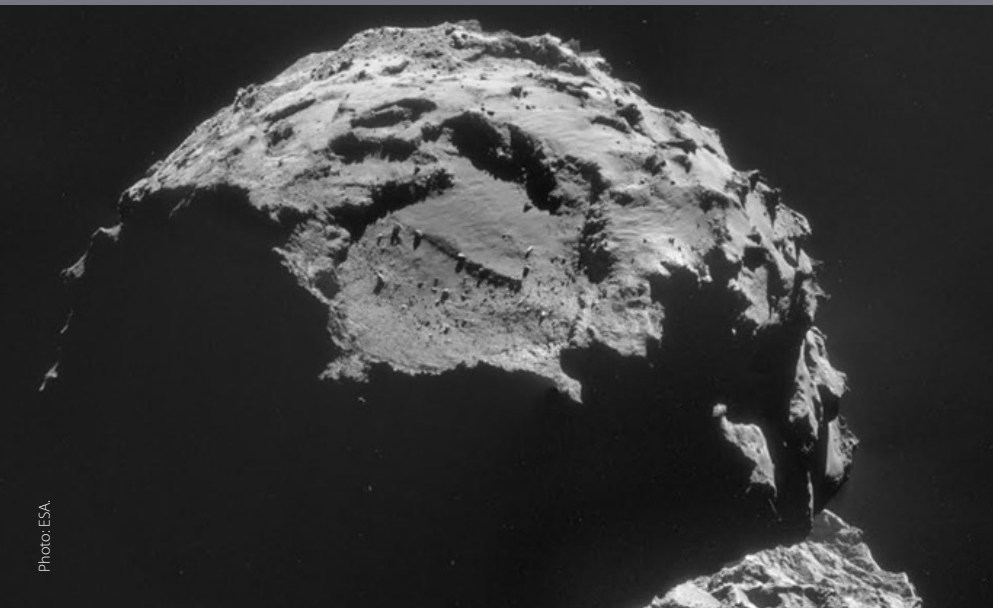

Photo: ESA.

'Agilkia': the landing site selected for the Philae craft before it ejected from the Rosetta orbiter last year. This image shows a mosaic of four individual frames from Rosetta's navigation camera, which features a 1 megapixel CCD camera supplied by e2v.

Teledyne Technologies, the California-headquartered industrial group with expertise across defense, aerospace and imaging applications, has agreed a £620 million cash deal to buy the UK-based imaging sensor company e2v technologies.

The 275p-per-share purchase price, which represents nearly a 50 per cent premium on e2v's closing stock price from December 9, has been accepted by the UK firm's board of directors.

Complementary businesses

In a statement to the London Stock Exchange (LSE), where e2v is listed, the companies highlighted the complementary nature of their imaging sensors, with Teledyne CEO Robert Mehrabian saying:

"We have followed e2v for more than a decade. Over time, as both Teledyne and e2v evolved, our businesses have become increasingly aligned. In fact, every business within e2v is highly complementary to Teledyne."

He added: "There is minimal product overlap. For example, we are both leaders in space

and astronomy imaging, but Teledyne largely provides infrared detectors and e2v provides visible light sensors."

Although e2v is probably best-known for the space imaging applications of its CCD and CMOS sensors, which have captured iconic images of dwarf planet Pluto and comet "67P" in recent years, it also produces microwave devices for cancer radiotherapy and high-performance semiconductor chips.

In its latest half-yearly report e2v announced total sales of £102.8 million, of which £45 million was generated by sales of imaging products.

Machine vision

Aside from the high-profile space imaging, e2v also sells into the machine vision sector. Teledyne's Dalsa subsidiary and e2v both attended last month's Vision trade show in Stuttgart, Germany, with Mehrabian noting:

"In machine vision applications, e2v's advanced capabilities in proprietary CMOS sensor design add to Teledyne's strengths in cameras and vision systems. While Teledyne designs advanced mixed-signal circuits for government and commercial applications,

e2v's broader product portfolio enhances our offerings and channels to market."

Describing the acquisition price as an attractive premium, e2v's chairman Neil Johnson added: "The e2v [board of director] has also considered the merits of being part of a larger, complementary group with enhanced scale and a wider range of capabilities to service its key customers and management and employees having access to the opportunities available in a larger group."

As a result, the e2v executive team is unanimously recommending that the firm's shareholders vote in favor of the deal. And according to the LSE statement, institutional investors including AXA, Aviva and Henderson Global, together representing nearly 46% of shareholders, have already signaled their intention to back the deal.

Quantum research

e2v is also closely involved in the UK's £330 million investment in the development of quantum technologies, known as the National Quantum Technologies Programme (NQTP).

For example the sensor firm's CTO Trevor Cross, part of the management buy-out team that saw e2v emerge from GEC-Marconi before listing on the LSE back in 2004, chairs the NQTP's special interest group of industrial partners looking to exploit and apply technologies developed through the quantum research.

Quantum projects involving e2v include a prototype gravity imaging camera for the UK's Defence Science and Technology Laboratory (DSTL), one of the key backers of the quantum technology push, and an innovative laser-cooled cold-atom trap known as "Freeze-Ray".

● Following news of the Teledyne bid, e2v's stock price jumped by around 47 per cent to match the acquisition price of 275p.

Teledyne posted total sales of $2.3 billion in 2015, and in its latest quarterly report the company said sales of imaging products came in at $98.5 million, up 3 per cent on the prior year thanks in part to stronger demand from the machine vision sector.

Shortly before announcing the e2v deal, Teledyne's stock had been trading at an all-time high of nearly $129 on the New York Stock Exchange, equivalent to a market capitalization of just under $4.5 billion.

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http://optics.org/news/7/12/12

VTT creates hyperspectral iPhone camera

Users will be able to monitor health, environment and diverse situations by full-spectrum cellphone.

Finland's VTT Technical Research Centre of has developed what it calls "the world's first hyperspectral mobile device" by the conversion of an iPhone camera into a novel optical sensor.

applications. For example, consumers will be able to use their mobile phones to assess food quality, to monitor their own health, or to inspect their surroundings.
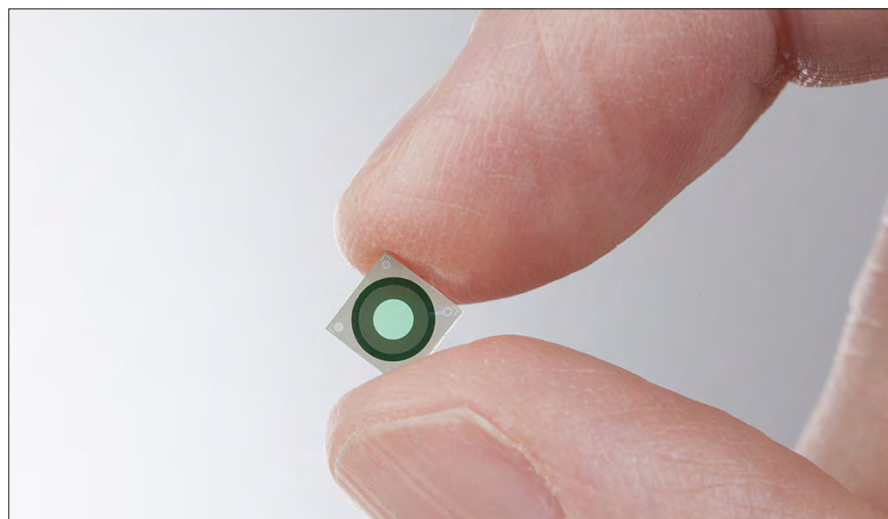
Hyperspectral cameras, which are
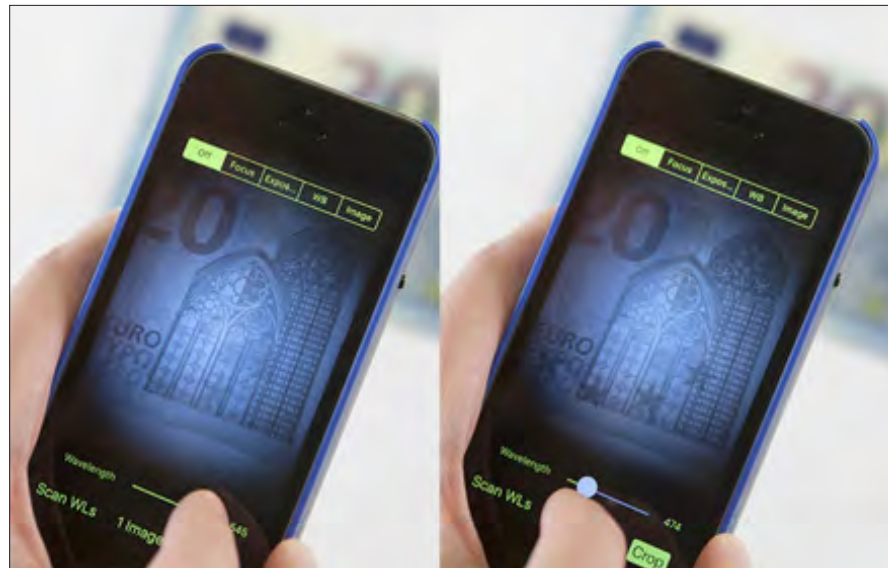
Imaging €20 bank note at different wavelengths reveals hidden safety features.

The developers believe that this innovation will take low-cost spectral imaging to various consumer

usually relatively costly, are typically used for demanding medical and industrial applications, and in space

MEMS have enabled the development of the affordable, compact, hyperspectral device.

and environmental sensing. However, cost-effective optical MEMS (Micro Opto Electro Mechanical Systems)-based spectral technology is enabling the development of mobile applications for environmental sensing and observation from vehicles or drones.

Anna Rissanen, who is heading the research team at VTT, commented, "Consumer benefits could appear in health applications, such as mobile phones that are able to check whether moles are malignant or food is edible.

They could also verify product authenticity or identify users based on biometric data. On the other hand, driverless cars could sense and identify environmental features based on the representation of the full optical spectrum at each point of an image."

VTT has now developed a range of new applications for its hyperspectral cameras. These include the diagnosis of skin cancer, environmental sensing based on nanosatellites, various drone applications for precision agriculture and forest monitoring, and there are other projects already underway for the remote measurement of vessel emissions.

Spectral imaging for all

Optical spectral imaging offers a versatile way of sensing various objects and analyzing material properties. Hyperspectral imaging provides access to the optical spectrum at each point of an image, enabling a wide range of measurements. The adjustable tiny MEMS filter is integrated with the camera lens and its adjustment is synchronized with the camera's image capture system.

"Today's smart devices provide huge opportunities for the processing of image data and various cloud services based on spectral data. Mass-produced sensor technology will enable the introduction of hyperspectral imaging in a range of devices in which low-cost camera sensors are currently used," Rissanen added.

VTT Technical Research Centre of Finland aims to cooperate with companies to commercialize the technology and bring new, innovative optical sensor products to the market.

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http://optics.org/news/7/11/48

Ensuring efficient inspection of automotive fabrics

**G2 Technologies deploys Teledyne-Dalsa camera system to identify material defects and cost savings.**

The inspection of automotive fabric has traditionally been a manual process, with inspectors completing a visual check as the fabric is wrapped on large rolls before shipment. But recognizing that these manual inspections are time-consuming and can be unreliable, one automotive fabric manufacturer recently decided to consider options for automating its inspection and asked G2 Technologies for help.

G2 Technologies, based in Apex, NC, USA, is a system integrator specializing in the automated inspection of a variety of materials, particularly for web applications. The company's systems for automated inspection of automotive fabric – including machine vision – enable manufacturers to identify product defects, thereby improving product quality and lowering

tears or stains. Thanks to a partnership between automated inspection, test and measurement company G2 Technologies and Teledyne Dalsa, of Waterloo, Canada, that situation is changing.

"Tears, holes, stains, or any other defect in the fabric can impact the customer's ability to use entire sections of the stock they purchase. For the manufacturer, identifying a defect early can mean significant cost savings later," said Craig Borsack, president of G2 Technologies.

Borsack's company has worked on improving continuous-motion web inspection for more than 10 years. Today, its fourth-generation architecture enables automated detection and marking of defects as small as 0.5mm (0.02in) on material moving at more than 300m (1,000
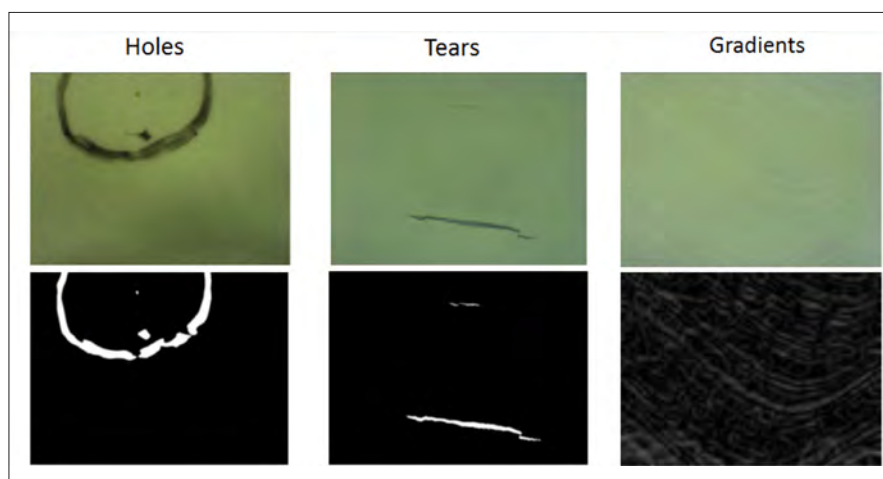
The G2 Technologies automated inspection system can detect holes, tears and gradients in the fabric.

production costs.

A roll of high-performance automotive fabric used for seat covers, door trim and headliners can be up to 6.1m (240 in) wide and move at speeds of more than 90m (300 feet) per minute during production. Due to the large width and the continuous motion, it is no surprise that manual inspection can only identify significant gross defects such as large

feet) per minute. Teledyne Dalsa camera technology is the standard technology solution in all G2 Technologies automated web inspection solutions.

"It was clear that customers needed a web inspection system that integrated high-resolution, high-performance vision technology," said Borsack. "We deployed Teledyne Dalsa's Pirahna3-16K cameras

Ensuring efficient inspection of automotive fabrics

as part of the application because no other camera on the market offers a comparable sensor resolution or scan rate."

Teledyne Dalsa's Piranha3 camera family delivers high resolution and throughput. With horizontal resolution up to 16k, the cameras deliver more detail with fewer cameras in a multi-camera system for measurable cost savings, the supplier claims. Additional system cost-savings stem from the Piranha3's sensor alignment accuracy, high responsivity and optimized pixel pitch, 3.5 µm (16k), 5 µm (12k) and 7 µm (8k).

Setting up

To cover the 6.1m (240in) field of view required to inspect the fabric, nine Pirahna3-16K cameras are positioned above the web, on which the material passes. With the automated inspection system in place,
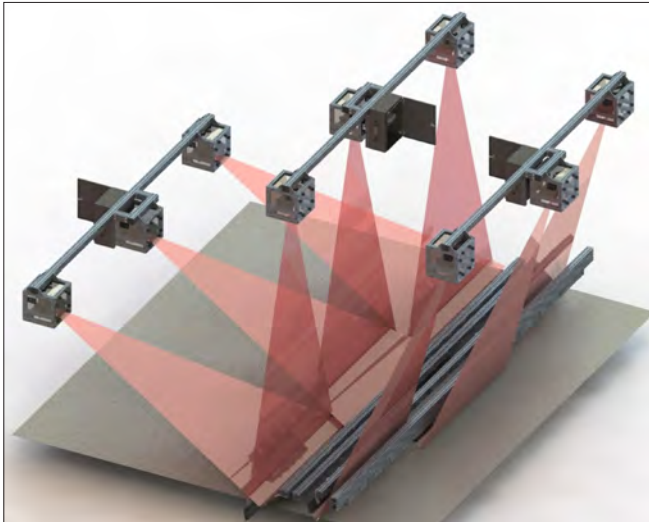
Automated Web inspection system uses nine Teledyne DALSA Piranha cameras.

the web moves at up to 90m (300 feet) per minute, although the system has been designed to operate effectively on a web that moves at greater than twice that speed.

The Pirahna3 cameras capture images of defects from grease stains and dirt spots to creases or wrinkles as small as 0.5mm (0.02 in). In addition to identifying surface defects, this automated system continuously monitors fabric width in real-time. At the site of each defect, the edge of the fabric is marked with a UV code, and then an image of each defect and information about its location on the roll are stored in G2's dTRAK data analytics platform.

High-Resolution

Borsack explained that the resolution of the images captured by the Pirahna3-16K cameras becomes critical in the post-processing phase of the inspection, which takes place before a roll is shipped. During post-processing, fabric is unrolled so that the defects pinpointed in the initial inspection phase can be assessed and remediated as needed.

Two cameras with special UV lighting are positioned at the edges of the fabric and are used to identify the unique code associated with each defect. In this case, less image resolution is required because the camera is finding only the markings made during the earlier inspection.

The Teledyne DALSA Piranha camera delivers a low price/pixel system solution.

As the cameras detect each marking, the material is automatically stopped and the high-resolution defect image from the dTRAK database is displayed to help the operator address the defect. Days or weeks can often pass between the initial inspection of a roll of fabric and the post-processing phase; therefore, the image and data recorded in the dTRAK database about each defect is especially important. Additionally, with the unique code, the system is intelligent enough to ensure the operator finds each defect, even if a roll's 'starting point' has changed because a length of fabric has been removed and used for some other purpose.

"For our customer, the ability to find and correct any problems with the fabric before it reaches their end customers was their primary reason for automating the inspection. The insight provided by the automated inspection system will absolutely increase their confidence in the quality of the fabric they ship," Borsack concluded.

"An additional benefit has been the time and labor costs saved as a result of automation. Fewer operators are needed and inspections can be completed with more speed and accuracy, making their team more productive and lowering manufacturing costs."

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SPIE.

Imaging technology transforming the automotive industry

2D, 3D and night vision cameras are "exploding" into the automotive sector, says analyst Yole Développement.

Systems based on visible, 3D and night vision cameras are exploding into the automotive space, according to Yole Développement, the Lyon, France-based market research and strategy consulting company. In its latest assessment of imaging technology for the sector, published this week, Yole predicts that revenue will grow at 20% CAGR between 2015 and 2021. And considering total systems sales value, revenue is expected to hit S$7.3 bn (€6.8 bn) in 2021.

Amongst the nine market segments identified by Yole's analysts, cameras designed for advanced driver assistance systems (ADAS) are the most important category, which alone will represent 51% in revenue by 2021. Cameras designed for display purposes are also critically important applications, which, says Yole, "will clearly foster the development of imaging technologies."

Titled Imaging Technologies for Automotive 2016, the report details the range of imaging technologies, related applications and market sector forecasts. Analysts describe the related ecosystems and the competing landscape. Covering technologies such as visible cameras, solid-state lidars, LWIR cameras and 3D cameras, the report also offers a technology development roadmap through to 2021.

Four trends

The automotive sector is facing a massive transformation, says Yole, driven by four key trends: environmental efficiencies, safety, digital connectivity and shared mobility. The company states, "imaging technologies are part of a sensing revolution. We invite you to look at a snapshot of this innovative wind of change in which autonomous driving will become a big part of the story."

Capitalizing on innovative technologies initially developed for smartphones, electronics has gradually invaded the automotive sector. Today, imaging technologies are taking

From applications to devices: imaging technologies are finding ever more roles in the latest car models.

Imaging technology transforming the automotive industry

center stage, states the analyst: "From less than one camera per car on average in 2015, there will be more than three cameras per car by 2021," predicted Pierre Cambou, Activity Leader, Imaging at Yole. "That means at least 371 million automotive imaging devices worldwide."

Cameras were initially mounted for ADAS purposes on high-end vehicles, with so-called "deep learning image analysis techniques" promoting their early adoption. Dr Eric Mounier, Senior Analyst at Yole, commented, "The Israeli company Mobileye has been instrumental in bringing ADAS technology to market, along with On Semiconductor, which provided the CMOS image sensor. Copycat competition will probably pick up as the market now justifies initial investment in design and technology."

Mounier added, "It is now a well-established fact that vision-based autonomous emergency braking is possible and it saves life. Consequently, we believe that adoption of forward ADAS cameras will therefore accelerate."

Big demand for 360° surround view cameras

Growth of imaging for automotive is also being fueled by the park assist application; so 360° surround view camera volume is therefore skyrocketing. While it is becoming mandatory in the United States for new cars to be supplied with a rearview camera by 2018, that uptake is dwarfed by 360° surround view cameras, which enable a "bird's eye view". This trend is most beneficial to companies such as Omnivision at sensor level and Panasonic and Valeo, which have become one the main manufacturers of automotive cameras.

Mirror replacement cameras are currently the big unknown and take-off will primarily depend on its appeal and car design regulation. Europe and Japan are at the forefront

of this trend, which Yole believes will become "only slightly significant" by 2021. Meanwhile, solid state lidar is well considered and will start to be found in high-end cars by 2021, the analyst adds. Cost reduction will be a key driver here as the push for semi-autonomous driving will be felt more strongly by car manufacturers.

LWIR technology-based night vision cameras were initially perceived by the market as more of a status symbol than a necessity. However, they're increasingly being appreciated for their ability to automatically detect pedestrians and wildlife. Yole concludes that LWIR solutions will therefore become integrated into ADAS systems in the future. Furthermore, 3D cameras will tend to be limited to in-car infotainment systems and driver performance monitoring. This particular technology will be key for luxury cars and therefore is of limited use today, says the analyst.

Matthew Peach is a contributor to optics.org.

http://optics.org/news/7/11/24
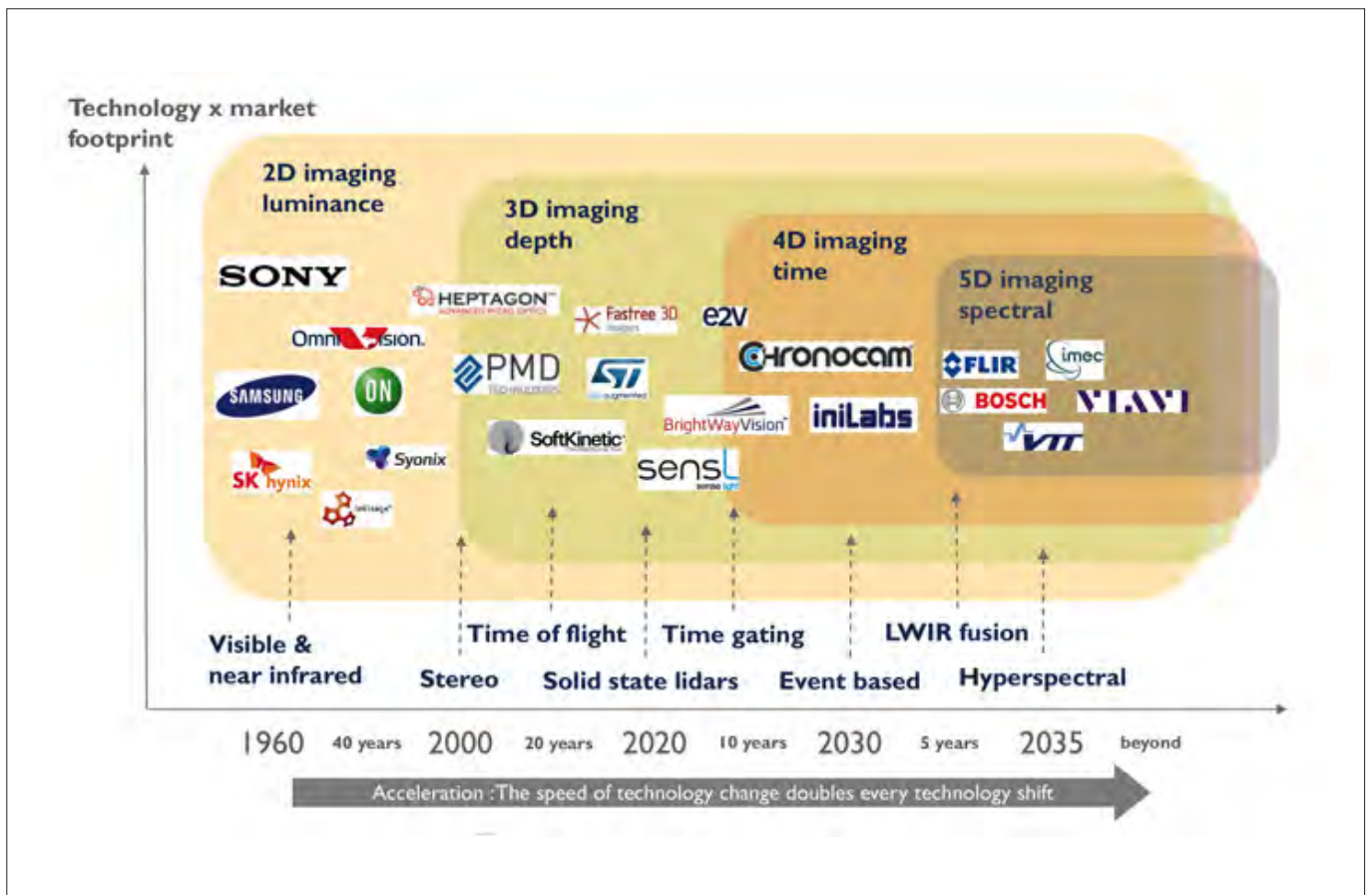
Automotive imaging technology roadmap – the speed of change doubles at every shift, says Yole Développement.

MicroVision begins shipping samples of pico-projectors

Also, earlier in December the company announced it has raised $15million from sale of stock.

MicroVision, a developer of ultra-miniature projection display and sensing technology, has begun on-schedule customer shipments of samples of its new, small form factor display engine.

The company announced in November that it plans to sell a display engine beginning in the second quarter of 2017. This small form factor display engine is based on the company's proprietary PicoP scanning technology, a laser beam scanning approach for "pico projection" and 3D sensing. MicroVision said it is planning to be ready for mass production of this engine early in the second quarter of 2017.

aftermarket head up display (HUD) applications and other applications with a fixed, short focal length. The PSE-0403-101/2 display engine is an all-in-one unit combining an integrated photonics module (IPM) containing MEMS and lasers and an electronics platform module containing MicroVision's proprietary ASICS and system control software.

MicroVision commented, "Some customers prefer a flexible solution of the IPM and our standalone MicroVision ASICS, which they can combine with the electronics of the device into which the engine is embedded. The form factor of the IPM, which measures only 47mm, is

are planned to be released in the second quarter of 2017 with production engines expected in the third quarter of 2017. The company said it expects to begin shipping samples of the mid-range LiDAR engine in the second half of 2017 with production units planned for first half of 2018 availability.

MicroVision raises $15 million from stock sale

MicroVision also announced on December 21, 2016, the sale of two million shares of its common stock at a price of $1.07 per share to Ben Lawrence-Farhi in a registered direct offering for gross proceeds of $2.14 million. The company said it intends to use the proceeds for "general corporate purposes".

Also, on December 9, 2016, the company announced the pricing of an underwritten public offering of 12,149,533 shares of its common stock at a public offering price of $1.07 per share, for gross proceeds of approximately $13 million. Farhi had indicated his interest in participating in this underwritten public offering, but was unable to do so "due to logistical reasons".

This offering closed on December 14, 2016 at $13 million in gross proceeds. MicroVision commented that it expects to receive approximately $11.8 million in net proceeds from the offering after deducting the underwriting discount and estimated offering expenses, and intends to use it for "general corporate purposes" as well.

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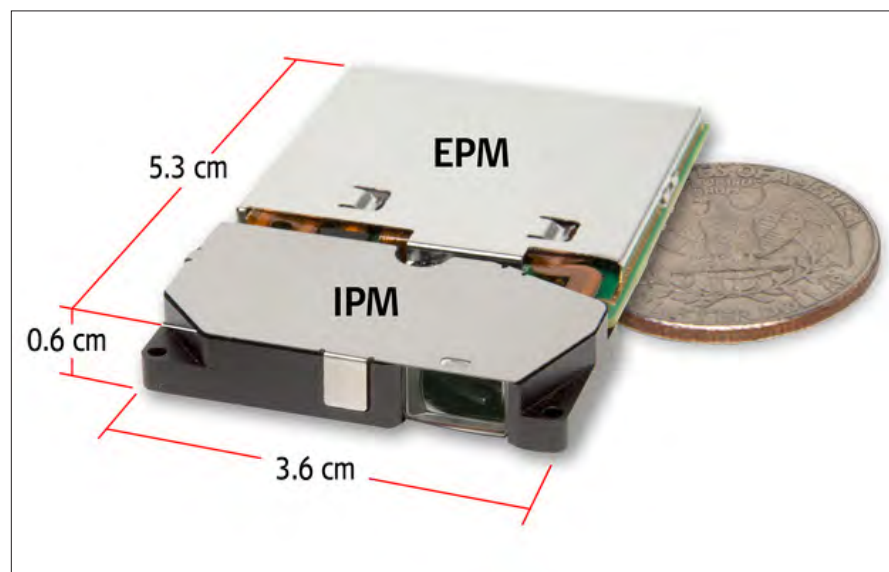
Pico-projector is suited to applications in smart phones, portable media players and tablets.

The small form factor display engine (which has the model number PSE-0403-101) is a compact laser scanning engine measuring 36mm x 53mm x 6mm thick, with a volume of 11.6 cm3. MicroVision says the size of this engine suits it to applications in products such as smart phones, portable media players, tablets and other handheld electronics.

All-in-one unit

A short focal length version of the engine (model PSE-0403-102) is suited to the

a critical attribute for OEMs considering incorporating pico projectors inside their consumer products."

Besides the PSE-0403-101/2 engines, MicroVision plans to offer two other scanning engines: an interactive display engine that can support simultaneous projected display and multi-touch interactivity with the projected images and a sensing engine for mid-range LiDAR.

Samples of the interactive display engine

Cognex expands 3D machine vision expertise with EnShape deal

US-based imaging firm buys German startup that has developed proprietary rapid projection technology.

Cognex, the Massachusetts-headquartered machine vision specialist, is further expanding its 3D imaging portfolio with the acquisition of Germany's EnShape.

The deal to buy the Jena-based start-up comes just a couple of months after Nasdaq-listed Cognex acquired Spain's AQSense, a software company focused on 3D machine vision applications, and the US firm will be showing off its new capabilities at the Vision trade exhibition taking place in Stuttgart next week.

highly experienced new engineering teams, will accelerate our ability to bring innovative new 3D products to market."

High projection rates

While 3D sensing featuring active structured illumination is already established as one of the most accurate optical techniques for large-object metrology, the approach tends to be limited by relatively slow projection rates and weak illumination.

EnShape says it has developed a proprietary approach that delivers rapid projection rates

"At comparable lateral resolution more object details and finer height differences can be detected," states EnShape. "This for instance allows or simplifies the detection and differentiation of small or flat objects for robot-assisted product handling."

The company has developed two main product lines: the "Inspect" sensor family aimed at in-line quality control applications offers detection of 3D surface defects at a rate of 10 Hz, while the "Detect" sensors are designed for robot-assisted handling and offer a faster capture rate in excess of 20 Hz.

Spun out of the local Fraunhofer Institute of Applied Optics, EnShape was set up by CEO Martin Schaffer, and lists auto giant BMW among its financial supporters. At next week's Vision event, the company will be demonstrating what it claims is the world's fastest 3D random bin-picking technology – capable of more than 40 picks per minute – at the Cognex booth.

Cognex sales rise sharply

EnShape's new parent company appears to be in rude financial health, having just posted a strong increase in both sales and operating profits for the third quarter of the year.

At a record $148 million, quarterly revenues were up fully 38 per cent on the same period in 2015, with company chairman Robert Shillman declaring the latest performance as "outstanding".

CEO Robert Willett told investors that sales had grown much more quickly than the anticipated 20 per cent, as opportunities opened up by the move to factory automation increase, although a recent surge in customer deployments will slow down somewhat in the current quarter.

The strong performance saw operating profits nearly double in the three months ending October 2, up more than 90 per cent to $54.5 million, compared with $28.5 million a year ago.

Willett told an investor conference call: "Sales to consumer electronics, automotive, and consumer products [markets] drove factory automation revenue to a new quarterly record, exceeding the prior record set last quarter."

The CEO added: "Europe delivered the largest contribution to growth [in] absolute dollars,

Photo: Cognex.

Cognex's latest offering, a "multi-smart-camera" vision system offering up to four different views of a fast-moving production line environment, but without compromising processing power.

Joerg Kuechen, VP of vision products at Cognex, said: "We see a growing number of opportunities for 3D vision in industries such as automotive, consumer electronics and logistics, to name just a few.

"We believe that our acquisition of these two companies, especially the addition of two

and strong illumination – meaning much faster acquisition of high-accuracy, full-field 3D shape measurements.

In combination with high-performance algorithms, the firm's hardware is said to produce a 3D representation of an object within milliseconds.

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SPIE.

Cognex expands 3D machine vision expertise with EnShape deal

helped by large electronics orders that were placed in Europe for Cognex products used on assembly lines in China."

New technology; and expertise

Commenting on the EnShape acquisition, Willett said: "This is a fast-growing approach to 3D data capture that we expect will find widespread use in factory automation." The CEO added that the AQSense software provides a user-friendly graphical user interface that would make 3D vision products easier to use, while complementing the firm's existing software platforms.

"Not only is all of this new technology exciting, but equally or perhaps more importantly, with these two acquisitions we have been able to bring on 11 highly skilled and experienced engineers, of which seven have advanced degrees in machine vision," Willett noted. "We expect these acquisitions will significantly accelerate our efforts to bring new 3D vision systems to market."

The recent performance puts Cognex in an even stronger position to continue making acquisitions, should it wish to, with the company now listing more than $700 million in cash and investments – and no debt – on its balance sheet.

The company's latest product launch is claimed to be the world's first "multi-smart-

vision processing with multiple smart cameras for high-performance applications."

Willett explains that this will be important, as manufacturers look for vision systems to work together to solve inspection tasks that require multiple views of an object on fast-moving production lines.

Photo: EnShape.

EnShape's 'Detect' sensor family is said to combine high-precision measurements with a rapid capture rate of more than 20 Hz.

camera vision system", and offer faster performance with each camera that is added.

"You can easily attach up to four In-Sight cameras to a controller for multi-view inspections in your manufacturing environment," Cognex says. "For the first time, you can leverage the power of distributed

• Cognex is exhibiting its products at booth D72 in Hall 1 at next week's Vision trade show taking place at Messe Stuttgart, Germany.

Mike Hatcher is a contributor to optics.org.

http://optics.org/news/7/11/1

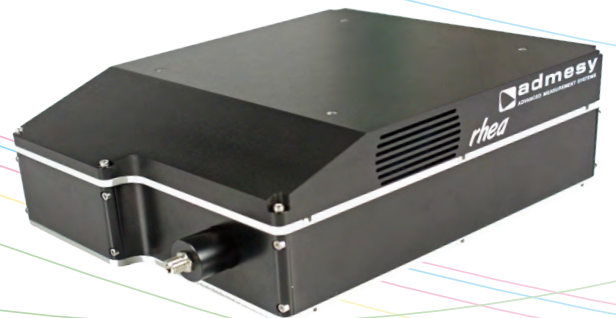# The ultimate high-end spectrometer

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