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VISION focus

Delivering the latest news from the Imaging and Machine Vision markets

Standard 2D camera adapted to produce 3D images

Photo credit: K-Lens

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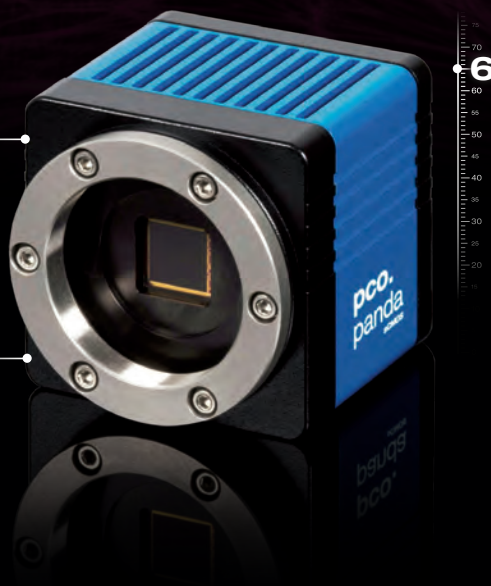

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Sunshiney days

Welcome to the latest issue of VISION Focus, the quarterly magazine (and free download from optics.org) that covers all aspects of vision and imaging, produced by the team that brings you optics.org. The editorial focus of this issue is centered on SPIE's Defense + Commercial Sensing 2018, the leading global technical conference and exhibition about sensing, imaging, and photonics technologies for defense, security, health care, and the environment.

This year DCS is located in Orlando, Florida, having moved back east from Anaheim. Attendees will get to hear the latest technical advances in sensors, infrared technology, laser systems, spectral imaging, radar, LIDAR, and more. According to enterpriseflorida.com, the Sunshine State's modern industrial strengths are diverse, ranging from photonics, to mobile technologies, communications equipment to modeling and simulation. Florida's photonics cluster is among the largest in the United States, with some 270 companies employing nearly 6000 professionals.

Issue highlights

Until now, photographers and filmmakers needed to use specialized equipment if they wanted to change the focus area in post-processing or reproduce an object three-dimensionally. However, a standard 2D camera has been adapted to produce 3D images; German start-up K-Lens has developed special conversion optics for photography and film applications.

Hyperspectral Imaging is today one of the most innovative fields of development in machine vision. Systems based on this technology are innovative and opening up new applications for machine vision, which previously could not be achieved with conventional systems. We preview some of the HIS developments that will be showcased at Vision later in the year.

Smart vision systems are now big business as our detailed analysis of four companies reflects. Chronocam, a French machine vision startup developing technology inspired by how animal and human vision works, has just raised $19 million in a series B round of venture finance. FLIR Systems, the Nasdaq-listed vendor of infrared imaging and surveillance systems, has posted record annual sales of $1.8 billion for 2017. Cognex, a big player in machine vision, has posted record sales and net income despite a huge tax charge following US law change. Furthermore, Stemmer Imaging has completed a €51 million IPO following an oversubscribed offering of its stock.

Each issue of VISION Focus magazine is promoted to more than 25,000 industry professionals. We also publish printed copies at major events and exhibitions, so if you're visiting Defense + Commercial Sensing 2018, make sure to grab a copy of the latest issue – you can visit the optics.org and SPIE team on booth 1615.

Matthew Peach, Contributing Editor

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This Issue

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Publication and Editorial Schedule 2018/19

June/July Issue 2018

- Bonus Distribution: **Astronomical Telescopes + Instrumentation**
- **Editorial Focus:** optical components, academic research, software applications.
- Published in advance of Astronomical Telescopes + Instrumentation, 12th – 14th June 2018

October/November Issue 2018

- Bonus Distribution: **Vision**
- **Editorial Focus:** opto-electronic systems, applications in sensing and manufacturing.
- Published in advance of Vision, 6th – 8th November 2018

January/February Issue 2019

- Bonus Distribution **SPIE BiOS, Photonics West, SPIE Medical Imaging**
- **Editorial Focus:** industrial applications, sensing, biomedical analysis and treatments.
- Published in advance of Photonics West, 2nd - 7th Feb, Lase, 2nd - 7th Feb, SPIE Medical Imaging, 16th – 21st February 2019

April/May Issue 2019

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

Photo credit: K-Lens

View of the future: commercialization is set for 2019.

Standard 2D camera adapted to produce 3D images

German start-up K-Lens develops special conversion optics for photography and film applications.

Until now, photographers and filmmakers needed to use specialized equipment if they wanted to change the focus area in post-processing or reproduce an object three-dimensionally.

But now Germany-based start-up K-Lens has now developed a special lens that can convert any standard camera into a 3D camera.

What began as a research project at the Max Planck Institute for Informatics (MPII) and Saarland University, and was developed further with the help of the startup support agency IT Inkubator, is expected to become available as a commercial product from 2019.

Previously, the capture of depth information was only possible using images or footage from camera arrays or special light field cameras, state the K-Lens developers. Along with the two image dimensions, these also record the direction of incident light rays.

However, photographers and filmmakers had to pay for the advantages – such as extended depth of field, adjustment of focus or blur in post-processing, depth-based segmentation and 3D images – with high acquisition costs and cumbersome work flows.

Photographer benefits

The Saarbrücken-based K-Lens has developed a special lens of the same name, based on a research project at MPII and Saarland University, which could allow all photographers to benefit from the

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Standard 2D camera adapted to produce 3D images

advantages of 3D technology using their existing 2D equipment.

Matthias Schmitz, founder, and CEO of K-Lens, commented, "The innovation of our lens is that it is compatible with today's technical standards and can, therefore, be used with any camera.

It offers not only complete control over focus and blur, fully automatic segmentation, depth-based segmentation, perspective change and 3D images, but also complete access to the depth planes of the recorded image."

He added, "So far, there is no lens on the camera market that can match the possibilities of the K-Lens."

CTO Klaus Illgner commented, "Photos do not have to end up in the digital recycling bin because of focusing errors, a common problem, for example, in macro photography. Image series, as in product photography, can be shot more quickly and image objects can be segmented faster."

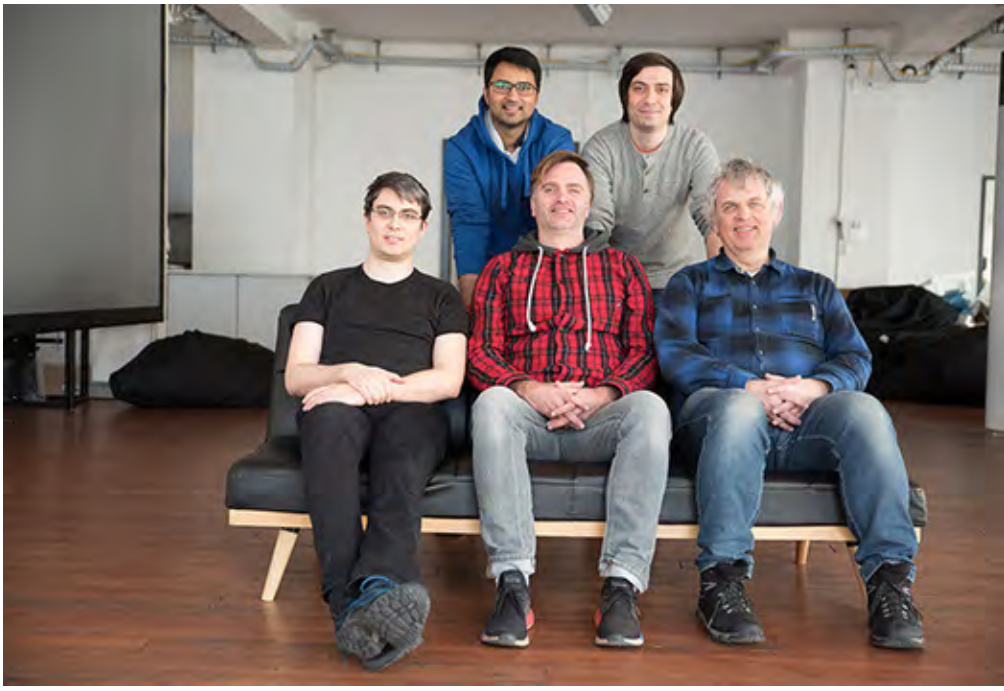
Illgner, an enthusiastic amateur photographer, is responsible for technical development. He said, "New effects, like focus and blur within the same image plane, can also be achieved with the K-Lens. We will also supply the software for achieving these post-processing effects."

Image Multiplier

The optics is expected to have a long dimension of 200 mm and a maximum weight of 800g – similar to conventional hand-held zoom lenses.

The core component is the so-called "Image Multiplier," a system of mirrors that, like a kaleidoscope, produces different perspectives of the same scene, which are then simultaneously projected onto the camera sensor. Software developed by K-Lens then generates the light field image.

Worldwide patent protection has been applied for. After approval in the USA,



K-Lens team: Pascal Bies, Sunil Jaiswal, Matthias Schmitz, Zaur Aliev, Klaus Illgner. Photo credit: K-Lens

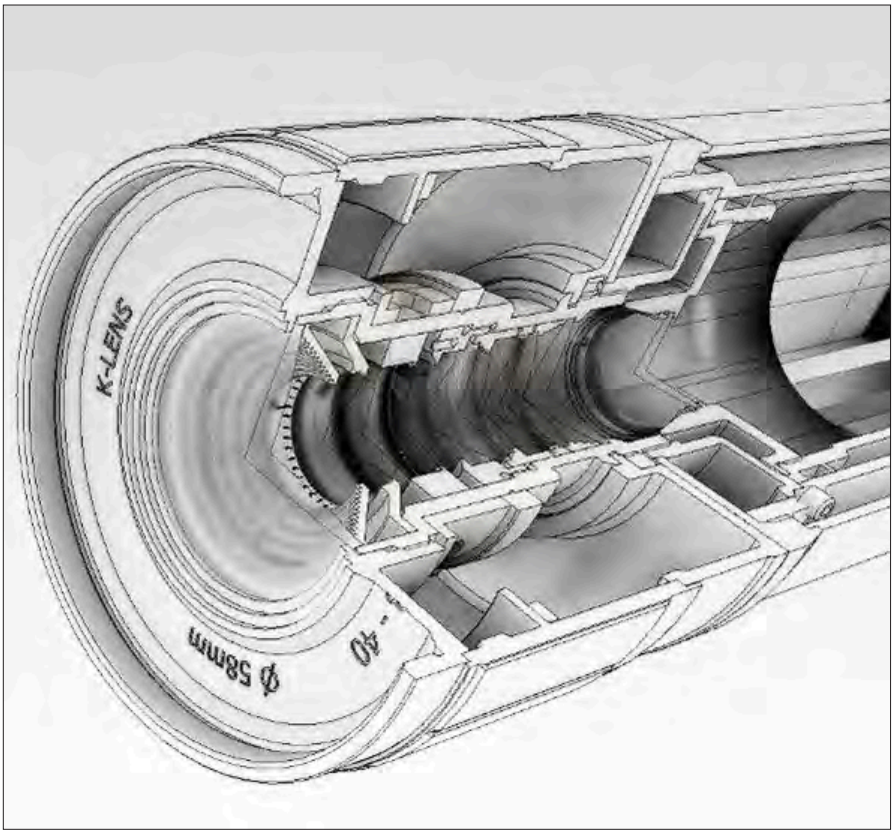


Photo credit: K-Lens

Key element is the "Image Multiplier", a system of mirrors that produces different perspectives of the same scene.

Matthias Schmitz and the K-Lens team are hoping to receive patent approvals for the other markets during 2018.

Following two years of development work in the IT Inkubator, the five-person team has been funded since October 2017 by the venture capital firm Saarländische Wagnisfinanzierungs GmbH (SWG).

Doris Woll, managing director of the SWG, commented, "New, demanding and attractive jobs will be created here in an innovative technological setting. This is the objective with all of the investments supported by SWG." At the same time, K-Lens is taking part in a research project developing a commercial light field camera for the professional film industry.

By Matthew Peach, Contributing Editor

http://optics.org/news/9/3/13

Hyperspectral imaging extends bandwidth of MV market

The latest hyperspectral technology will be showcased at VISION 2018 in Stuttgart.

Matthew Peach reports.

Hyperspectral Imaging is today one of the most innovative fields of development in machine vision. Systems based on this technology are innovative and opening up new applications for machine vision, which previously could not be achieved with conventional systems. Numerous exhibitors will be presenting their latest hyperspectral systems at VISION 2018, which will run between November 6-8 in Stuttgart, Germany.

Photo credit: Solpi

Drones in combination with hyperspectral cameras make possible photogrammetry or inspection applications, e.g. in the area of Precision Farming.

Machine vision continues to be one of the strongest growing sectors in German and European industry. According to the latest figures from the VDMA in Germany, the companies in this industrial sector generated 18% more turnover in 2017 than in 2016. And also all over Europe the increase was significantly above the average increase in general turnover growth in mechanical engineering.

Hyperspectral Imaging (HIS) in particular represents a significant growth segment. The potential of this relatively young discipline is estimated to be massive for the future. Why is this? Markus Burgstaller, CEO of Perception Park, describes a key difference from traditional vision systems as follows:

'Key difference'

"HSI systems offer a spectrum for each object pixel instead of a monochrome or colour value compared to established MV technologies. Depending on the wavelength range and spectroscopic

Photo credit: Perception Park

Markus Burgstaller, Perception Park: "Similar to other machine vision technologies, the trend is also heading towards Embedded for Hyperspectral Imaging."

processing, high-precision color coordinates, chemical material properties, but also coating thickness information can be derived from the spectral data. The output information of such a camera has a significantly higher degree of complexity, but also allows greater diversity and selectivity in terms of manageable applications."

Photo credit: LuxFlux

Dr. Jan Makowski, LuxFlux: "Hyperspectral cameras allow the differentiation of more than one hundred colours. As a result, the properties of materials can be examined and chemicals can be made visible."

Dr. Jan Makowski, President of LuxFlux, explains, "Whereas traditional RGB cameras depict only those colors, hyperspectral cameras make it possible to distinguish between more than one hundred

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Hyperspectral imaging extends bandwidth of MV market

wavelengths. With such high-precision color measurement, the properties of materials can be examined and specific chemicals can be made identified."

Diverse applications

Tim Huylebrouck, Product Manager at Stemmer Imaging, described the range of possible applications thus: "Supposed identical objects can reflect completely different light spectra owing to their chemical properties, when stimulated by a broadband light source. They can then be distinguished with hyperspectral systems. No other type of machine vision solution can do this."

Dr. Georg Meissner, Managing Director of Specim, mentions one application as an example: "ZenRobotics is a leading global provider of robot-supported systems for waste separation. Because the waste material that is sorted in such plants often contains hazardous materials, such as asbestos, it is important to safely and reliably identify and sort such substances. That's why ZenRobotics relies on hyperspectral cameras from Specim, which have the necessary detection reliability, sensitivity and speed for this task."

Different plastics

Gion-Pitschen Gross, Product Manager at Allied Vision, also sees the area of recycling and sorting of plastics as an important application for hyperspectral systems: "HSI makes possible the automatic separation of plastic parts, for example polyethylene and polypropylene, which can be detected and separated on the basis of their chemical composition. In addition to existing color sorting, materials can also be distinguished by their molecular properties. The quality of results in the sorting process is thus significantly increased."

According to Gross, the inspection of foodstuffs also offers huge potential for the HSI technology: "Meat, fat and bones also have distinct molecular properties, which can be clearly recognised in a HSI image. This also applies to other types of materials that also seem to have barely any differences in the actual image, such as the almost identical foodstuffs sugar, salt and citric juices."

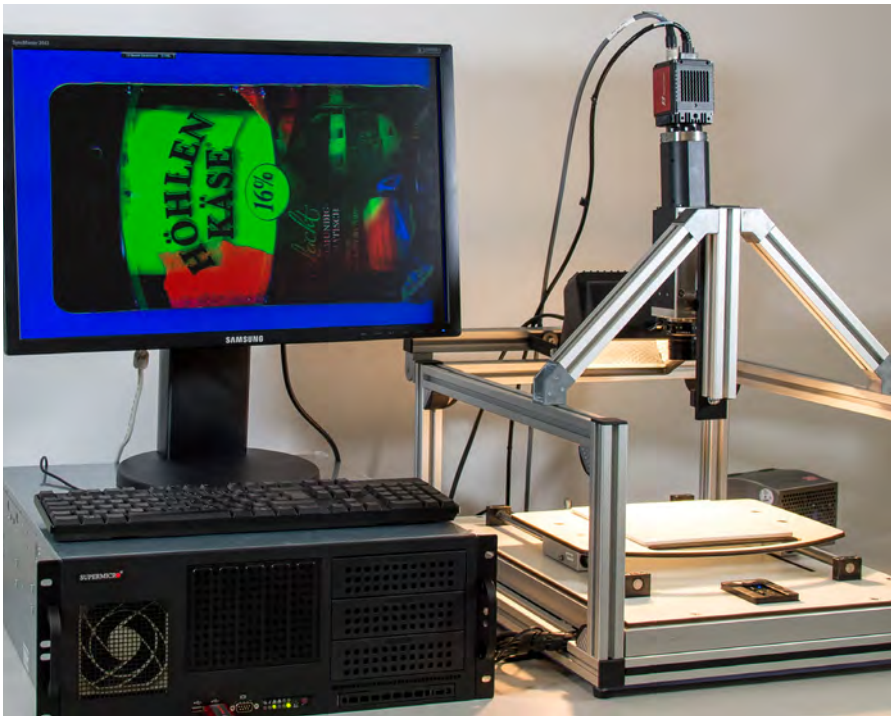

Photo credit: Stemmer Imaging

STEMMER IMAGING offers complete hyperspectral systems for diverse application areas. Here is an experimental set-up for examining cheese.

For cameras in the visible spectral range it is also difficult to detect physical changes to objects. This plays a big role, for example in the food industry, when fruit or vegetables are inspected for their degree of ripeness or for possible mould contamination. Here HSI systems offer suitable solutions, which Allied Vision addresses with its hyperspectral cameras in the Goldeye series, among others.

Photo credit: Allied Vision

Gion-Pitschen Gross, Allied Vision: "In the future it should be possible to detect materials solely based on their spectral signature, without the need for training."

Daniel Hofmann, CEO of Spanish firm Photonfocus-Tochter Solpi, expects a breakthrough in the future of HSI applications with mobile carrier systems such as Precision Farming by means of UAVs (Unmanned Aerial Vehicles): "Camera systems can be installed on a drone, for example, in order to enable photogrammetry or inspection applications.

"Such a camera system may consist of several hyperspectral cameras, a GPS system, an embedded computer and lots more. The pictures taken have accurate GPS data to simplify subsequent machine vision," he said. Solpi is offering a camera system that allows the use of several hyperspectral cameras in an independent image-grabbing solution.

Challenges of HSI Imaging

Despite this and other promising application examples, HSI is currently still widely regarded as one of the exotic disciplines of machine vision. One reason for this is the number of challenges that still have to be solved before the technology can be used comprehensively. The relatively high cost of hyperspectral technology is also a significant entry barrier. On top of this is the fact that the entire technology is not simple to understand and often requires in-depth specialist knowledge of spectroscopy.

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Hyperspectral imaging extends bandwidth of MV market

Stemmer's Huylebrouck also mentions the topic of lights and illumination as another challenge: "Hyperspectral Imaging does not work with the LED lights and the illumination methods that are often used in machine vision, but with halogen lamps which emit a wide wavelength spectrum. There is still a need for suitable illumination here." In addition, the lights must have protective glass, such as in applications in the food industry, which cannot be made from actual glass in this industry because of safety standards. "However, other materials distort the spectrums. A few tricks are needed here," said Huylebrouck.

According to many experts, these reasons as well as the lack of high-performance hyperspectral software, reliable spectral data and experience are leading to a somewhat hesitant expansion of this new technology at the moment.

Trends and further developments

Nevertheless, the innovative opportunities of the technology are prompting many companies to work intensely on further developments in this area. "We are observing a trend towards the reduction of systems, whereby it must be ensured that this is not achieved at the expense of the performance," said Hilmar Krüger, Sales Manager at Innospec.

Perception Park's Burgstaller lists some other current approaches: "The trend is heading towards embedded technologies and this also applies to HSI. The cameras are becoming smaller and more affordable and in combination with new MVtechnologies they will be used in handheld devices such as future smartphones in the foreseeable future."

With the addition of a pre-processor, HSI cameras are also becoming smart themselves and make possible the pre-processing of the hyperspectral data volume as well as the extraction and transfer of chemical or physical object information per object pixel. "This will lead to much greater acceptance thanks to the possible standard interfaces", stated Burgstaller. "HSI systems will learn by means of chemical and physical information and thus ensure greater simplification of the application of Hyperspectral Imaging systems."

Gion-Pitschen Gross from Allied Vision agrees: "In the future, it should be possible to detect materials solely based on their spectral signature, without the need for specialist training." The hyperspectral software Perception Studio from Perception Park already provides an intuitive software suite for the recording, modelling and analysis of hyperspectral data.

For Specim President Dr. Georg Meissner, Hyperspectral Imaging is increasingly becoming a widely used and established segment of machine vision and quality inspections as a result of these numerous trends. "The technical advances in this area will very soon lead to higher image capture rates as well as probably also wider spectral ranges and more compact camera sizes."

By Matthew Peach, Contributing Editor to optics.org

SWIR Vision aims quantum-dot cameras at industrial vision March 2018

Research Triangle Park venture to offer high-resolution infrared imagers based on layer of colloidal lead sulfide dots.

A new spin-out company from the Research Triangle Institute (RTI) in North Carolina is set to commercialize a range of low-cost, high-resolution infrared cameras based around a sensor featuring an active layer of colloidal quantum dots (CQDs).

PbS dots key

The key to the approach is the use of lead sulfide CQDs - which can be fabricated directly on top of a commercial CMOS read-out circuit (ROIC) – in place of epitaxial indium gallium arsenide (InGaAs) layers grown on indium phosphide (InP) wafers.

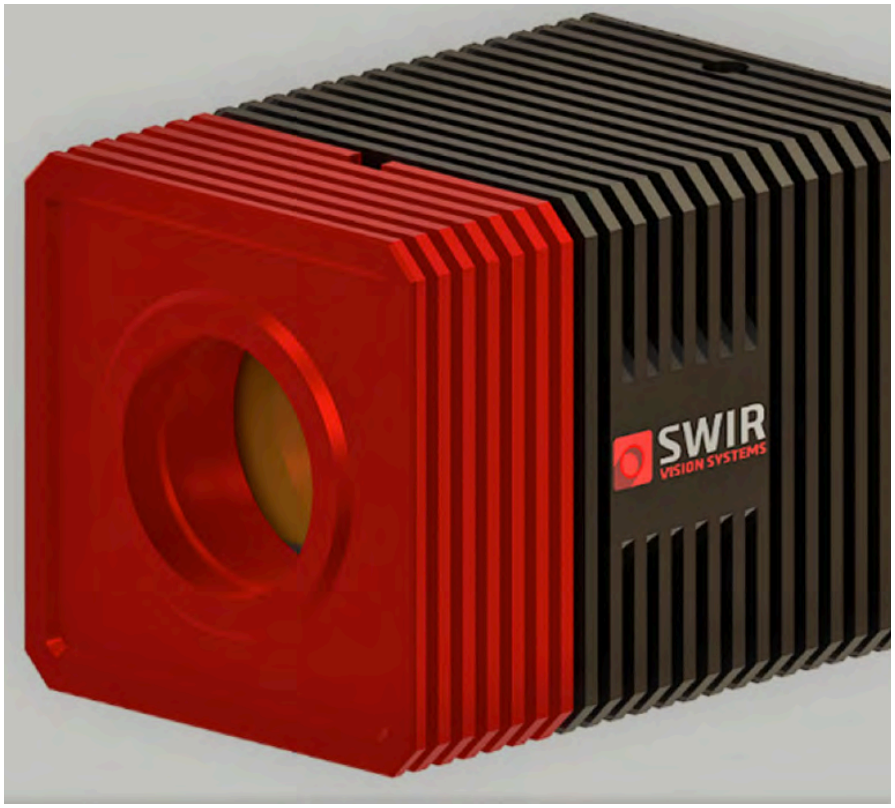

Photo credit: SWIR Vision Systems

SWIR Vision Systems AcurosTM camera featuring CQDTM quantum dot sensor technology and 1920x1080 full HD resolution .

SWIR Vision Systems says it will aim the technology at applications in industrial machine vision, automotive, agriculture, and security markets, among others.

The resulting "Acuros" cameras from SWIR Vision, set to be available in three different resolution formats, will operate across the visible and near-infrared wavelength range, up to1700 nm.

CEO George Wildeman told *optics.org* that the CQD technology, which was partly developed under the US Defense Advanced Research Projects Agency (DARPA) program entitled Wafer-Scale Infrared Detectors (WIRED), can be deposited to form arrays of p-n heterojunctions using low-temperature, low-cost processing techniques.

"Our business model includes in-house manufacturing of our core sensor technology," added Wildeman, who has previously held senior roles at the likes of Corning, Leica Microsystems, and Duke University.

"We intend to utilize low-cost manufacturing partners for some of the camera components. Commercially, we plan to sell both directly and indirectly into targeted segments, leveraging value-added partners, integrators and distributors to access selected markets."

Currently SWIR Vision has fewer than ten employees, but Wildeman expects that number to grow this year as the Acuros is commercialized, and when production ramps next year.

Initial backing for the firm comes from parent RTI International, with operations for CQD sensor production and final camera assembly already established within a Research Triangle Park semiconductor processing facility.

Hybridization step eliminated

Critically, explains the CEO, InGaAs-based imagers require not just complex, high-temperature epitaxial growth, but expensive chip-level heterogenous hybridization processes, to connect the compound semiconductor and silicon CMOS pixels.

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SWIR Vision aims quantum-dot cameras at industrial vision March 2018

That also imposes practical limitations on array and pixel size - effectively limiting InGaAs devices to VGA resolution. In contrast the monolithic SWIR Vision System approach requires no epitaxial growth or expensive InP substrates, and eliminates the need for the hybridization steps.

One inevitable trade-off comes in the form of a lower sensitivity for photon-starved applications. An Acuros data sheet claims 15&nbs;per cent quantum efficiency, compared with a maximum of around 80 per cent for InGaAs-based cameras – but Wildeman says that the CQD-based sensor will still offer high performance in daylight, or in applications featuring active illumination.

"Also, in our research and development roadmap, we expect further quantum efficiency improvements to come," he added.

The CEO expects the novel technology to both disrupt and expand the market for SWIR cameras by offering a lower cost point for high-resolution imaging, while Acuros' classification as a non-ITAR "EAR99" product will also permit global adoption.

"We expect to displace InGaAs technology first in applications where higher resolution is valued, and where cost-sensitivity is important," Wildeman told *optics.org*.

"We are seeing many potential uses for the technology. To start we are engaging commercial customers with hot glass, liquid fill level, food sorting, and semiconductor inspection applications, to name a few."

Once in production, the Acuros cameras will be available in three different formats: a 640x512 pixel resolution "VGA"; 1280x1024 "1MP"; and 1920x1080 "HD".

By Mike Hatcher, Contributing Editor to optics.org

SWIR Imaging Application: Food Sorting

Visible image using standard CMOS based camera.

InfraRed image using SWIR Vision Systems AcurosTM Camera detects subsurface bruising valuable for food sorting applications.

SWIR Imaging: Fill Level Detection

Visible image using standard CMOS based camera.

InfraRed image using SWIR Vision Systems AcurosTM Camera detects liquid fill levels for quality control on factory manufacturing lines.

SWIR Imaging: Surveillance and Maritime Imaging

Visible image of landscape through maritime haze using standard CMOS based camera.

InfraRed image using SWIR Vision Systems AcurosTM Camera sees through maritime haze with vivid detail of opposite shoreline, for use in surveillance and maritime imaging applications.

Chronocam raises $19M; rebrands as 'Prophesee'

Intel, Renault, and Bosch among the investors to back series B round for startup developing animal-inspired machine vision technology.

Chronocam, the French machine vision startup developing technology inspired by the way that animal and human vision works, has raised $19 million in a series B round of venture finance.

The Paris-based firm has also decided to change its name to "Prophesee". Its technology, initially developed at France's Vision Institute, is able to capture extremely fast events by mimicking so-called "neuromorphic" imaging at rates of up to 100,000 frames per second.

Photograph courtesy of https://twitter.com/Prophesee_ai

New strategic investor

In late 2016, the company founders won a startup competition at the photonics-focused Inpho Venture Summit in Bordeaux, shortly before raising $15 million in a series A funding round. Among several other awards, Chronocam/Prophesee was one of around 30 early-stage firms to be identified last year as a "technology pioneer" by the World Economic Forum.

That initial funding was, like the new series B raise, backed by blue-chip investors in the form of Intel Capital, Renault, and Robert Bosch – although the latest round was led by an unspecified strategic investor "from the electronics industry".

"The financing is further market validation of the company's patented approach to revolutionizing the next generation of machine vision applications, such as autonomous vehicles, robots, industrial automation and IoT [Internet of Things] devices," announced Prophesee.

The company's CMOS sensors acquire dynamic visual information in the form of a continuous stream of pixel-individual data, an approach that senses the context of a given scene – and is able to focus on changes within that scene - rather than the entire data set.

It means that only the data necessary to perform the relevant visual function is acquired, rather than the highly computationally and energy-intensive task of collecting and analyzing thousands of full-frame, high-resolution images every second.

The approach is therefore much more akin to animal and human vision, where neural systems have evolved to respond to sudden changes within the field of view, and to ignore an unchanging scene.

Dynamic range

The company adds that with a dynamic range of more than 120 dB, the technology is able to let systems operate and adapt effectively in a range of challenging and changing lighting conditions.

"It sets a new standard for power efficiency with operating characteristics of less than 10 mW, opening new types of applications and use models for mobile, wearable and remote vision-enabled products," claimed the firm in a release announcing the latest funding, adding that the new money would enable it to accelerate the development and industrialization of that technology.

Company CEO and co-founder Luca Verre said: "Our event-based approach to vision sensing and processing has resonated well with our customers in the automotive, industrial and IoT sectors, and the technology continues to achieve impressive results in benchmarking and prototyping exercises."

"This latest round of financing will help us move rapidly from technology development to market deployment," he added. "Having the backing of our original investors, plus a world leader in electronics and consumer devices, further strengthens our strategy and will help Prophesee win the many market opportunities we are seeing."

By Michael Hatcher, Contributing Editor

http://optics.org/news/9/2/28

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FLIR hikes dividend on 'positive momentum'

Thermal imaging giant posted record sales of $1.8BN in transitional year.

FLIR Systems, the Nasdaq-listed vendor of infrared imaging and surveillance systems, has posted record annual sales of $1.8 billion for 2017, with CEO Jim Cannon hailing the company's "positive momentum" following a transitional year.

That sales figure represented a rise of 8 per cent on fiscal 2016 – mostly the result of acquisitions including machine vision camera firm Point Grey Research – and although the company swung to a net loss of $50.3 million in the closing quarter of 2017, that was due to a much larger tax bill resulting from the recent changes to the US corporate tax regime.

Cannon, a US Army veteran who replaced Andy Teich in the CEO office in June 2017, told investors that adjusted operating margins were now at a five-year high. "This was accomplished during a year of transition that included an operational realignment, changes to the management team, and portfolio rationalization that resulted in the divestment in our Lorex security business," he said.

Point Grey adds momentum

FLIR announced the $29 million cash sale of Lorex last week, with Cannon saying that the unit – acquired for CAD$59 million back in 2012 - no longer fitted with the wider company strategy to "build intelligent, turn-key security solutions based on multiple wavelengths".

The sale of Lorex and pivot away from retail security applications means that FLIR's 2018 revenues will likely be a little lower than the 2017 total, with Cannon and his executive team anticipating a total somewhere between $1.73 billion and $1.76 billion – equivalent to organic sales growth of around 5 per cent.

But earnings should be higher: Lorex was said to be breaking even on its 2017 turnover of $140 million, and the FLIR board has approved a penny rise in the shareholder dividend, to $0.16 per share (approximately $23 million).

The full-year results show the positive impact of the Point Grey acquisition on FLIR's "OEM and emerging markets" business unit. Its full-year sales of $347 million were up 42 per cent year-on-year, delivering an operating profit of $103 million.

Commenting on the results in an investor conference call, CEO Cannon said that FLIR was "set up well for 2018", and highlighted the company's presence at last month's Consumer Electronics Show (CES) in Las Vegas, where it highlighted the potential for thermal imaging in future autonomous vehicles.

FLIR rolled out its second-generation thermal camera automotive development kit (ADK) at CES, with Cannon saying that it ought to prove particularly useful in night-time and adverse weather conditions, with the ability to "see" four times further than conventional headlamps. The technology is based around one of FLIR's high-resolution "Boson" sensors.

DoD certainty

With FLIR's backlog up 10 per cent year-on-year at $652 million, the CEO added that the company's organic sales should grow at their highest rate in more than a decade this year, assuming that guidance targets are hit. He added that, from 2019, FLIR should benefit from the now greater certainty over future US Department of Defense budgets.

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FLIR hikes dividend on 'positive momentum'

Cannon is also aiming to improve margins as a result of a corporate "realignment" that will see the current six reporting business units reduced to three as of the next quarter, a move that is expected to reduce complexity and enhance collaboration across the firm.

Other productivity boosts are expected to result from a focus on improved manufacturing yields of thermal imaging sensors.

Asked about the possibility of future acquisitions – FLIR now has more than half a billion dollars in cash on its balance sheet – Cannon hinted at a potential move up the value chain, saying that he wanted the company to be able to offer "total mission outcomes" as well as sensor solutions.

Image: nasdaq.com.

Despite slipping back following management's latest financial update, FLIR Systems' stock price remains close to recent all-time highs. Trading at around $46 on the Nasdaq exchange, the infrared imaging company commands a market capitalization of more than $6 billion.

However, with market valuations currently close to all-time highs making full-blown acquisitions tricky, the CEO said that minority investments were also being considered.

• With US inflation figures again pushing markets lower, FLIR's stock price slipped back around 4 per cent in early trading following the company's latest financial update. However, at just over $46 on the Nasdaq exchange, FLIR's valuation remains close to the all-time high of just under $53 reached in recent weeks.

By Michael Hatcher, Contributing Editor

http://optics.org/news/9/2/19

Cognex chiefs hail 'spectacular' year

Machine vision firm posts record sales and net income despite huge tax charge following US law change.

Executives at the Nasdaq-listed machine vision company Cognex have reported what they described as a "fantastic" year of record sales and profits.

"Market conditions were very strong, the best we have ever experienced," CEO Robert Willett told an investor conference call, as annual revenues in 2017 soared 44 per cent to $748 million.

With the fast-growing Natick, Massachusetts, firm able to command enviable profit margins thanks to its market dominance, Willett and Cognex' founder "Dr. Bob" Shillman registered a pre-tax income of $267 million in 2017 – up from $169 million in the previous year.

And while the company recorded a tax charge of $83 million in the final quarter, relating to the US administration's recent sweeping corporate tax reforms and the estimated cost of unrepatriated earnings outside the US, Cognex was still able to deliver a record net income of $177 million for the year.

Willett told investors that the company saw growth in all geographic regions and a wide range of industries, highlighting the broader deployment of organic LED (OLED) displays in consumer electronics devices as a key factor. Apple's recent adoption of OLED displays has helped drive that, with the around 20 per cent of Cognex' sales now attributed directly or indirectly to the giant consumer electronics firm.

Headcount up

Cognex has also been growing rapidly in terms of employees – who the executives refer to as "Cognoids" - with headcount up 25 per cent year-on-year as spending on both research and development and sales efforts rose sharply.

Image: Cognex.

Released last month, Cognex' latest barcode reader technology features a built-in LED aimer and diffuse lighting - said to "transform" smartphones into better barcode readers.

Willett is expecting that trend to continue, stating: "Market dynamics were strong in 2017 and that has continued into the first quarter of 2018. Even though Q1 will likely be the lowest revenue quarter of the year, we will invest in new product development, expand our sales force and develop our IT and other infrastructure so that we are ready for the growth we expect in the years to come."

And while the full implications of the new US tax regime are not yet fully understood, the CEO indicated that overall corporate taxes should end up significantly lower, with an expected effective tax rate of 14 per cent in the opening quarter of 2018.

Willett also told the investor call that applications in the emerging field of 3D machine vision were growing quickly, and that although this area represented only about 5 per cent of the company's current business, it was growing at around 50 per cent annually – primarily driven by applications in the consumer electronics and automotive sectors.

Dividend payout

With $828 million in cash and investments now on the Cognex balance sheet – and no debt – Shillman told investors that the priority remained investing in future growth and technological development.

However, the company is looking to return some of that cash to shareholders, both declaring a new quarterly cash dividend of $0.045 per share and authorizing a $150 million share buyback program intended to help reduce share dilution associated with employee incentives.

• Despite the buoyant mood, Cognex' stock price was down 10 per cent in pre-market trading following the results announcement and call – likely a reflection of the anticipated Q1 revenues of around $170 million.

Although that total would represent year-on-year growth of 20 per cent in what is a seasonally weak period, it would also mean a decline on both the Q4 2017 total of $180 million, and the bumper Q3 sales figure of $260 million.

By Michael Hatcher, Contributing Editor

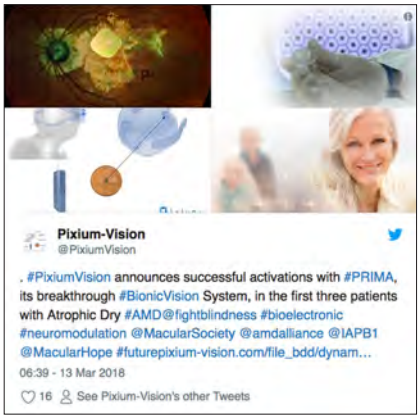
http://optics.org/news/9/2/23

Pixium Vision reports success with 'bionic' vision system

Prima system trialed in three patients with Atrophic Dry-AMD; all now showing positive reactions to implants.

Pixium Vision, a Paris, France-based company developing "bionic vision" systems to enable patients who have lost their sight to lead more independent lives, has reported successful activations of Prima, its miniature wireless photovoltaic sub-retinal implant.

The device has been implanted in the first three of five patients earmarked for treatment; all have severe vision loss from atrophic dry Age-related Macular Degeneration (AMD). The French feasibility study began In December 2017.



Pixium reports that its initial observations were, "encouraging", being made just a few weeks after the first implantations. The company statement said:

- "In all three patients, the miniature wireless chips were successfully implanted under the atrophic macula by a minimally invasive surgical procedure, and the chip placement is stable throughout the postoperative follow-up period";
- "All three patients are perceiving light patterns, within the expected ranges of light intensity, in the area where no light perception existed previously due to loss of light-sensitive cells. Resolution of the perceived signal matches [our] expectations;" and
- "As planned by the clinical protocol, patients are now undergoing training and readaptation procedures."

Prima facie: Pixma's "bionic eye" successfully activated in three Dry AMD patients in France.

'Restoring light perception'

Khalid Ishaque, CEO of Pixium Vision, commented, "Following activation of the implants in the first three patients, the initial observations are exciting for the company. They confirm Prima's ability to restore light perception from the retinal atrophic zone of these dry-AMD patients, where no visual sensitivity remained prior to the treatment. This is in line with the expectations based on preclinical experiments.

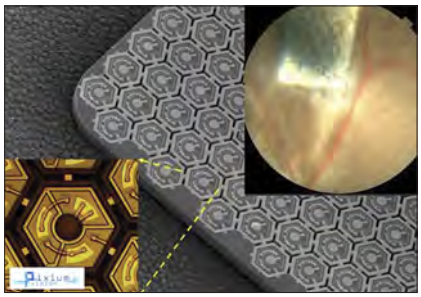
The feasibility studies are set to continue with two more patients to be identified in Paris, and an additional five patients in the US feasibility trial which is to begin shortly. Ishaque added, "We are confident that Prima is a feasible therapeutic option to restore some useful vision in patients blinded by retinal degeneration."

The French feasibility study1 with Prima is a 36-month, five-patient clinical study, designed to evaluate the safety and function of the wireless sub-retinal PRIMA chip in eliciting visual light perception, with an interim six-month analysis enabling to prepare and start also for the pivotal clinical study in the European Union.

Prima is a new-generation miniaturized and totally wireless sub-retinal implant. The implant is a micro photovoltaic chip measuring 2 x 2 mm and 30 µm thick, equipped with 378 electrodes.

Implanted under the retina via a "less invasive" surgical procedure, it acts like a tiny solar panel that is powered by pulsed near infrared light through a miniaturized projector integrated in a pair of augmented reality-like glasses, along with a mini-camera, worn by the implanted subject.

Prima is designed to compensate for severe vision loss from retinal dystrophies,



Sub-retinal miniaturized wireless photovoltaic implant platform for treating AMD.

initially atrophic dry Age-related Macular Degeneration (dry AMD), a significant unmet medical need with currently no curative therapeutic solution, and at later stage also Retinitis Pigmentosa (RP).

By Matthew Peach, Contributing Editor

http://optics.org/news/9/3/15

Stemmer Imaging completes €51M IPO

Machine vision firm set for debut listing on Frankfurt exchange following oversubscribed offering of stock.

Stemmer Imaging, the Germany-based provider of machine vision equipment, has raised €51 million in an initial public offering (IPO) of stock.

Headquartered in Puchheim, near Munich, Stemmer sells machine vision tools for both scientific and industrial applications, and has enjoyed growing sales in recent years as the technology has proliferated.

Its product line-up covers virtually the entire supply chain in machine vision equipment, from customized imaging systems to illumination sources, optics, cameras, and software.

With the IPO said by Stemmer to have been "significantly oversubscribed" at the placement price of €34, some small private applicants will not receive any stock.

"Subscription orders under 20 shares were not allocated," Stemmer announced, adding: "Subscription orders from 20 shares up were allocated 30 per cent of the respective subscription volume (at least 20 shares, a maximum of 500 shares)."

The successful launch will see Stemmer's stock begin trading on the Frankfurt Stock Exchange on February 27, although just over half of the company's equity remains owned by a subsidiary of Primepulse Group – a Munich-based private investor in SMEs.

Sales and profits on the up

Stemmer's CEO Christof Zollitsch, who joined the firm as a technical support engineer in 1991, said in response:

"The high demand of investors in Germany and abroad shows great confidence in the future potential of Stemmer Imaging. We are excellently positioned in an exciting future market with the topic [of] machine vision, a key technology in the area of Industry 4.0 and digitization, and our portfolio around the proprietary software solution."

Stemmer says that the proceeds generated by the listing will be used primarily to help expand its competitive position in Europe, although expansion into Asia is also a possibility.

The firm posted sales of €88.3 million in its latest fiscal year, which ended in June 2017. That represented a 5.6 per cent rise on the prior year, with net profit jumping from €2.2 million to €2.8 million in the same period.

At the moment, Stemmer employs around 260 people across locations in no fewer than 19 European countries.

The company, founded in 1987, expects the field of machine vision to grow at a compound annual rate of 10 per cent, and sees challenges emerging in the areas of embedded vision and hyperspectral imaging specifically – two key themes in the machine vision sector.

Another focus for investment will be further development of Stemmer's own image processing software, called "Common Vision Blox", and engagement in co-operations or acquisitions in this area.

• The IPO comes just a few months after founder Wilhelm Stemmer sold his shareholding in the firm; a deal that saw the company's management team acquire around a quarter of the company's equity.

Stemmer also acquired the Data Vision business unit from Benelux-based Batenburg Mechatronica last month. Like Stemmer, the company provides machine vision components, systems and solutions.

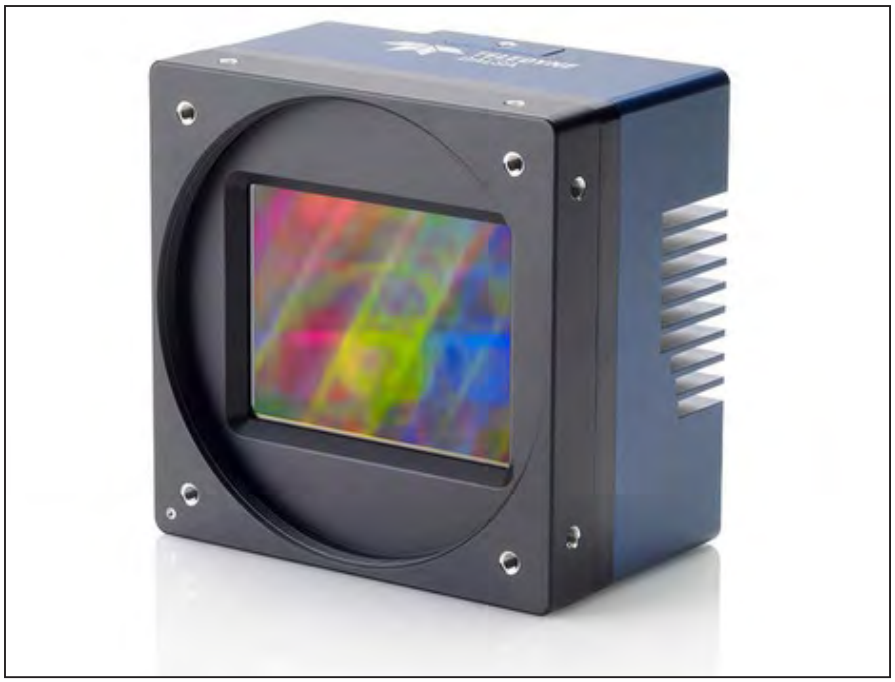


Image: Teledyne Dalsa/Stemmer

One of Stemmer's partners is Teledyne Dalsa, and Teledyne's 86 megapixel 'Falcon 4' camera is now available via Stemmer. With color and monochrome versions, the Falcon 4 is said to provide exceptional resolution at high frame rates of 16 fps. The camera's 10720 × 8064 pixel CMOS sensor allows inspection of extremely large areas without the need for image stitching.

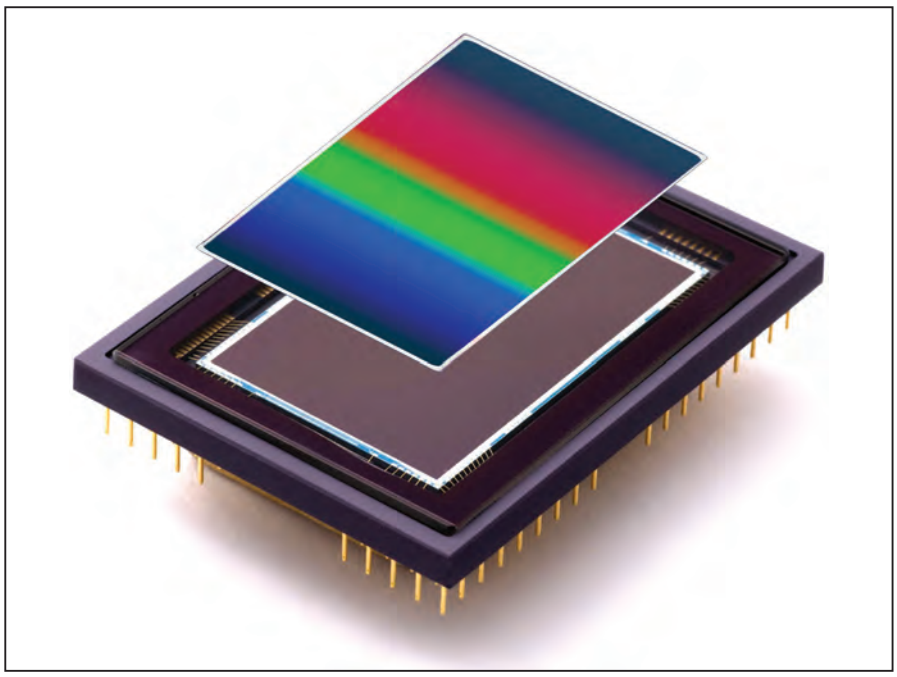
By Michael Hatcher, Contributing Editor

http://optics.org/news/9/2/33

Sponsored Editorial

Continuously Variable Bandpass Filters for Hyperspectral Imaging

Hørsholm, Denmark, April 3rd 2018 – Delta Optical Thin Film A/S announces the launch of several Continuously Variable Bandpass Filters that are specifically designed for Hyperspectral Imaging.



Hyperspectral imaging (HSI) has been used for a couple of decades in applications such as satellite imaging, air reconnaissance and other not overly price sensitive markets. Classical Hyperspectral imaging cameras use prisms or grating as dispersive elements. These cameras are bulky, sensitive to misalignment and very expensive. The advent of alternative approaches makes HSI attractive for volume markets or even consumer products, for example cancer detection, precision farming, food testing in supermarkets and many more.

Delta Optical Thin Film A/S develops and manufactures custom Continuously Variable Bandpass Filters (CVBPF) for mid-size and full-frame CCD/CMOS sensors (e.g. 25x25mm^2 24x36mm^2). These filters offer very high transmission and are fully blocked in the light sensitive wavelength range of silicon-based detectors (200nm to 1150nm). The combination of CVBPFs with silicon detectors allows the design of very compact, robust and affordable HSI detectors that offer several advantages and benefits over conventional approaches:

- Huge aperture compared to grating and prism
- Higher transmission than grating and prism
- Short measurement time
- High suppression of stray light
- Excellent signal to background ratio
- Possibility for 3D measurements and snapshot acquisition

Delta Optical Thin Film A/S welcomes requests for custom designed Continuously Variable Bandpass Filters. Available for immediate testing are filters with the following specifications:

- Centre wavelength range 450nm to 950nm, bandwidth approximately 2% of centre wavelength, transmission 60% to 90%, blocking range 200 nm to 1150nm, blocking level OD4, active area 30mm x 36mm
- Centre wavelength range 450nm to 850nm, bandwidth approximately 4% of centre wavelength, transmission 70% to 90%, blocking range 200nm to 1100nm, blocking level OD4, active area 30mm x 25mm
- Centre wavelength range 800nm to 1100nm, bandwidth approximately 1% of centre wavelength, transmission >70%, blocking range 200nm to 1150nm, blocking level OD4, active area 32mm x 18mm

The sizes are given as height x length, where height is perpendicular to the wavelength gradient and length is along the wavelength gradient. The filters can be diced to smaller sizes.

About Delta Optical Thin Film A/S

Delta Optical Thin Film A/S *(www.deltaopticalthinfilm.com)* is the leading supplier of advanced, high performance linear variable filters commonly used in a variety of biomedical imaging applications including fluorescence microscopy, flow cytometry, monochromators and micro-plate readers among others.

Delta Optical Thin Film A/S also provides single, multiband, laserline and broadband band pass filters; long pass filters; short pass filters; notch filters; dichroic and polarizing beam splitters along with other custom coated optical components.

Delta Optical Thin Film A/S offers a wide range of high efficiency durable ultra-hard coated filters that have set the standard for high performance and precise operation. With its unique design tools and decades of experience, Delta is able to provide highly competitive standard filters and customized filters and optical components tailored to customers' specific applications.

Trade shows:

SPIE Defense + Commercial Sensing Expo – booth #1025

Optatec – booth H10 in hall 3.0

Conference on Hyperspectral Imaging in Industry – booth #23

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