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INSPECT

Vision 2010

Camera Trends

Expert Panel on Green Vision

Machine Vision Software

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I N D U S T R I E L L E E N D O S K O P I E

Mind Games

Every company in every industry inevitably and ultimately moves along a given path of market consolidation: either the company will grow into the ranks of the two, three market leaders, or sooner or later it will perish. This thesis has been phrased already a couple of years ago by A.T. Kearney, and has been coined "Merger Endgame." In different types of industries consolidation might occur rather sooner or rather later; in some industries the individual steps of the merger endgame might last significantly longer than in others. In the end, however, the consolidation of an industry will always happen, and always happen in the same four stages. These stages are, according to Kearney: opening, scale, focus, and balance and alliance. In the opening stage young industries are to be found with a strong focus on innovation, this stage offering great market opportunities at high risk affinity. The low market entry barriers lead to high company density. As long as the market is growing, or can develop into individual niche markets, the number of market participants is prone to grow. Entry into the second stage of scale takes place when competition picks up, and also when new larger players start to enter into the market, changing the market rules by economies of scale. Now a very active phase of company mergers starts, lasting up until the third stage of focusing. During the focus stage the remaining players, grown during the phase of consolidation, join forces through mega-deals: the number of mergers decreases but the size of these mergers goes up. At the final stage of the merger endgame there are no further options for consolidation. The remaining market dominating oligopolists strive to maximize their cash flow on the one hand, on the other hand they move towards strategies to defend their market position. During this stage there is an increase in spin-offs, which then might lead to new industries or sub-industries.

At Vision, international leading trade show for machine vision taking place early November in Stuttgart, there will be more than 300 exhibitors present for the first time ever. Among them quite a few young enterprises can be found which are still rather new to the market. About 80 of the 300-odd exhibitors are offering cameras for the industrial use. Every single year this number is increasing. However, the demand for these cameras is endless. Right?

Let´s have a closer look: On a global scale more than 2 billion cameras are produced every single year. Market analysts have found out that about 80% of these cameras end up in mobile phones. Several hundreds of millions of cameras can be found in optical mice and as digital cameras for the consumer market, respectively. The share of cameras for industrial uses, on the other hand, ranges at a couple of hundred thousand units per year.

Assuming the Kearney model is right machine vision is without doubt at the opening stage of the merger endgame. However, first signs can be seen that stage 2 might be on its way: the increasing market entry of larger players, especially but not exclusively from the realms of optoelectronics; increasing merger & acquisition activities; and an increase in competition. Is the Kearney model in fact a fact? Is thus the inevitability of the merger endgame also applicable to the machine vision industry? Or have the vision companies nested themselves so successfully in so many heterogeneous niches that consolidation is neither possible nor necessary?

The Vision trade show in Stuttgart is the annual mirror of the industry. Let's wait and see if it is the number of exhibitors that will grow in the upcoming years – or if it is rather the square meters per trade show booth.

Enjoy getting into the mood for Vision with the articles, exhibitor surveys and interviews of this INSPECT issue!

Gabriele Jansen
Publishing Director INSPECT

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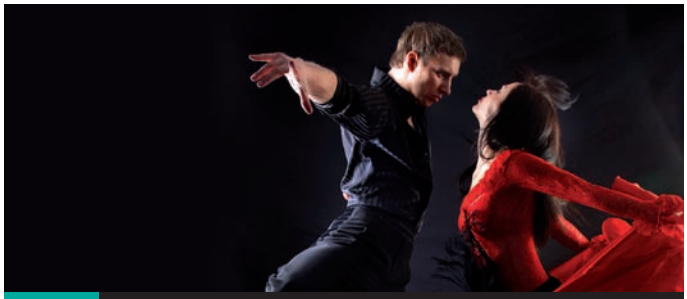

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e2v Doubles Its Line Scan Camera Production Capacity

e2v, based in its facility in Grenoble, France, has responded to increased demand within the line scan camera business by increasing its temporary workforce and implementing new shift patterns that better utilize equipment which has led to greatly increased productivity. Positive trends within the machine vision industry have led to significant increased demand for e2v's new world class camera products that have been introduced over the last two years. "Recovery within the machine vision market has been far quicker than everyone expected, generating a significant strain within the global supply chain for camera products. e2v is now in the best position to meet the needs of the market in terms of camera lead times, thanks to our increased capacity utilization and the range of cameras we can offer," explained Cedric Stein, supply chain manager at e2v. The temporary operators and test lines are already up and running and have already doubled the production capacity over the last two months.

www.e2v.com

viZaar Acquires 100 % of the Shares of Fort

As a part of a well planned retirement plan of the principal owner and President of Fort SA, Francois Fort, viZaar AG – the German expert for industrial vision and inspection systems – has acquired all of the shares of Fort. Fort SA (based in Dourdan, France) has a long history in the development of specialized film and video equipment. Founded in 1936 by the father of the retiring president, Francois Fort, the company started developing special film equipment used for public education. In 1986 the company changed name to Fort SA and specialized in the manufacture of industrial endoscopes, video-endoscopes and glass fibre production for light and signal transmission. Today Fort is well known and an accepted expert manufacturer of remote visual inspection equipment. Customers in the power and nuclear power industry, aero and automotive industries and many other industrial non-destructive testing companies appreciate the quality of equipment and flexibility to design special solutions. This acquisition brings advantages and synergies along the complete value chain for both companies and will strategically strengthen the position and future direction as well as creating added value for the customers. "With this acquisition we have made a further step to service our national and international customers even better. There will be immediate benefit for our customers and we have already initiated some new interesting development projects for the future," said Kersten Zaar, the president and founder of viZaar AG. "As an example bundling our joint capabilities for one of our key segments, the nuclear power industry, will offer those international operating companies big advantages because we now can match their international structure and needs."

www.vizaar.de

Boulder Imaging and Framos Imaging Solutions Announce Distributor Agreement

US vision and imaging solutions company Boulder Imaging and European vision integrator and reseller Framos Imaging Solutions will formally announce a Distributor Agreement at Vision 2010 in Stuttgart, Germany. Framos will be selling the full line of Boulder Imaging products. To date, Boulder Imaging has provided solutions to its international customers, such as GE Energy in Germany. Now the alliance with Framos will provide for focused European market. Michael Willis, president of Boulder Imaging explains, "We have been extremely careful in executing partnerships, relationships and overall managing our growth – which has been astronomical (doubling year over year). Our alliance with Framos opens up Europe to Boulder Imaging's image acquisition, analysis, and processing solutions in a substantial way. In the past we didn't pursue European customers with a focused, concerted sales and marketing effort. With Framos, we now have the ideal partner to do so. Their strong presence throughout Europe, along with their stellar reputation as one of the premiere providers of imaging components and solutions in Europe is the catalyst for great success for our product lines there." CEO of Framos Imaging Solutions Andreas Franz stated that "We have been seeking the right high performance imaging products to add to our existing imaging mix for a while. We require partners to have high quality products that deliver significant value which excel in technical innovation and in price/performance. Boulder Imaging went well beyond these criteria and now Framos can confidently go head to head with anyone and provide the best in vision solutions and products for any application."

www.boulderimaging.com, www.framos.de

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* **Visit DALSA at VISION 2010, Stuttgart, Germany, November 9-11, Hall 4, Stand D51 to see live demonstrations, including the BOA Vision System.**

DALSA

Kontron and Stemmer Imaging Close Cooperation Contract

Kontron, manufacturer of Embedded Computing Technology (ECT) and Stemmer Imaging, technology provider for industrial image processing, announced the closing of a cooperation contract. The goal of the collaboration is to optimize the customization of hardware and software for image processing applications as well as reduce cost and time to market for large-scale customer-specific image processing projects through single source supplying. Christof Zollitsch, Managing Director of Stemmer Imaging remarked: "Working with Kontron will allow us to increase the innovation available to our customers. This will enable us to considerably increase the speed and efficiency with which we implement large-scale industrial image processing projects, which always have a strong need for individualization when it comes to configuring hardware and software and the interaction between them. We also expect that the further optimization of our image processing algorithms can take the overall quality of our applications to an even higher level by tying our algorithms even closer to the underlying hardware, which is based on the latest processor generations. Kontron's broad embedded hardware portfolio enables exceptionally rapid access to the latest embedded processor technology. Furthermore, customers also stand to benefit from a high degree in flexibility when it comes to the configuration of their application as well as high design security due to long-term availability. Customers have the added advantage that Kontron develops its own server boards in house, so that responsibility for the entire system lies entirely with a single source. Our collaboration now enables customers to obtain everything including the software from a single source."

Günther Dumsky, Director of Systems & Boards EMEA at Kontron stated: „As a developer of sophisticated image processing algorithms and a provider of customer specific image processing solutions, Stemmer Imaging has the necessary know-how to optimally support customers in meeting innovative challenges in image processing. Major customers often prefer system platforms in which the hardware and software originate from a single source, and where the platform is optimized to make best use of the hardware, which is itself designed using the latest processor technology in order to ultimately reduce operating cost via higher processing quality and speed. Working together with Stemmer Imaging will now enable us to provide this. Furthermore, customers will not only benefit from a faster and more efficient development and commissioning of their individual configurations. We are also able to respond more rapidly once the system is up and running, for example in the case of servicing or if image processing requirements are modified."

The cooperation between Stemmer Imaging and Kontron has given rise to application-ready image processing platforms which will be available from both organizations. The emerging industrial image processing solutions focus on the identification and quality control of general and bulk cargo in manufacturing and packaging as well as the quality control of sheet goods such as woven items and plastic and metal sheeting. The certification standards of Kontron products ensure the platforms are particularly suited for use in intelligent traffic systems and medical technology applications.

www.kontron.de, www.stemmer-imaging.com

IDS Anticipates New Sales Record in 2010

German camera manufacturer IDS Imaging Development Systems with its headquarters in Obersulm near Heilbronn, Germany looks back on a successful first half of 2010. Sales in the period ending in August were up by 60% year on year and the sales target for this year will be reached ahead of schedule already in September. Additionally, IDS reports a very positive outlook for the coming months regarding the order situation and delivery capabilities. "So far, 2008 had been our best year on record in terms of sales, but we expect to significantly exceed that figure this year," explains Torsten Wiesinger, Director of Marketing and Sales at IDS. "Our sales target is 45,000 cameras – which is considerably more than we sold in the previous two years combined." IDS's focus is now on international growth. "By opening a representative office in Asia and expanding our subsidiary in the United States we aim to significantly increase our market share in these important regions," adds Wiesinger. Even the current shortage in the market for electronic components is no worry for IDS as the Swabian company procured sufficient quantities of critical components despite the downward sales trend in 2008. As a result, IDS is in a good position to reliably deliver all ordered cameras to its customers. As the company's sales have grown, so has its team. More than 10 new employees were hired since the start of the year, putting the growth of employees on par with the growth in sales. IDS currently employs more than 80 people at its three locations in Germany, the United States and Japan.

www.ids-imaging.de

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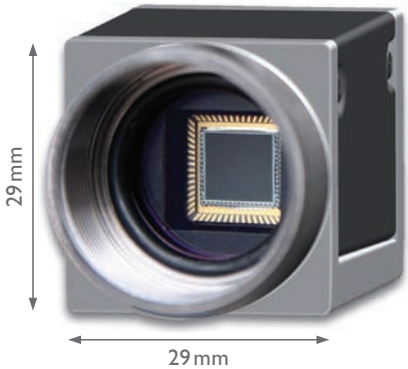

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Quality Assurance in 25 Different Ways

Review: Fraunhofer Vision Technology Day 2010 in Stuttgart

The accompanying exhibition with state-of-the-art systems informed about the possibilities and limits of machine vision at the Fraunhofer Vision Technology Day. Source: Fraunhofer-Allianz Vision

For the third time it took place: the technology day of the Fraunhofer Alliance Vision with the topic "Innovative Technologies for the Industrial Quality Control with Machine Vision." Michael Sackewitz, Fraunhofer Alliance Vision Manager, had invited to the two-day event at the Fraunhofer IPA, Institute for Manufacturing Engineering and Automation, in Stuttgart, Germany. About 170 visitors came, some of them users from the industry but also researchers and scientists. Also some professionals from the machine vision field took the opportunity to get first-hand information on what Fraunhofer sees as the future trends of quality assurance.

Alternating Lectures and Exhibition

In about 25 lectures the speakers showed which technologies are suited for which application in the wide field of quality assurance. The short presentations were divided into three areas: "Surface Inspection and Characterization", "Optical 3D Measurement and Object Recognition" and "Making the Invisible Visible". Thereby, the experts who are all working at the different Fraunhofer institutes, reported about the state-of-the-art-technology. At the same time they gave an insight into their institute's work and forecasted future trends. The speakers described several applications for each of the presented methods, for deflectometry as well as for quality assurance with terahertz imaging or x-ray technology. In this manner, the organizers showed the machine vision systems' relevance for industrial applications. Alternating with the short presentations, visitors had the possibility to attend the accompanying exhibition. There, the speakers were available to answer any questions as directly after the presentations there had been no time for an ensuing discussion. Thanks to the relaxed atmosphere in the exhibition room, ample possibilities to establish contacts and to network have been provided. And while some visitors just wanted to get an overview, others went home with concrete ideas.

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Green Vision – Driving Factor for a Green Future

The INSPECT Expert Panel at Vision 2010

Over the years the INSPECT Expert Panel, embedded in the Industrial Vision Days of the annual Vision trade show in Stuttgart, has become almost a tradition. After addressing topics like the "Future of Machine Vision Software," "Machine Vision and Security Technologies" and last year's topic "All you ever wanted to know about 3D," we decided this year for "Green Vision": what can our technologies contribute to protect our environment and to maintain our nature for future generations?

To sum it up right away: much more than you would think of at first glance. Come to think of it, every vision system for quality inspection on the factory floor contributes to saving raw material and to reduce energy consumption. The earlier a quality flaw is detected in the production process, the smaller is the amount of energy wasted for the manufacture of what is scrap in the end anyway in further production steps and the smaller is the amount of raw material lost. This scenario does apply for a huge variety of different industries and products in almost endless variations.

In addition, also the automation of production processes, e.g. by the use of robot vision technologies, almost always increases the resource efficiency. To name only one example: Just think about the optimized use of adhesives at the body-in-white shop of a car manufacturer as soon as high-precision seam-tracking is put in place.

But this is not all: vision systems are also employed in the cost-optimized production of high-quality environment-friendly products, for example in the production of solar modules, the surface finish of rotor blades for wind turbines, and the highly precise silk screen printing during the manufacture of hydrogen-oxygen fuel cells. Machine vision and camera technology is also at work for intelligent traffic control in areas of high

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VISION 2010

We are looking forward to meeting you at:
Vision 2010, Stuttgart, Germany
Wednesday, 2010, November 10, 2 p.m.
Forum Industrial Vision Days
Neue Messe Stuttgart, Hall 6, Booth A81

population density. Traffic congestions can be avoided this way, fuel consumption is subsequently lowered and air pollution reduced. One part of this task is also speed control, as much as this hurts in individual cases, as is the regulated access to inner-city areas. Another very significant application for Green Vision is of course the use of optical technologies in automated waste sorting and recycling. Valuable resources are harvested from scrap and fed back into the production cycle. Last but not least machine vision supports the sustainable management of natural resources and the responsible behavior within our natural habitat. Machine vision and Laser metrology are used at yield optimization in wood processing and make sure that any waste of the valuable natural resource wood is minimized. In agriculture, in so-called high precision farming applications, camera technology is used to precisely control the application of fertilizer and to apply plant protection pesticides only in those spots where it is specifically needed. The modern farmer can in this way not only achieve much higher cost efficiency but at the same time also cuts down significantly on floor loading with chemicals.

For quite a lot of companies being able to contribute with machine vision and optical technologies to sustainability is an incentive far beyond the pursuit of profitability. With the five inspirational keynotes of our Expert Panel at Vision 2010 we would like to provide you with insights into what is feasible today and maybe even inspire you to take up one or the other idea for your own line of work.

We are particularly pleased to present to you the distinguished experts we were able win for our Expert Panel on "Green Vision – Driving Factor for a Green Future":

Camera Technology Put to Work for Reduction of Traffic Congestions, Fuel Consumption and Air Pollution

Jørgen Andersen, CEO JAI, Denmark
Jørgen Andersen founded JAI in 1963 and is today the CEO of JAI A/S, the President/Chairman of JAI Inc., USA, the Chairman of the Board in JAI Ltd, Japan, the Chairman of JAI Ltd., UK. Apart from this Jørgen is also a judge in the Maritime and Commercial Court in Denmark, the former chairman of internal committees within The Danish IT Industry Association (ITB), a former member of the board of the Trade Council in Denmark and an active pilot specialized in flying aircrafts and helicopters.

JAI develops and manufactures innovative digital camera technology for applications in machine vision, traffic imaging and global security solutions. JAI has a global presence through sales companies in Denmark, Germany, Japan, UK and USA, and via distribution partners in more than 30 countries. The company´s worldwide service capability and two R&D centers are key elements in maintaining leadership in the industry – enabling both, world-class innovation and responsiveness to the needs of local markets.

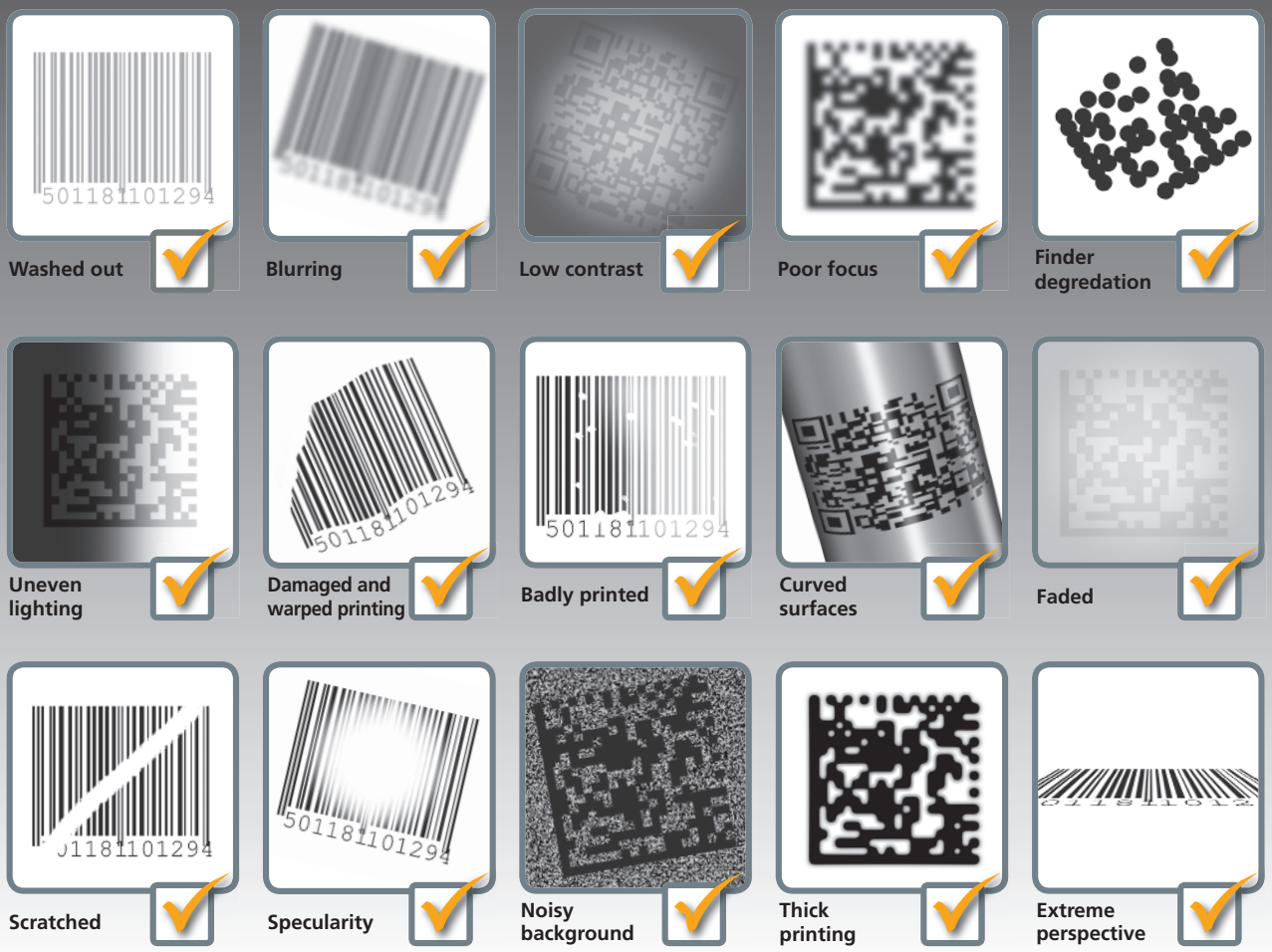
Today, JAI has more than 1 million industrial cameras in operation worldwide in multiple applications and industries where camera vision technology is used

as an integrated part of a process, product or service. The company contributes with their imaging and software solutions for the various tasks in the area of intelligent transportation solutions to the reduction of congestion, the avoidance of traffic jams and thus to the reduction of fuel consumption and the resulting toll on the environment.

Sensor-based Yield Optimization Enabling Resource Efficiency in Wood Processing

Dr. Federico Giudiceandrea, CEO Microtec, Italy
Federico Giudiceandrea graduated as electronic engineer at the University of Padua in 1980. In the same year he founded the company Microtec in Bressanone, Italy, with the idea to apply image processing technologies to the industrial sector. The first areas of application concerned industrial fruit processing and steering controls for the automotive industry. Soon after, Microtec became the first European provider of opto-electronic devices such as infrared, laser and x-ray scanners for the woodworking industry.

Today the company is a worldwide technological leader in maximizing recovery for the global woodworking industry. Applications mainly involve localization and recognition of geometric,



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We´ve researched the Web for you and found this (and beware – in this issue it is all about having fun):

www.firstpersontetris.com

■ First Person Tetris is an online version of the cherished classic: Tetris. While playing one sees the tiles from the "first person" perspective. Check out for yourself what this is about.

http://memory-alpha.org

■ Another classic: Do you remember the TV show Star Trek? This show went on for several (not only seasons but) generations and triggered quite a number of movies. Meanwhile there are more than 700 episodes to be seen from the realms of Captain Kirk, Jean-Luc Picard and Captain Janeway ("there is coffee in this nebula"). What happened in each single sequel, which type of image processing was used on the star ship "Pasteur" and in which episode this occurred, can be checked out with this Star Trek Wiki. All Star Trek books are covered as well as the bios of all of the actors, even the minor ones, and you get to know how specific future technology works.

www.deviantart.com

■ Haven´t you been on the lookout for a helpful page presenting young and mainly unknown artists, like forever? Deviantart.com might be just what you have been looking for. Upcoming artists have a showcase here for their photos, digital images and graphic art. The exhibits can be rated, but also acquired online right away.

www.juliettepochin.co.uk

■ If you actually like the music of Juliette Pochin or not, is another question – but her website is technically excellent. This is Web 3.0 by the book – and worthwhile to check out even for the non-music lover.

www.good.is

■ There is so much good stuff in this world – what precisely is good right now is shown on the website "good is".

www.youtube.com/watch?v=ne6tB2KiZuk

■ Last but not least, a personal favorite: Bobby McFerrin shows live at the World Science Festival 2009 that the pentatonic scale is sort of genetically coded in all of us, no matter our heritage or culture. At the same time you can see how easy it can be to motivate a crowd to do something out of line. Charisma provided.

Feel free to send us your online favorites to contact@inspect-online.com

aesthetic and structural qualities of the surface and the inside timber and lumber with the aim to maximize yield of the existing resources. The technology portfolio consists of color cameras, infrared, laser and x-ray scanners, radio and microwave devices, and computer tomography. Microtec vertically integrates in the design and development of proprietary hardware and software so to control every detail starting from the silicon and up to data processing.

Presently, Microtec employs over 130 qualified professionals in five offices around the world – Bressanone, Venice, Linz, Vancouver, Melbourne – and has an annual turnover of estimated € 29 million. At least 10% of the annual turnover is invested in proprietary R&D projects.

Sensor and Machine Vision Technology in Waste Sorting and Recycling

Dr. Volker Rehrmann, Technical Director TiTech Group, Norway/Germany

Master in Computer Science, Volker Rehrmann started his career 1990 as research associate at the Universities of Paderborn and Koblenz, received his PhD in Computer Vision in 1994, and then became Assistant Professor for Computer Vision at the University of Koblenz. In 1998 Volker Rehrmann founded the company Real Vision Systems which he led as Managing Director until he sold it to TiTech in 2002. Since 2002 Dr. Rehrmann is the Managing Director of TiTech GmbH in Germany, and since 2003 he is Technical Director of the TiTech Group.

TiTech has pioneered the automation of waste sorting and is known as the world leader in this field. Founded in 1993, TiTech developed the world's first NIR (Near InfraRed) sensor for waste sorting applications. With a strong focus on R&D, TiTech continues to spearhead the development of this market by offering cutting edge technology for the sorting of recyclables.

Today there are more than 2,500 TiTech units in operation in more than 30 countries. Right from the start, TiTech has invested substantial resources in developing sorting technology geared to the needs of a changing world. Waste handling is one of the most severe environmental issues facing our society, and TiTech contributes to tackling this problem by fulfilling one of the most important steps in the recycling chain: providing pure fractions for material and energy recycling.

Minimization of Fertilizer and Pesticides Usage by Stereo Camera-based Steering Systems

Klaus-Herbert Rolf, Marketing Manager Claas Agrosystems, Germany

After serving an apprenticeship in farming, Klaus-Herbert Rolf studied agriculture at Soest University of Applied Sciences. Since 1986 his career has concentrated on the agricultural business, mainly agricultural electronics and software. He has been Head of Marketing at Claas Agrosystems since 1998.

With its Agrocom brand, Claas Agrosystems – a member of the international Claas Group – serves over 20,000 customers in the areas of guidance systems, precision farming and monitoring, management software and service in all the key international agricultural markets. All the programmes, equipment and services are developed in cooperation with farmers, contractors and other users in order to ensure that they are functional and viable for the future. The spectrum ranges from crop cultivation to animal breeding, from accounts to fleet management and from site-specific farming to automatic steering. Just one look at the company´s range of steering systems with integrated GPS and camera-assisted solutions shows clearly how users can achieve the required accuracy and save resources without compromising efficiency. Economy and ecology in harmony with all types of agricultural enterprises, no matter what business form or size – based on this philosophy, Claas Agrosys-

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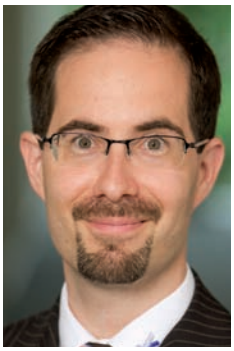
Neue Messe Stuttgart, Hall 6, Booth A81

tems has set national and international agricultural standards for the field, stables and office.

Smart Cameras for the Quality Control in the Production of Solar Modules

Jan-Erik Schmitt, CEO Vision Components, Germany
Born in 1975 in Baden-Baden, Germany, Jan-Erik Schmitt holds a graduate degree in engineering from Karlsruhe University. After working for a Swiss startup company, he joined Vision Components in 2003 as a Sales Manager. Since 2008, he has been in charge of all sales activities in Germany and abroad as Vice President of Sales.

Vision Components GmbH, founded in 1996 by Michael Engel, inventor of the first intelligent camera for industrial applications, is a leading supplier in the field of machine vision. The Ettlingen/Germany-based company has distributors in more than 25 countries worldwide. Vision Components develops and distributes intelligent, network-compatible real-time Smart Cameras, which are able to operate without a PC and can be integrated into almost any industrial facility. Typical applications include quality inspection and automation. Equipped



with the proprietary multitasking operating system VCRT, VC Smart Cameras can be easily configured for all possible tasks. Furthermore, VC provides software libraries for a wide range of applications including motion capture, decoding, measurement, and positioning. Additionally, VC provides, either directly or via partners, custom-tailored solutions for specific tasks like for the solar module production. The solar manufacturers are facing the challenge of minimizing production costs for solar cells and other components while simultaneously increasing product quality and efficiency. Fully automated production facilities will therefore gain increasing importance in the future. Providing high-performance machine vision components, machine vision expert Vision Components enables users in the solar industry to design reliable and cost-efficient quality control solutions.

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www.titech.com,www.agrocom.de,
www.vision-comp.com

Baumer TXG Camera

Cast off!

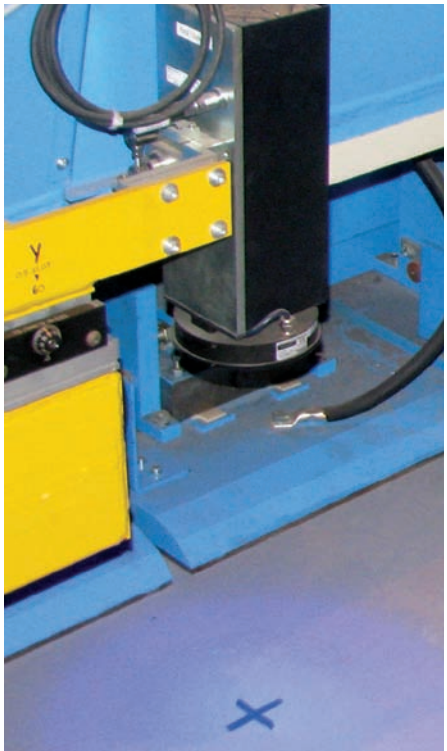
Baumer GigE Cameras Help to Build Ultra-modern Cruise Liners

Ocean cruises are very much in fashion. To meet this growing demand for cruises, shipping companies are ordering ocean liners of ever-increasing size from shipyards. By now, they manufacture the luxury liners in individual segments. Therefore, it is necessary to weld steel plates precisely together. This task is supported by a machine vision system with GigE cameras.

Ocean cruises used to cater mainly to the wealthy tourist elite, but changing trends have greatly widened their appeal during the past 10 years. Any vacationer can now enjoy the luxury of a cruise liner such as the brand new Disney cruise liners. To meet the growing demand for sea cruises, shipping companies are ordering larger ocean liners from shipyards. The Meyer Werft yard in Papenburg, Germany, solves this task by using state-of-the-art camera technology from the very start of the construction process. An innovative machine vision system from the Oldenburg company Axios 3D Services equipped with GigE cameras from Baumer guides the welding process of steel plates serving the cruise ship's basic structure.

Increasing Complexity

Because of their complexity, cruise ships are designed to be built in individual segments right from the start. Every segment is built separately and is not joined up to the other segments until the end. Individual segments consist of a number of steel plates. The bigger these segments can be made, the more efficiently the ship can be built. Thanks to a specially developed optical measuring system from the company Axios 3D, this process can now be improved. The size of delivered steel plates is limited by their weight, their dimensions and the effort expenditure of transporting them. The first production step in the shipyard therefore consists of welding individual steel plates together into segment panels of the required width.

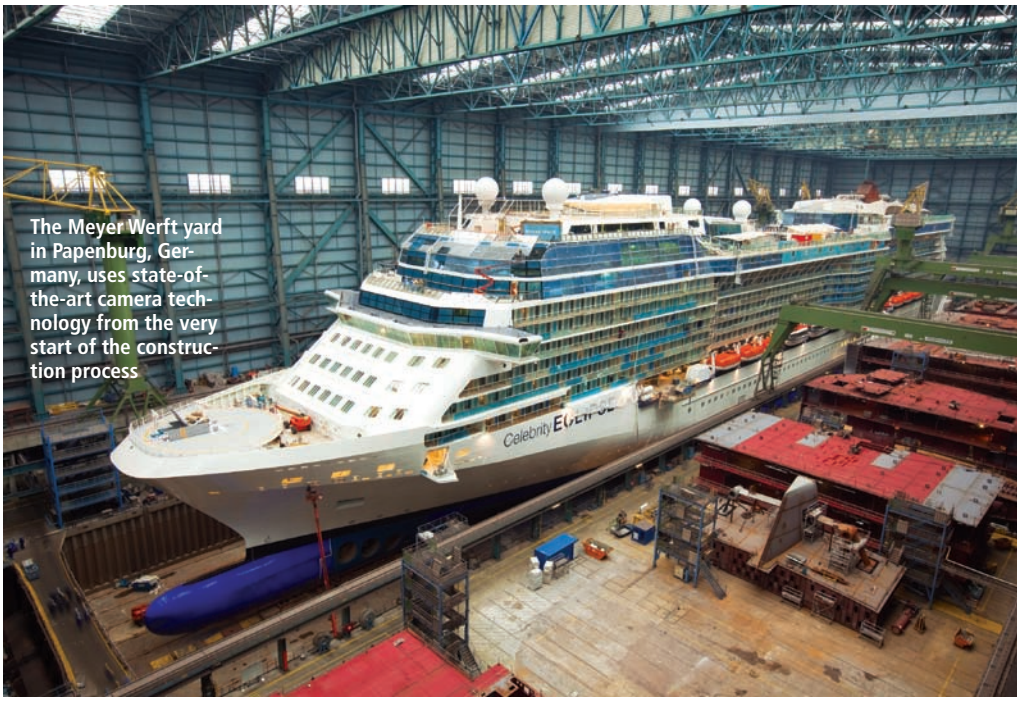


Clear recognition of the markings on the steel plates is a key precondition for aligning them correctly

Fully Automatic Alignment

The laser center at the Meyer Werft shipyard in Papenburg contains one of the largest and most modern systems for the automated production of such segment panels. The fully automated system produces these panels from individual steel plates. After delivery to the center, the small steel plates are loaded onto a specially developed transport system. This system is designed to begin by welding the short sides of two plates together. However, they must be mutually aligned before welding can commence. The required position data are supplied by the optical measuring systems CamBar B2 and OPUs from Axios 3D with their integrated Baumer cameras. For this purpose, special, cross-shaped laser markings are previously made in at least two corners of each steel plate. The ultra-modern welding station allows left- and right-hand edge markings to be aligned. The multi-camera system uses cameras

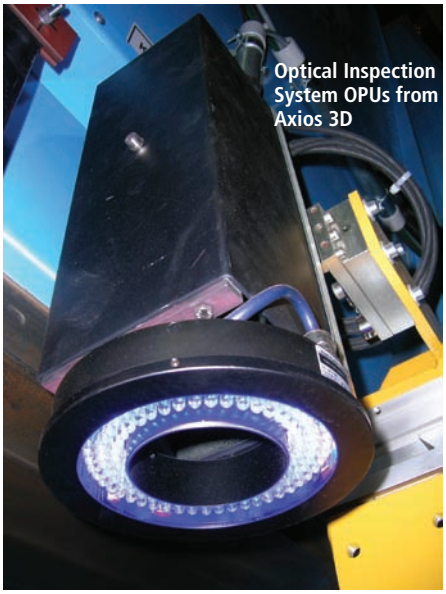
before and after the welding station to register all the markings on a particular steel plate. The individual camera systems are connected to the image processing system so that it can deduce the alignment of the steel plates from the detected positions of the individual markings. The image-processing system is integrated into the control of the transport system so that it can align the steel plates. When both plates are optimally aligned to each other, the welding process is started. When the welding process is completed, the resulting larger panel is removed from the welding station by the transport system. Another small plate can then be loaded onto the system and welded to the previously joined plates by the same procedure. This process eventually creates a steel panel of the desired length. To broaden this panel to the required segment width, several narrow plates are produced and subsequently welded on longitudinally at another welding station. The same automatic alignment method is used at this station. Since the composite panels are larger than the small component plates, however, they are susceptible to vibration, sagging and torsion effects which make accurate measurements more difficult. Even when this happens, the required accuracy is ensured by the three-dimensional measurements performed by a stereo camera system. Because of the large detection zone, the system is no longer dependent on the stability of the welding station and is not attached to it, and can therefore deliver reliable measurements.



The Meyer Werft yard in Papenburg, Germany, uses state-of-the-art camera technology from the very start of the construction process

Camera System Meets Tough Demands

Clear recognition of the markings on the individual steel plates is a key precondition for aligning them correctly. The optical measuring system must fulfill various demands. It must be robust enough to stand up to rugged industrial conditions, yet it should not be too large. To meet these requirements, the Baumer cameras are protected by a special housing which also contains the lighting. Since some of the portals employ up to four cameras, the chosen transmission technology must be capable of ensuring reliable multi-camera operation. Gigabit Ethernet offers advantages which make it an ideal solution. This already established camera interface offers the double benefits of a long cable that measures up to 100 m and a network operation with a simple layout. The image quality must also meet high standards because it finally decides how effectively the algorithm can evaluate the markings. In this respect, a Sony monochrome ½" chip with a resolution of 776 x 582 pixels delivers the desired performance. Axios 3D opted for GigE industrial cameras from Baumer at an early stage. Intensive project discussions between Axios 3D and Baumer very soon established the vital importance of the size – along with the high performance – of the cameras. Coupled with the innovative technology offered by Baumer, manufacturer of industrial cameras, the high development competence of its Radeberg plant was a convincing argument. This enabled Baumer to develop a special module for the planned application. The space requirement for the cameras was reduced still further and 100% fulfillment of system requirements was achieved.



Optical Inspection System OPUs from Axios 3D

Clear Recognition of Markings

After the hardware was defined, the next step called for developing an algorithm that could cope equally well with changing environmental conditions and a multitude of surface effects on the steel plates. The steel plates can be discolored by various kinds of treatment. But the system must also overcome the influence of simple disturbances like a footprint on a marking. The algorithm of the CamBar system, which was specially developed by Axios 3D to recognize markings, can ignore such disturbing effects and reliably locate the position of each marking.

The system described here was commissioned at the Meyer Werft shipyard in Papenburg, Germany in December 2009 and enables segment panels for modern cruise liners to be produced more efficiently.

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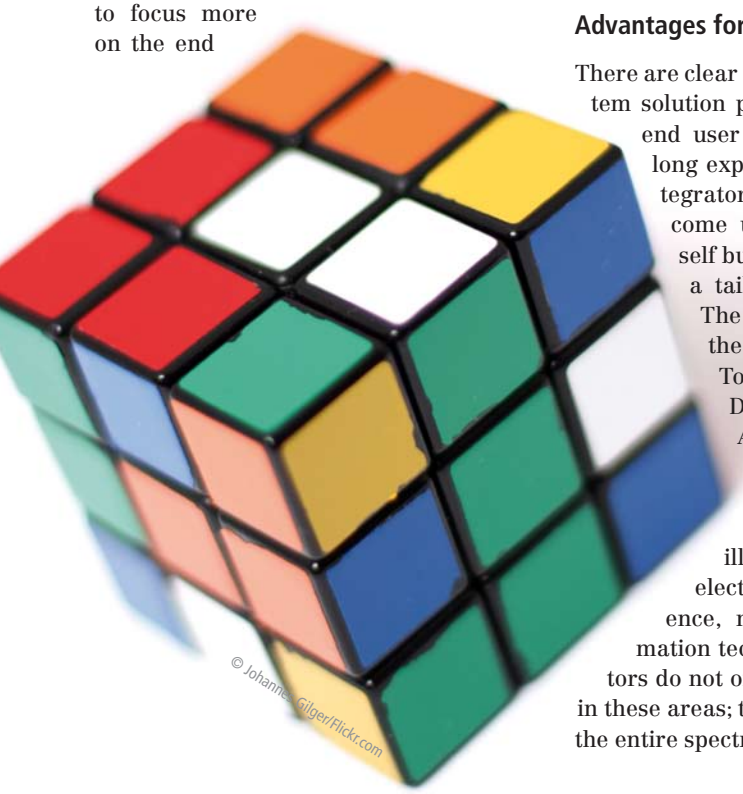
Main Focus: Vision Solutions

After Last Year's Success: Extension of the Integration Area at Vision 2010

Vision 2010, international trade fair for machine vision, will feature the Vision Integration Area for the second time in a row. Within this platform system integrators will present their application-specific vision solutions. Due to the positive resonance to this platform last year, Messe Stuttgart decided to continue expanding the integration area in 2010. Florian Niethammer, project manager of Vision, explained this decision: "We want to focus more on the end users of machine vision systems and provide this target group with a competent forum for problem solving." Also Ronald Krzywinski, Managing Director of Bi-Ber, welcomes the decision of Messe Stuttgart: "The expansion of the Vision Integration Area is an important move as it will make it easier for the end customer to come into contact with the integrators."



Advantages for the End Users

There are clear advantages to having system solution providers on board: „The end user benefits from the year-long experience of the system integrators and does not need to come up with a solution himself but rather receives more of a tailored complete package. The risk is borne purely by the system integrator," says Torsten Reusch, Managing Director of EHD imaging. As a complex cross-sectional technology, machine vision combines such different fields as illumination and optics, electronics, computer science, mechatronics, and automation technology. System integrators do not only need to be competent in these areas; they also have to consider the entire spectrum of the available technologies in order to reach the individually best solutions for their customer. The business of a system integrator is not only developing system concepts including the necessary feasibility studies, it also covers the integration into the customer's production line, the commissioning of the system, training courses for the end users as well as service and maintenance.

A Yellow Carpet for the Integrators

In the Vision Integration Area of Vision 2010, end users again can meet competent partners for specific application solutions. Since we are convinced of the system integrators' importance for the successful growth of the technology machine vision, INSPECT again will sponsor the integration area this year. In case you are looking for a tailor-made solution for your task, just follow the yellow carpet in hall 4 and discover the possibilities offered by system integrators.

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VISION 2010

23rd International Trade Fair for Machine Vision

VISION Integration Area

Platform for system integrators and solution providers of machine vision.

Turn-key systems, application-specific solutions and optimized processes for different industries: from automobile industry to photovoltaic, from food industry up to medical technology.

At Vision, follow the yellow carpet in hall 4 and discover the variety of machine vision solutions: quality control, identification, inspection, metrology and robot guidance, 2D and 3D.

Hall 4, Booth A74
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Illuminating the Design Process

Product-centric Simulation Enables Virtual Defect Detection

Up until now the processes of product development, from design to inspection, had been rather "sequential." First the design of the product had to be finished using CAD software. Then by using CAM software the manufacturing had to be planned and evaluated. Finally product developers had to ensure quality by designing a testing station. Now, a newly developed software tool makes it possible to design in the end-of-line control already during the product development process.

The new CAD-integrated machine vision simulation solution to optimize the choice, configuration and positioning of cameras, sensors and lighting early in the product development process was introduced by France-based company Optis, leading supplier of physics-based simulation of vision and light-matter interaction. This innovative solution offers the machine vision designer the advantage of incorporating the virtual product with its different potential defects in order to optimize all the parameters before the product even exists. He can choose off-the-shelf cameras and lighting from built-in libraries. This is the first time that product inspection can be planned for right from the start of the product development process. Until now, machine vision tended to be an afterthought, with all the constraints that go with it.

For the purposes of machine vision simulation, Optis replaces the complex human eye with the comparatively simple characteristics of digital sensors. The simulation result will be the „raw image" on the sensor, so exactly what the camera sees taking into account the lighting conditions.

Vision Simulation: How It Works

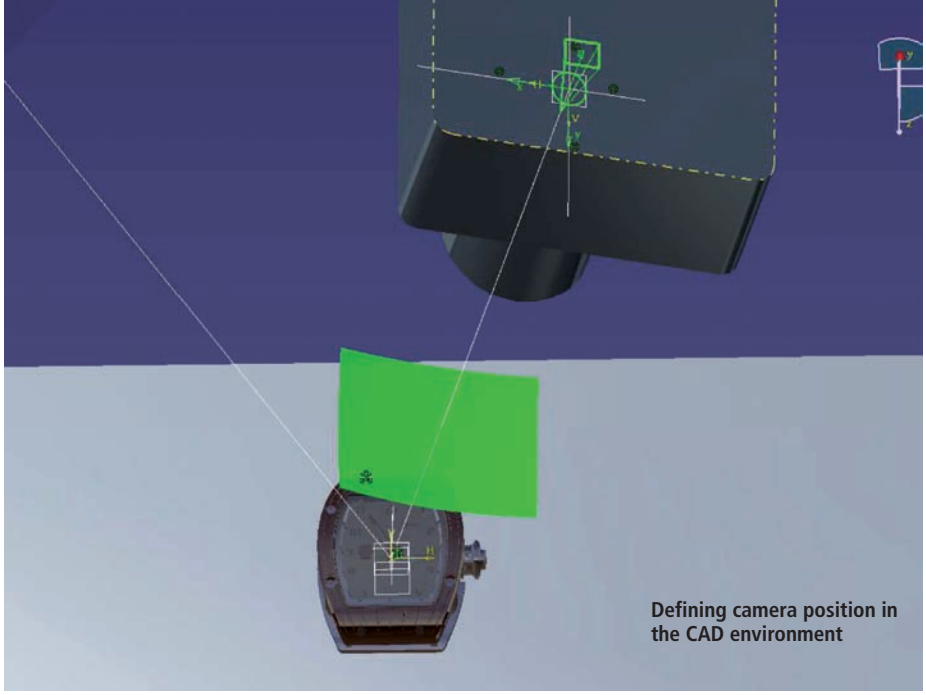
First we need to have a CAD description of the sample to be inspected. We can start by using the optimal shape of the sample as it has been designed by the engineers – a sample with 'zero defects.' Then we can also introduce the environment, conveyor belt, laboratory walls, baffles etc. Thanks to the software's 100% integration in three of the most widely used CAD systems, it is possible to select the material and surface characteristics of the object and to include this information simply by drag and drop.

The next step is to define the light sources. We can select different sources from the library: different colored LEDs, incandescent lamps, fluorescent sources etc. The non visible spectral domain, the UV and IR can be taken into account as well. The sources are positioned around the sample whereby different lighting configurations can be set up: frontlight, backlight, diffuse or collimated light. Finally, and perhaps most importantly, the ambient light around where the machine vision system will be working can be included in the simulation e.g. by using an HDRI. This very powerful advantage enables designers to reduce the straylight coming from the environment, which might reduce the contrast and thus the accuracy of the results.

Application Example: Raw image result of the glass window of a watch as seen by a vision system

Digital sensors can be either taken from the library or can be defined using a simple interface based on the manufacturer's descriptions. Thus a multitude of different lens/sensor combinations can

Virtual defect detection in the result simulation of the subtraction of two camera images



Defining camera position in the CAD environment

be tested during the simulation in order to find out the optimal system. The simulation result will give the raw image on the sensor – exactly the image that later on will be physically present on the sensor, taking into account the camera parameters.

Virtual Defect Detection

A first interactive simulation, the pixel grid projection helps to find out the field of vision of the sensor and to evaluate whether the resolution of the sensor is enough to see the details of the object. An interactive simulation means that it is possible to easily change the sensor position; automatically the pixel grid projection in the CAD view is updated.

The last step includes the post-processing of the raw images. The images can be post-treated to analyse if the contrast in the image is sufficient to see the sample. Sometimes it will be necessary to combine several images into one, for example in order to evaluate the front and the back of the sample. By simulating defects and subtracting the defect results from the optimal results, we can ensure that defect samples will be correctly identified and rejected from the production line.

Design over Trial

An application example shall highlight the significant benefit of the new technology: A glass object poses difficulties for production control systems because of its transparency and reflectivity. For example we can use a stripe projector source to project lines on the top surface, but it is hard to detect them as the amount of reflection on the surface is only 4%. However, the contrast of the lines can be improved, for example by using a red grid on a green glass. Like this the transmitted part of the light will be absorbed by the material and the reflection can be detected with a higher contrast. The right choice of lighting is made much faster in simulation than in the real-world trial-and-error.

Product Lifecycle Management

Instead of the sequential design of product, production, and quality management processes, in modern product development the Product Lifecycle Management (PLM) process has been introduced. Now using these tools, it is possible to control the complete production process from initial design up until the recycling of the product using a single software. This enables the processes to run in parallel. Already during the design phase of the product we can think about manufacturing and testing. This is not only an advantage in time and cost; if we imagine that we need to implement a product change late in the development process, just before starting serial production the costs of these changes can be so high that the project becomes unfeasible. Using Optis' simulation technologies to test the product changes very early in the design helps optimizing not only the manufacturing and testing process but the actual product to be inspected.

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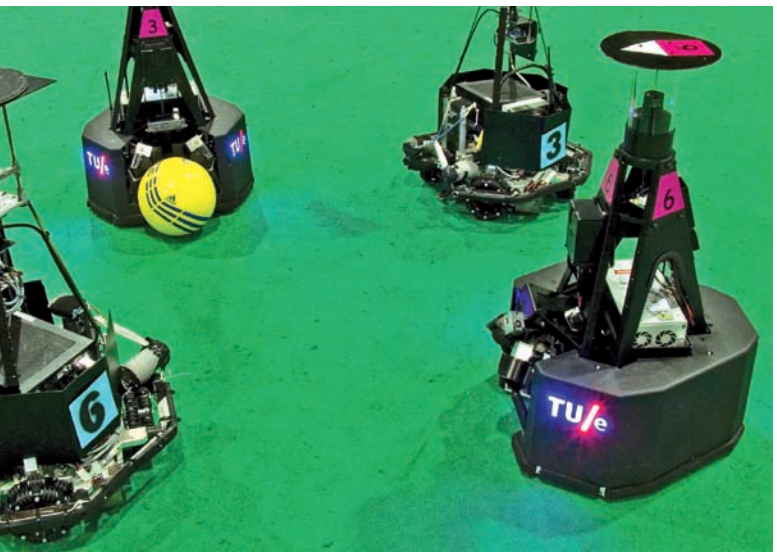
Eldorado for Visionaries

VISION 2010

Vision 2010 from November, 9 till 11 in Stuttgart

Also in 2010, the Vision, international trade fair for machine vision, presents itself as a world leading fair. Exhibitors already announced several product premieres. The trade fair's attractive supporting program provides further highlights, like the top-class expert lectures at the Industrial Vision Days or the autonomous football robots which are pitted against each other during penalty shoot-outs.



The machine vision industry is still showing a high degree of innovative capacity even though it suffered a temporary drop in turnover in 2009. This capacity will also be demonstrated at Vision 2010, the world's leading trade fair for machine vision, which will be held for the 23rd time from November, 9 till November, 11. On a total gross exhibition area of 20,000 m², more than 300 exhibitors present their products. In hall 4 and 6 at the New Stuttgart Trade Fair Centre, they show innovative camera systems, vision sensors, frame grabbers, as well as illumination, lasers, optics and lenses, optical filters, accessories, software libraries, application-specific machine vision systems, configurable machine vision systems and complete solutions and services. Furthermore, Messe Stuttgart created with the Vision Integration Area a field where system integrators present applications from the automobile industry, mechanical engineering, the food industry and medical technology. After the last year's success, Messe Stuttgart continues expanding the integration area. We report in detail on page 18.

Robots Play Football

The autonomous football robots are together with the Eindhoven University's "Tech United" team guests at Vision 2010. Fitted with intelligent cameras, the football players will pit against each other in a game of "two against two" or during penalty shoot-outs. The team won already the last RoboCup German Open in Magdeburg and took second place in the Middle Size League at the RoboCup 2010 world championships in Singapore. The robots have a 360 degree view thanks to angled upwards-facing smart cameras. These cameras allow keeping the robot's eye on the ball while the intelli-

gent algorithms ensure that clever playing tactics are employed.

Crowd Puller Industrial Vision Days

Of course we must not forget about the traditional Industrial Vision Days, which provide high-quality information to exhibitors and visitors through more than 40 presentations on all three trade fair days, whether it is about the state-of-the-art technology, standardization efforts or innovative and practical solutions. There were over 2,600 visitors at last year's forum in hall 6. That the selection of topics precisely meets today's requirements is attributable to the high competency of the VDMA Machine Vision as organiser. For the trade fair's visitors, the Industrial Vision Days are free of charge. The complete program of the series you will find on the following pages. As part of the Industrial Vision Days, there is a special highlight, the INSPECT Expert Panel themed "Green Vision – Driving Factor for a Green Future." The panel features five experts which will present in ten-minute inspirational keynotes each how vision technologies help to protect our environment. Further information as well as a short introduction of the experts you find from page 11 onward.

Further Highlights and Trends

The supporting program's variety provided at Vision 2010 is seen in further interesting events: the 18th Vision Award as the award for applied machine vision, the Application Park which shows the interaction of machine vision, handling techniques and automation, the special show "International Machine Vision Standards" of the machine vision associations AIA, EMVA and JIIA, the joint booth for young companies supported by the Federal Ministry of Economics and Technology (BMWi), the beginners seminar of Vision Academy, the first appearance of the Career Center for professional advice and the Job Board containing current job offers.

As a trend topic at Vision 2010, Messe Stuttgart saw the further development of camera systems with varied standard interfaces. A summary of these and other new products which are presented this year at the Vision tradeshow is shown on the pages 28 till 32. Let us get you in the mood for the trade fair.

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Industrial Vision Days 2010 • Hall 6, Booth A81

Talks will not be translated

Tuesday, November 9		
9:15–9:30 a.m.	Der Markt für Industrielle Bildverarbeitung in Deutschland	*VDMA, Patrick Schwarzkopf*
9:30–10:00 a.m.	New VITA family, the introduction of a new generation of CMOS Image Sensors	*Cypress Semiconductor Corporation, Wim Wuyts*
10:00–10:30 a.m.	Are you ready for USB 3.0?	*Lumenera, Darren Bessette*
10:30–11:00 a.m.	Make the most of your framegrabber – DMA900 and SmartApplets expand the application focus	*Silicon Software, Michael Noffz*
11:00–11:30 a.m.	ATOM oder DSP? Embedded Lösungen im Vergleich	*Imago Technologies, Carsten Strampe*
11:30–12:00 a.m.	How Advances in Camera Technology Will Reduce Cost and Maximize Vision System Performance	*Point Grey, Vladimir Tucakov*
12:00–12:30 a.m.	GigE Vision over 10 Gigabit Ethernet – Full Speed Ahead	*Pleora Technologies, Vincent Rowley*
12:30 a.m.–1:00 p.m.	Megapixel-lenses: Delusion and reality	*Jos. Schneider Optische Werke, Steffen Mahler*
1:00–1:30 p.m.	Herausforderung Messen mit Bildverarbeitung	*Vision & Control, Ronny Walther*
1:30–2:00 p.m.	Machine Vision Komponentendesign mit FPGA IP Cores am Beispiel des Sensor to Image GigE Vision Cores	*Sensor to Image, Matthias Schaffland*
2:00–2:30 p.m.	GigE Vision for Real-Time Machine Vision	*Dalsa, Eric Carey, Dalsa*
2:30–3:00 p.m.	Robot Vision und 3D Vision mit EyeVision Standardsoftware	*EVT Eye Vision Technology, Michael Beising*
3:00–3:30 p.m.	Big pixels or small pixels? Demystifying pixel size, resolution, sensitivity full well capacity and noise in view of machine vision applications	*Awaiba CMOS Image Sensors, Martin Wäny*
3:30–4:00 p.m.	All the experience of Euresys in a new cost-effective line of Camera Link frame grabbers – from Base to Full configuration –	*Euresys, Marc Damhaut*
4:00–4:30 p.m.	Online spectral infrared imaging with high speed sensors adds a new dimension to machine vision	*Xenics, Martin Ghillemyn*
4:30–5:00 p.m.	HEML: High power, temperture stabilised, laser diode module for industrial machine vision applications	*Frankfurt Laser Company, Scott Harvey*
Wednesday, November 10		
9:15–9:30 a.m.	The European Machine Vision Market	*EMVA - European Machine Vision Association, Andreas Breyer*
9:30–10:00 a.m.	Objective Monochrome and Color Camera Characterization – the new EMVA 1288 Standard, Release 3	*Chair of the EMVA 1288 Working Group, Prof.-Dr. Bernd Jähne*
10:00–10:30 a.m.	ColorRanger – High-speed 3D and Color from one camera	*Sick, Fredrik Nilsson*
10:30–11:00 a.m.	Prosilica GX from Allied Vision Technologies is redefining the limits of GigE Vision bandwidth using Link Aggregation	*Allied Vision Technologies, Paul Kozik*
11:00–11:30 a.m.	High-End Goes Mainstream, Mainstream Goes Low-End – Basler's Latest Cameras Fuel These Market Trends	*Basler Vision Technologies, Henning Tiarks*

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GS2-GE-20S4	2.0 MP	Sony ICX274 CCD	1600x1200 at 30 FPS
GS2-GE-50S5	5.0 MP	Sony ICX625 CCD	2448x2048 at 15 FPS

The GS2-GE-20S4 is the only GigE camera that runs the Sony ICX274 CCD - the industry's favourite 2 megapixel image sensor - at 30 FPS, while maintaining exceptional image quality.

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Measuring just 44 x 29 x 58 mm in size, the GS2-GE-50S5 is the smallest GigE Vision camera to use the Sony ICX625 CCD, a highly sensitive, dual-tap, 5 megapixel sensor capable of running at 15 FPS.

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Talks will not be translated

11:30–12:00 a.m.	HDR: High Dynamic Range Images & Sensors How does it work and what is it good for?	*IDS Imaging Development Systems, Daniel Seiler*
12:00–12:30 a.m.	Understanding Data Transmission Standards for Machine Vision	*Stemmer Imaging, Mark Williamson*
12:30 a.m.–1:00 p.m.	Die Vision-Landschaft und was sie mit Moores Gesetz zu tun hat – Welche Leistungsfähigkeit haben einzelne Vision-Systeme und wie verändert sich diese über die Zeit?	*Matrix Vision, Horst A. Mattfeldt*
1:00–1:30 p.m.	GenICam: the standardized unified programming interface for cameras	*Chair of the EMVA GenICam Working Group, Dr. Friedrich Dierks*
1:30–2:00 p.m.	CoaXPress – True benefits	*Adimec, Jochem Herrmann*
2:00–3:00 p.m.	**Expert Panel: Green Vision–Driving Factors for Green Automation**	**Jørgen Andersen, JAI Dr. Federico Giudiceandrea, Microtec Dr. Volker Rehrmann, TiTech Klaus-Herbert Rolf, Claas Agrosystems Jan-Erik Schmitt, Vision Components Gabriele Jansen, INSPECT**
3:00–3:30 p.m.	Halcon 10 – Innovation und Performance als Mehrwert für die Industrie	*MVTec Software, Dr. Olaf Munkelt*
3:30–4:00 p.m.	Long Time Recording: A Time-Quantum-Jump in High Speed Video Recording	*Mikrotron, Juergen Zimmermann*
4:00–4:30 p.m.	CMV12000: 12Mp 180fps 12 bit global shutter sensor	*CMOSIS, Pieter Willems*
Thursday, November 11		
9:15–9:30 a.m.	Der Markt für Industrielle Bildverarbeitung in Deutschland	*VDMA, Patrick Schwarzkopf*
9:30–10:00 a.m.	First robust and feasible gesture control using Time-of-Flight technology	*PMDTechnologies, Thorsten Ringbeck*
10:00–10:30 a.m.	Berührungslose Überwachung von Fügetechnik mit modernster 3D-Technik	*SmartRay, Mathias Reiter*
10:30–11:00 a.m.	Ein Erlebnis: S3D High Definition in Echtzeit	*Kappa opto-electronics, Dietmar Günther*
11:00–11:30 a.m.	360 degree inspection of objects with just one lens	*MaxxVision, Luca Palleschi*
11:30–12:00 a.m.	Dual GigE - The New High Speed Interface Solution for Advanced Imaging Sensors	*Baumer, Jens Klattenhoff*
12:00–12:30 a.m.	Quotientenbild-Stereo: zuverlässige Höhenbilder – breite Anwendungspalette	*Vision Tools Bildanalyse Systeme, Andre Neuber*
12:30 a.m.–1:00 p.m.	Can the interaction of 2D and 3D extend the capabilities of our developments? Enhancement of 3D applications with 2D tools	*Aqsense, Dr. Josep Forest*
1:00–1:30 p.m.	Bildverarbeitungskomponenten für die Oberflächeninspektion von Groß-Serienbauteilen	*OBE Ohnmacht & Baumgärtner, Dr. Christoph Wagner*
1:30–2:00 p.m.	Qualitätsprüfung von Strich- und 2D-Codes als Voraussetzung der automatisierten Dateneingabe mit Barcode-Scannern	*Barcodat, Uwe Renn*
2:00–2:30 p.m.	How Many Pixels? How Many Photons? – or – Why aren't CMOS Image Sensors for Machine Vision Shrinking?	*Photonfocus, Chris Softley*
2:30–3:00 p.m.	Non-Destructive Evaluation Techniques Combined – the Global Inspection System	*Siemens AG Corporate Technology, Helmuth Euler*
3:00–3:30 p.m.	Chip-on-Board LED Linescan Illumination: Providing solutions for complex applications	*StockerYale, Niall Bolster*
3:30–4:00 p.m.	Theorie und Praxis der Kameravermessung	*AIT Austrian Institute of Technology, Michael Rubik*
4:00–4:30 p.m.	Demand fuelled innovations in e2v image sensors and cameras	*e2v, Sebastien Teysseyre, Gareth Powell*

StockerYale and Photonic Products have united their strengths and experience behind a new name – ProPhotonix Limited. You now get the best research and development expertise for LED and Laser Systems, Linescan Illumination, and Laser Diodes all from one business partner.

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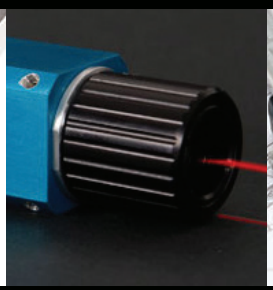

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New 3D Compact Sensors

With the new CX compact sensors, Automation Technology presents a new generation of detector-heads for high-speed 3D scanning. Its core comprises the fast high-resolution-sensors, which are available with a resolution of 2,352 x 1,728 pixels and a profile-frequency of max 23.5 kHz; or 1.280 x 1.024 pixels up to 71.5 kHz. They are built in together with the complete laser electronics into a compact protective housing, which can be arranged to meet customer specific needs. With CameraLink and the GigE Vision standard, two very common interfaces are available for the CX sensors. The integration of these sensors into applications is simple because the sensors heads are compatible with the GenICam protocol. This means that the complicated configuration of the cameras through camera-specific libraries is already history.

Automation Technology GmbH · Tel.: +49 4531 88011 0
info@automationtechnology.de · www.automationtechnology.de

Vision: Hall 4, Booth C73

1.2 Inch Megapixel Lenses

Kowa is introducing two new C-mount lenses for sensor size of 23 mm at Vision. These new 1.2 inch models with focal length of 12 mm (1.2 inch, 12 mm / F2.0) and 16 mm (1.2 inch, 16 mm / F2.0) show a resolution of 160 lp/mm in the centre and thus match perfectly with 5 megapixel cameras. Just as other machine vision lenses from Kowa these new lenses are constructed to withstand high requirements on vibration, shock and temperature. Both models are equipped with a special broadband coating for extraordinary transmission at NIR wave length.

Kowa Europe GmbH
Tel.: +49 211 179354 29 · lens@kowaeurope.de · www.kowa.eu

Vision: Hall 6, Booth C48

GigE Camera Innovation

Basler Vision Technologies will expand its successful ace GigE area scan camera series by introducing four new models with Sony CCD sensors in standard resolutions. In addition, Basler will launch a set of fast and high resolution CMOS cameras within the ace series, for example, cameras with 5 megapixel resolution and 14 frames per second speed. Like all ace cameras, these new models come with a small 29 x 29 x 42 mm housing, Power over Ethernet, and a variety of useful features. Basler aviator cameras are currently only available with a Camera Link interface, but the new aviator GigE family will be another innovation. The new aviator GigE models range from 1 to 4 megapixels and can capture more than 100 frames per second thanks to a new data transport concept. And despite the high data rates, this technology only requires one data cable.

Basler AG · Tel.: +49 4102 463 0 · info@baslerweb.com · www.baslerweb.com

Vision: Hall 4, Booth B59

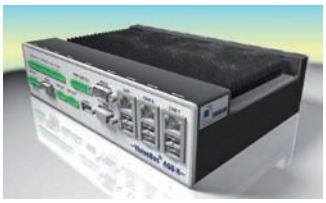
Nine New Camera Models

Allied Vision Technologies will be presenting several new products at Vision, like the Guppy Pro. With 29 x 29 x 29 mm, the Guppy Pro models are even smaller than the Guppy, and as such are some of the most compact FireWire cameras available for industrial imaging. The new family has also become faster, thanks to its IEEE1394b interface with image rates from up to 120 fps with VGA resolution. Six models will be introduced, offering resolution from VGA up to 5 megapixels. Since May of 2010, the AVT Manta has been successfully stirring up the entry-level market for industrial cameras with Gigabit Ethernet interface. This robust GigE camera is already available with six sensor variations from VGA to 2 megapixels. Two new models will premiere at the show, the Manta G-033 and G-504.

Allied Vision Technologies GmbH
Tel.: +49 36428 677 0 · info@alliedvisiontec.com · www.alliedvisiontec.com

Vision: Hall 4, Booth D33

Embedded Machine Vision PC



Imago Technologies introduce the new VisionBox AGE-X. This fanless embedded computer is optimized for the needs of machine vision applications. Based on Atom and i7 processors the box provides 1.000 Mbit/s Ethernet and two GigE Vision ports, six USB ports, digital IO, serial interface and a RS422 interface. Remarkable are two ports to connect directly LED lighting units. All parameter of the LED current are controlled by the VisionBox. On the side of the operating system the computer runs with the latest Windows 7 embedded, stored on a compact flash partition. Imago itself expands the product range in addition to programmable smart cameras and scalable real time computer, all of them based on a DSP. The professional advice helps the customer to decide between PC or DSP based components.

Imago Technologies GmbH · Tel.: +49 6041 968672
info.itf@imago-technologies.com · www.imago-technologies.com

Vision: Hall 4, Booth E68

Prism-based 4-CCD Color Line Scan Camera

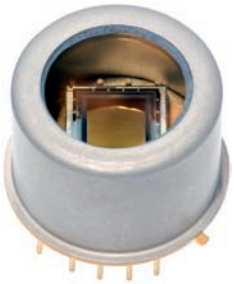
Jai has announced the release of the LQ-200CL – a new prism-based 4-CCD color line scan camera providing simultaneous separate imaging of red, green, and blue, plus near-infrared light data. The camera, which is one of the only industrial-grade 4-CCD line scan cameras on the market, features a beam splitter prism with hard dichroic coatings incorporating four precisely pixel-to-pixel aligned CCD sensors. By adding an NIR sensor, the new camera makes it possible to identify an even wider set of defects on inspected objects. The camera's prism-block technology enables users to avoid the complex alignment and encoding issues associated with tri-linear line scan cameras, especially those related to off-axis viewing, variations in conveyor speeds, surface undulations, or objects that roll or move as they pass through the camera's field of view.

JAI A/S · Tel.: +45 4457 8888 · camerasales.emea@jai.com · www.jai.com

Vision: Hall 4, Booth C52

New 2D InGaAs Image Sensor

Hamamatsu Photonics introduces a new two dimensional InGaAs image sensor that complements the existing range of high performance linear image sensors. The sensor G11097-0606S consists of a CMOS readout integrated circuit (ROIC) and a back illuminated InGaAs photodiode array, which are connected via indium bumps on a hybrid structure. This 2D InGaAs sensor features simultaneous charge integration and a 5 MHz video data rate. Also included within the ROIC is a timing generator to allow simplified operation. Featuring 50 x 50 µm pixels, the sensor offers high sensitivity in the 0.95 µm to 1.7 µm infrared region with excellent linearity characteristics. It is the ideal, low cost solution to a wide range of industrial applications, including low resolution thermal imaging, laser beam profiling, NIR image detection or foreign object detection.



Hamamatsu Photonics Deutschland GmbH
Tel.: +49 8152 375 0 · info@hamamatsu.de · www.hamamatsu.de

Vision: Hall 6, Booth B11

CMOS Sensor with Selectable Modes

Based on the renowned Magic HDR technology, the sensor NSC1001 is the world first HDR LOG CMOS sensor which can operate under both rolling shutter mode and a global shutter mode. The global shutter mode is particularly useful in machine vision applications where capturing fast moving objects without motion blur is a must. As in every NIT Magic HDR, the NSC1001 delivers a fully contrast conserving image sensing without smearing, tearing and without the need of external control. It is specially designed for high performance in industrial applications and automotive applications which require capturing accurately timed images of fast moving objects. The NSC1001 can be scanned at 50 MHz with a maximum frame rate of 100 Hz at VGA resolution and can be delivered with a standard CLCC-48 package.

New Imaging Technologies (NIT)
Tel.: +33 160 764648 · info@new-imaging-technologies.com · www.new-imaging-technologies.com

Vision: Hall 4, Booth E35

Real-time Video Connectivity

Pleora Technologies releases the vDisplay family of IP engines, a video receiver designed specifically for viewing stations and specialized processing appliances on high-performance video networks. vDisplay IP engines are comprised of compact, purpose-built hardware that allows high-resolution video streams on GigE networks to be displayed directly on monitors, in real time, without the need for a PC. They can also be used for real-time video capture in specialized processing appliances. The engines comply fully with the open, global GigE Vision and GenICam standards. They are ideal for OEMs and integrators building high-performance video products and systems for the military, medical, and manufacturing sectors. The HDMI-Pro engine is available as a compact OEM board set or a small enclosed unit.

Framos GmbH · Tel.: +44 1276 4041 40 · info@framos.eu · www.framos.eu

Vision: Hall 4, Booth E76

Monochrome Cameras with Mini-CameraLink

Hitachi Kokusai Electric Europe GmbH, releases the first time in Europe two new Monochrome Cameras with high resolution CMOS sensors, high speed transfer rate and Mini-CameraLink interface. Both cameras offer 2 and 4 Megapixel resolution with a transfer rate of 280 and 140 frames/s, Mini-CameraLink with auto selection of SCL or PoCL, easy to use and small dimensions of 44 x 44 x 41 mm. One of the major application fields for these new cameras of Hitachi Kokusai is the wide range of image processing and machine vision, especially everywhere high resolution with high speed data transfer is needed. Furthermore, all camera types contain functions, like standard trigger or customized trigger functions, or the electronic shutter from 1/60 s up to 1/50,000.

Hitachi Kokusai Electric Europe GmbH
Tel.: +44 845 121 2177 · info@hitachi-keu.com · www.hitachi-keu.com

Vision: Hall 4, Booth C20

New Software

As a world premiere, MVTec Software will present the new version of the standard software for machine vision Halcon 10. The company will showcase live demos running the new features to vividly demonstrate the unique possibilities of Halcon 10. It offers an amount of 3D vision methods making it the only software needed for any 3D application. Halcon, already well-known for premium matching technology both for 2D and 3D vision applications, provides local deformable matching to even find objects with deformed or wrinkled surfaces. For high performance, Halcon 10 provides an efficient automatic acceleration by optimal usage of computing power of GPUs based on the OpenCL standard. In addition to this, Halcon's automatic operator parallelization for multi-core processing has been extended and improved to further speed up the library in general.

MVTec Software GmbH
Tel.: +49 89 457695 0 · sales@mvtec.com · www.mvtec.com

Vision: Hall 4, Booth C55

High-speed Camera for Crash Tests

Polytec presents the new TRI-VIT high-speed camera for the first time at Vision.

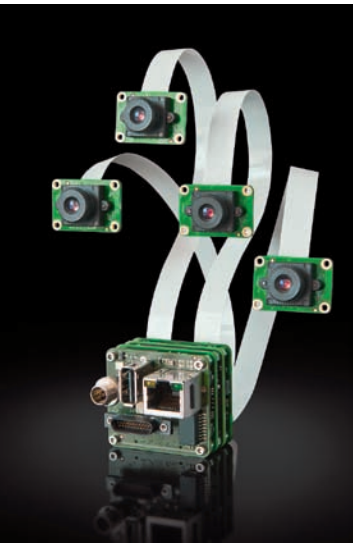
The camera has been developed for extremely rough conditions such as those that are found during crash tests in the automobile industry or in military applications. The model has a shock resistance of up to 100 G across all three axes. The dimensions of the aluminium housing have a construction depth of 46 mm. As a result the camera can be placed in very confined spaces that are close to the motif and which previously have been inaccessible to conventional models. In addition to an upgradable 2 gigabyte image memory the camera can also optionally be supplied with a flash memory for ultra fast internal storage of image sequences. The high-speed camera is supplied with AOS Imaging Studio Full Software, power supply and data cable.

Polytec GmbH · Tel.: +49 7243 604 0 · info@polytec.de · www.polytec.de

Vision: Hall 6, Booth B19

Intelligent Multi-Sensor Camera

The camera manufacturer company VRmagic will present an intelligent, freely programmable multi-sensor camera, which is able to perform even complex image processing tasks fully independently. Up to four external sensors can be connected to the central unit of the camera by a flex-foil-cable with LVDS transmission. The multi-sensor camera can produce pixel-synchronous images from several positions, as required for 3D reconstruction of moving objects, for example.



With a standard Debian Linux operating system, the intelligent camera provides developers with a convenient platform for programming their own applications and transferring them to the camera by means of cross-compilers. The CMOS sensors with global shutter are available in monochrome or color. The image data is coordinated on a FPGA module with 256 MB RAM.

VRmagic GmbH · Tel.: +49 621 400416 0
info@vrmagic.com · www.vrmagic.com

Vision: Hall 4, Booth B72

11 Megapixel Camera: Next Generation

Lumenera, manufacturer and developer of high performance digital cameras and customized machine vision solutions, announced the release of its next generation Lw11059 11 megapixel USB 2.0 camera. The latest version of the Lw11059 camera features fan-less cooling, allowing the camera to run silently while operating within a temperature range of 0 to 50°C.

The camera is designed specifically for industrial and scientific applications requiring large fields of view. With an 11 megapixel sensor measuring 43.3 mm diagonally, the Lw11059 is capable of taking clear images covering a great span in a single frame. Other highlights include software controllable focus and iris with full auto modes (with Canon EF lenses), low noise, and high sensitivity, making it suitable for light challenged applications such as traffic monitoring and flat panel inspection.

Lumenera Corp.
Tel.: +49 341 3413087962 · info@lumenera.com · www.lumenera.com

Vision: Hall 4, Booth E77

Function Library Eases Connection

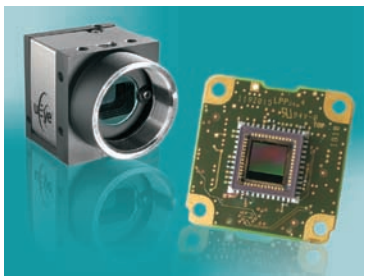
VeriSens Vision sensors can be quickly and easily integrated into system controls. This requires controlling digital inputs and outputs as well as capturing data via Ethernet or RS485. Often however, access to the individual interfaces must first be implemented. To support this step, Baumer has developed a function library for the Simatic S7 which makes it much easier to connect the VeriSens Vision Sensors. Along with modules to control the digital inputs and outputs, it contains a communication module to exchange data via Ethernet (TCP or UDP) or RS485. All function modules are extensively documented and accessible in the commented source code. The library supports both integrated and external communication processors of the Simatic S7-300 and S7-400 controls.

Baumer Group
Tel.: +41 52 728 1122 · sales@baumer.com · www.baumer.com

Vision: Hall 4, Booth A 75

Driver Update for Fast Line Mode

IDS will present an updated driver version that significantly expands the range of functions offered by its new cameras with global shutter CMOS sensors by e2v. The driver will enable a fast line mode for the USB and GigE models UI-1240/UI-5240. In this operating mode the sensor records a line 12,000 times per second, making these affordable CMOS cameras suitable for inspecting yard ware or scanning barcodes. The driver update will also provide an additional readout mode that allows up to four areas of interest (AOIs) per frame to be set and simultaneously transmitted. Moreover, it adds a digital scaler to the cameras with e2v sensors which generates reduced images almost steplessly while maintaining a full field of view and enables a frame rate of 100 frames per second. Thanks to what is known as overlap trigger mode, the same frame rates are achieved for externally triggered images as in live mode.



IDS Imaging Development Systems GmbH
Tel.: +49 7134 96196 0 · info@ids-imaging.de · www.ids-imaging.de

Vision: Hall 4, Booth C53

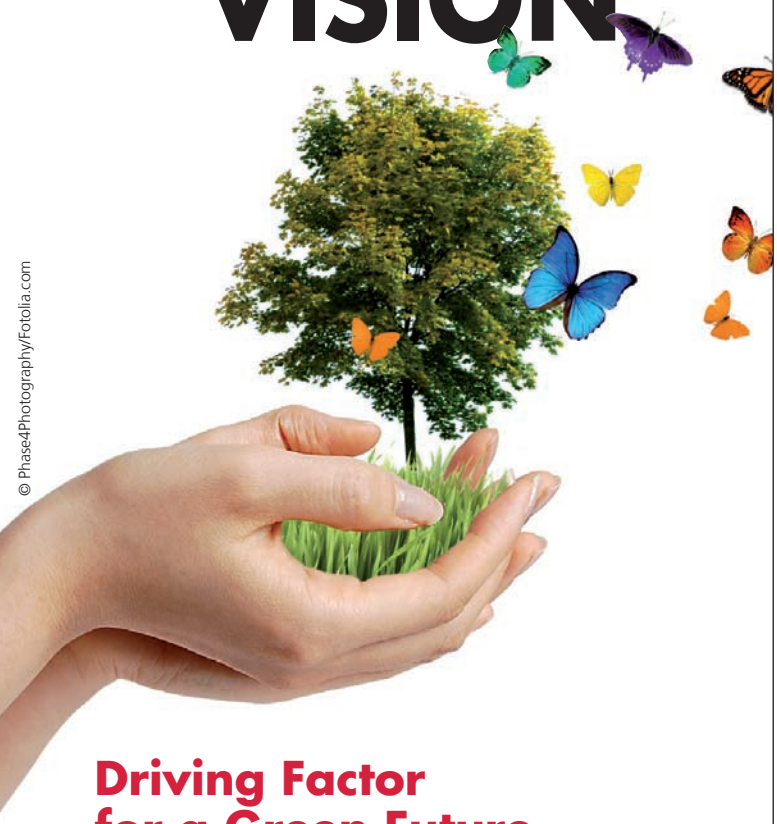
High-speed Camera with New Software

The company Optronis adds the CamRecord CR3000x2 high-speed camera to its product portfolio. This camera offers 3 Megapixel full resolution at a speed of 540 frames per second. The flexibility of the camera allows extending the speed to much higher values for regions of interest. Acquisition, detection and analysis of the fast moving process are performed by the completely new TimeBench software. The software integrates cameras of the Optronis CR series, as well as GigE cameras with CVB (Common Vision Blox) interface and DAQs (data acquisition systems). Optronis spotlights with TimeBench the interaction of different camera technologies and data acquisition systems to completely and time-synchronously acquire, analyse and report complex and fast movements.

Optronis GmbH
Tel.: +49 7851 9126 0 · info@optronis.com · www.optronis.com

Vision: Hall 6, Booth D33

GREEN VISION



Driving Factor for a Green Future

Expert Panel with inspirational Keynotes

Under the header **"Green Vision – Driving Factor for a Green Future"** five renowned experts will present to the audience in inspirational keynotes how vision technologies help to protect our environment, support economical use of resources, improve energy efficiency, play a role in the development of eco-friendly products and overall pave the way for a "greener" future.

VISION 2010, Stuttgart, Germany
Wednesday, 2010, November 10th, 2 pm
Forum Industrial Vision Days
Neue Messe Stuttgart, Hall 6, Booth A81

Camera Technology put to work for Reduction of Traffic Congestions, Fuel Consumption and Air Pollution
Jørgen Andersen
CEO JAI, Denmark

Sensor-based Yield Optimization enabling Resource Efficiency in Wood Processing
Dr. Federico Giudiceandrea
CEO Microtec, Italy

Sensor and Machine Vision Technology in Waste Sorting and Recycling
Dr. Volker Rehrmann
Technical Director Titech, Norway/ Germany

Mimimization of Fertilizer and Pesticides Usage by Stereo Camera-based Steering Systems
Klaus-Herbert Rolf
Marketing Manager Claas Agrosystems, Germany

Smart Cameras for the Quality Control in the Production of Solar Modules
Jan-Erik Schmitt
CEO Vision Components, Germany

Chair: Gabriele Jansen
Publishing Director INSPECT

www.inspect-online.com

GIT VERLAG
A Wiley Company
www.gitverlag.com

Barcode Technology and Machine Vision

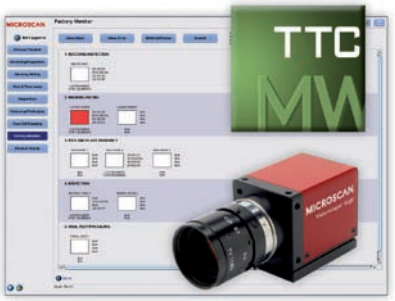
The company Barcodat will present quality assurance solutions with barcodes, industrial vision systems and RFID. The provider of barcode systems shows how hardware and software can be combined to prevent mistakes and optimize processes. Applications can range from a simple comparison of barcodes ensuring that the correct parts are delivered, to the booking of incoming and outgoing goods with batch terminals, to the complex organization of storage areas in a warehouse using mobile terminals with WLAN communication. The camera portal E.SEE Scan can identify a complete pallet of products at once, thus automating the process of shipping and receiving goods. The mobile work station 900/1120, which will also be shown at Vision, is the ideal solution for logistic and harsh environments.

Barcodat GmbH
Tel.: +49 7443 9601 0 · vertrieb@barcodat.de · www.barcodat.de

Vision: Hall 4, Booth A13

Track and Trace Solutions

During the show, Microscan will demonstrate the QX Hawk, a high-performance barcode imager for multi-purpose code reading. With a fully integrated liquid lens, the QX Hawk is optimized for both superior image clarity and infinite focus capacity. The result is unmatched flexibility to read 1D and 2D barcodes in any orientation, either up close or at great distances. For example, during assembly a QX Hawk can perform a wide range of identification applications, from small code unique item traceability to long range pallet tracking with the barcode in any orientation.



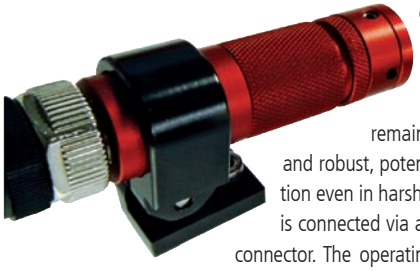
Also at the show, Microscan will highlight its Track, Trace, and Control (TTC) middleware, designed to provide WIP visibility through a factory, validate the process flow, and provide the history of the process steps accomplished on a product.

Microscan Systems
Tel.: +1 425 226 5700 · info@microscan.com · www.microscan.com

Vision: Hall 6, Booth D43

Focusable Line Laser

Laser Components will premiere a new series of laser modules for industrial image processing: the machine vision (MV) series. One of the products from this new series is the Flexpoint MV Micro, a line laser with a homogeneous power distribution that can be precisely focused without the use of any tools. A counter screw prevents accidental re-adjustment. The line position remains unchanged. Small line widths and robust, potential-free housings allow application even in harsh environments. The power supply is connected via an industrial standard 4-pin M12 connector. The operating voltage can be set arbitrarily between 4.5 and 30 VDC without affecting the brightness of the line. Customer-specific laser modules can be produced without a problem.



Laser Components GmbH · Tel.: +49 8142 2864 0
info@lasercomponents.com · www.lasercomponents.com

Vision: Hall 4, Booth D13

Best Players play at VISION

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VISION 2010

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Dynamic Noise

Image Processing Basics: Sensitivity

What is the irradiance needed to produce a camera signal suitable for image processing? What are the maximum and minimum intensities in the brightest and darkest areas of an image, respectively, which will allow for stable algorithms? When tackling these questions, you will immediately realize that a short glance at a data sheet will not settle this case. The article describes some basic concepts which may be helpful for further reading [1] about this complex topic.

Sensitivity

The signal in CCD and CMOS sensors is generated by the internal photoelectric effect. Photons from the incoming flux of light release electrons within a detector pixel. The probability for this process is called quantum yield or quantum efficiency. The quantum yield depends upon the wavelength of the incoming radiation. Camera chips thus are not sensitive to the power or energy of the radiation, but to the number of single photons N_{ph}, which hit the detector during the integration time interval. The source signal is the number of photoelectrons N_e which are generated in a pixel during the shutter time and are stored at this detector site, hence a charge. This charge will be read out and results in a voltage, which in turn will be converted to a grey level by an analog-to-digital converter. The factor $K = g/N_e$ is called output conversion gain and is an important figure of merit for a camera. To aid the reader the pseudo-unit "DN/e$^-$" is added to the number, "digital numbers per electron," that is grey levels per electron. The value K = 0.25 DN/e$^-$, e.g., shows that four signal electrons are converted to one grey level step. A constant value for K in the full range of the camera signal means a very good performance of the electronic signal path. Cameras with significant deviations from this ideal, however, are out there. When, as a second quantity, the quantum yield is specified, the number of photons required to produce a certain grey level in the digital signal may be calculated. On the other hand, the grey level to be expected may be estimated from the radiation flux which hits the pixel and from the shutter time by calculating the number of incoming photons [2]. As a measure for sensitivity the ratio s between the grey level and the number of incoming photons may be specified, the unit being DN/photon. An alternative is the grey level related to the cumulative energy of the incoming photons during integration time, resulting in a sensitivity figure associated to the unit DN/J or, if

more suitable, normalized to the unit cell size, DN/(J/m²). An application specialist who wants to estimate a grey level signal from the information given in a data sheet thus will be grateful to read a number for the unit cell size, for the absolute spectral sensitivity with one of the units DN/photon, DN/J or DN/(J/m²) and for the corresponding wavelength of the radiation used to determine these values. In addition, the wavelength dependence of the sensitivity or of the quantum yield must be given, at least in relative units. As an alternative, the two quantities quantum yield and output conversion gain K with the unit DN/e^- will be helpful.

Dark Signal and Full Well Capacity

Even in a capped camera, with no light shining on the detector array, electrons are released and stored in a pixel during the integration time. This dark signal is generated by thermal effects within the detector material and may only be reduced by cooling. There is no means to discriminate between signal electrons and dark electrons, they look perfectly alike. The total signal thus will be the sum of the dark signal and the photo signal, $N_{total} = N_e + N_{dark}$. A single detector pixel, however, has a limited capacity for signal electrons, the so-called "full well capacity" FW. In standard cameras, the maximum shutter time is determined by the frame rate, and the dark signal under these circumstances will be far below the saturation limit. In any case, however, the dark signal will reduce the signal range available for the photo signal. As an example, a dark signal of 4,000 electrons in a pixel with 16,000 electrons FW will reduce the range fort the photo signal to 12,000 electrons only. With K = 0.25 DN/e^-, e.g., the full range of 4,000 grey levels, corresponding to a 12bit-signal, is reduced to 3,000 grey levels for the photo signal. As a consequence, low light intensity in a scene may not just be compensated by an increase of the shutter time up to a proper signal. The dark signal will also increase, and the net signal range will be reduced. A further problem is the non-linearity of most sensors in the vicinity of FW, resulting in a non-linear dependence of the signal as function of the irradiance. Many application specialists thus avoid this range.

Noise

The signal in a single pixel is not constant when tracked over several integration periods. There is always noise on the signal. Even under perfectly identical circumstances a series of images will show stochastic variation for the dark signal as well as for the photo signal around their mean values. A good measure for this scatter is the square root of the mean squared deviation from the mean value, rms. For a particle detector like a CCD or CMOS sensor, noise is equal to the square root of the number of particles. A mean signal of 16,000 electrons, e.g., will be associated with a fluctuation within an rms range of about 125 electrons. When mapping this signal to 12 bit, which means to represent 16,000 electrons by a grey level of about 4,000, the rms noise corresponds to about 32 grey levels. Subtracting the dark signal does not provide a solution. Unfortunately, rms values add as squared values under the square root, and the noise of the difference of two signals will be larger than any of the two single noise levels. The larger the dark signal, the larger will be the noise on the total signal and, if so, also on the difference signal, and the signal will eventually be completely obscured by noise. As a consequence, there may be cases where the grey level resolution provided by the ADC will not be the ultimate criterion for the number of grey levels which can reliably be detected in an image. The limiting factor is noise.

Dynamic Range

The situation for signals just below the saturation limit has been described above. When dealing with very low signals, read-out noise has to be taken into account. Even with truly identical numbers of signal electrons the grey value for subsequent read-out of a detector array shows fluctuations around the mean value. The rms value of this scatter is the read-out noise. Read-out noise may be larger than a grey level step produced by the ADC. As an example, five electrons rms are not uncommon for a good CCD array. As a figure of merit, the ratio between FW and read-out noise is given, the so-called dynamic range DR. In our example, DR would amount to 16,000/5 = 3,200 or 70 dB, which would be quite an impressive figure for an industrial camera. This value, however, does not mean that 3,200 grey levels can be reliably detected, since signal noise near saturation will amount to about 125 electrons, outnumbering read-out noise by a factor of 25. For this reason the dynamic range (DR) must not be confused with the signal-to-noise ratio (SNR) as can unfortunately be found in some data sheets. In our example, SNR near saturation is only about 125, and it will by no means become better at any other signal level. Even this number is an optimum figure, since the electronics downstream can and usually will add further noise to the signal. In order to discriminate a signal against the noise floor, a SNR of at least 10 is usually requested. In our example, a signal of 120 electrons would be associated with a total noise of about 12 electrons, where we have omitted the dark signal. The grey level 30 would thus pick up a noise of about three grey levels. There are probably several application specialists around who dare to tackle such a signal with their image processing algorithms. Grey levels larger than 400 would provide SNR = 40 and higher, and a noise of about 10 at a grey level of 400 may well be called a fine signal. This simple reasoning, however, already shows that the considerations concerning the influence of signal quality upon the stability of algorithms are not yet finished at this point. Whenever differences of grey levels are to be detected, which is at the heart of most image processing algorithms, the absolute noise is the key parameter rather than the SNR, resulting in different criteria for dark and bright areas of the image.

Summary

When grey levels in an image are to be estimated, the brightest and the darkest spots in the scene should be examined and the light energy or the number of photons be measured or calculated which will fall upon a pixel within the integration time period. The spectral distribution of the radiation has to be taken into account for these calculations. Quantum yield and output conversion gain or an alternative measure of the sensitivity of the detector will then provide the grey levels. When the signal is too low in dark areas, a larger aperture of the optics or more light on the scene may solve the problem. On the other hand, the bright zones of the image must not be saturated. Longer integration time will also yield higher signals, but the dark signal will increase along with the photo signal. Choosing a higher gain results in a higher output signal, but the noise floor of the source signal will also be amplified. If the bright spots are saturated, the signal may be attenuated by equivalent means. The next step will be to calculate the signal-to-noise ratio for the bright areas as well as for the dark regions of the image. This provides the data base for the decision whether a certain algorithm may work properly on this image or not. If not, have a look for a camera with higher quantum yield, tune the lighting to the spectral range where the camera has the maximum quantum efficiency, reduce the dark signal (choose a shorter shutter time and a strobe light, e.g.) or get a model with higher FW and smaller read-out noise, hence better dynamic range. Finally, a brief look at the EMVA 1288 standard [3] is recommended, which provides material on several interesting topics such as fixed-pattern noise or, in forthcoming version 3.0, features of cameras with non-linear characteristics.

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[1] G. C. Holst, CCD Arrays, Cameras and Displays, 2nd ed., SPIE 1998

[2] INSPECT 2/2010, p. 18, Radiant Presence, Optical Metrology Basics: Radiometry

[3] www.emva.org/standard1288

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Symphony of Lights

From Fiber Optics to High Power LED Ring Lights

Light is an important foundation for all cultures, for it allows people to enjoy a safe and pleasant life. Controlling light and making it technically useful continues to present a complex and challenging engineering task even up to the present day. This includes generating, shaping, diverting, converting and measuring light. Without optimized lighting, even modern automation technology remains blind, which is true for optical inspection applications and image processing, as well as for endoscopic applications.

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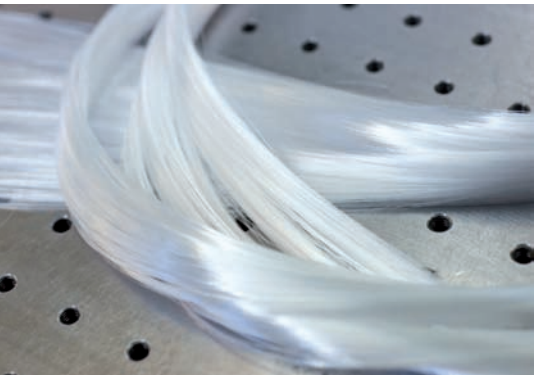
Different tasks require different illumination concepts. What sounds quite obvious can in reality often be a difficult decision for users, when it comes to choosing between the necessary light intensity, on the one hand, while at the same time considering the illumination frequencies, qualities of the surfaces being illuminated and, last but not least, the reliability and longevity of the light source. Working out customized solutions for specific applications is considered to be the core strength of Volpi, located in Schlieren, Switzerland. The company specializes in the development and production of fiber optic and optoelectronic components as well as custom OEM solutions, particularly in the fields of medical technology, automotive, testing technologies and machine vision.



The glass fibers for the fiber optic illumination systems are produced by Volpi; the company also uses them in sensor technology

Fiber-Optic System or LED Illumination?

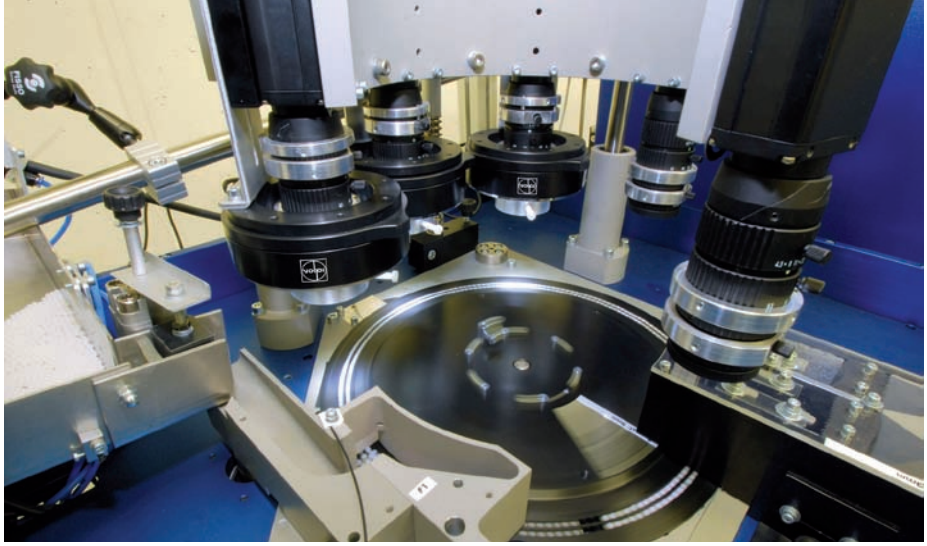
While fiber-optic illumination systems have in many areas been eclipsed by LED technology, they still remain the first choice for numerous applications, such as when temperature-critical objects must be further away from the light emitter and the light must bridge large distances or needs to be provided in areas where there are high electrical charges. In these situations, fiber-optic ringlights give a homogeneous and shadow-free illumination of the work surface. Flexible light emitters are well-suited for illuminating hard-to-reach objects in confined spaces or over large distances. In order to connect to cold-light sources there are also special fiber-optic background light fields, useful when it is necessary to perform precise measurements in transmitted light mode. Fiber-optic line lights offer a practical illumination solution for inspecting surfaces with line or area scan cameras.

Today, however, LED lighting systems are taking on a more dominant position as a result of their high efficiency and low power consumption. The same is true for traditional fiber optics applications for which LED light sources are increasingly being used. Volpi is one of the first manufacturers to have developed an LED light source with high-power LED technology. For machine vision applications, this means that the homogenous light distribution so typical of fiber optics can be combined with the economy and longevity of LEDs.

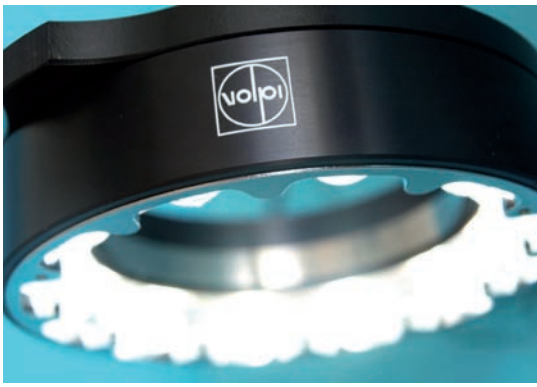
Today, proven standard products are available for a great variety of tasks requiring LED lighting systems: Coaxial illumination is suitable, for example, for objects with reflective or highly reflective surfaces. LED line lights from Volpi offer a good degree of uniformity and ho-

Inspection Systems by Systron

Situated in Birmersdorf, Switzerland, Systron develops and builds inspection systems that are customized to the customers' needs. These include stand-alone systems as well as systems that can be integrated directly into automation lines. The main focuses of development here are image processing, the design of lighting and optics as well as the appropriate PC software and control systems.



Automatic inspection system for surface and dimensional inspection of glass, plastic and metal spheres; camera systems inspect the entire sphere surface



The new four-segment LED ringlight provides homogeneous, shadow-free incident light in high contrast

mogenous illumination all the way to the line edges. Diffuse dome lighting is ideal for illuminating non-reflective or low reflective objects, without causing shadows. LED dark field illumination is excellent for emphasizing edges and elevated structures on objects. LED background or transmitted light illumination is preferable for measuring or testing contours. LED ringlights provide the perfect conditions for microscopy and machine vision applications.

LED Ringlight in Action

The new, fully automated Uranus-S inspection system for spheres developed by Systron is a good example here. The system is well-suited for many different applications in the pharmaceutical and cosmetic industries all the way to automotive production. A new, adjustable-focus 4-segment LED ringlight from the Volpi product portfolio provides the right illumination for inspecting the surface and dimensions of metal, plastic and glass spheres with diameters ranging between 1.0 and 3.5 mm. Its 12 white high-power LEDs, which can be controlled in four segments, provide homogeneous, shadow-free and especially bright incident light. In addition, the ringlight can be easily modified to meet the requirements of the particular sphere inspection system.

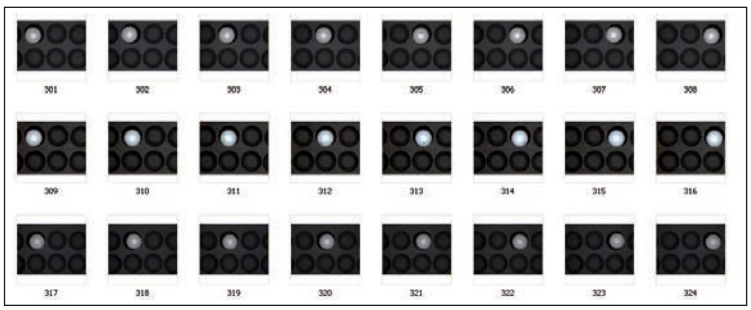
Before testing, the spheres are ionized in the intake basin. From there, they pass in batches to the perforated disc in the testing compartment. During the optical inspection, each of the three camera systems takes eight images of each sphere while it is being rotated in order to inspect the entire surface of the sphere. Thus, 24 image acquisitions are made from each part. This allows any damages from the smallest scratches all the way to cobble, casting and sanding defects to be reliably detected. A fourth camera tests the diameter and any potential eccentricity of the spheres. An additional camera monitors the good/bad sorting to the reject container. The throughput of the inspection system depends on the particular application and can be set for between eight and 16 parts per second. Modifying the system for other sphere types is quick and easy to do.

Flash Mode Increases Luminous Efficacy

The flexible inspection system, which is suitable for spheres of the most diverse materials, colors and finishes, demands quite a bit from the technology used. "We depend on extremely high-performance solutions for camera systems and illumination," reports engineer Stefan Ubezio, CEO of Systron. "The focusable LED ringlight from Volpi fully meets our expectations here." The focusing optics makes it possible, for example, to have variable working distances or to easily modify the system for different part sizes.

But beyond this, the illumination during the sphere inspection must meet an entire range of additional requirements. After all, it is no trivial task to provide the right illumination of small, moving objects made of various materials for the purposes of image acquisition. "You can virtually never have enough light," Ubezio summarizes the situation. "We therefore designed the control of the ringlight in such a way that it flashes, i.e. illuminates for 500 µs in order to provide the ideal illumination for each camera shot; the LEDs then have a break for about 50 msec. This allows us to achieve luminous efficacy four times greater than in continuous mode. This also results in less waste heat, which in turn increases the life expectancy of the LEDs." Ringlights have a typical life expectancy of at least 10,000 operating hours at 100% intensity and in continuous operation, meaning that they have a very long service life in the first place.

The sphere inspection system detects diametrical deviations from 0.01 mm, eccentricity from 0.02 mm and surface imperfections down to 0.05 mm. Without the LED ringlight, these microscopically small deviations would not only be invisible to the human eye – but to industrial cameras as well.



The logging function of the Uranus software makes it possible to display and save the 24 pictures used for inspecting the surface

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Camera Innovations

The Great INSPECT Camera Survey Preceding Vision 2010

Vision 2010, leading international trade show for machine vision, is fast approaching. Very soon a couple of thousands of visitors will again come to Stuttgart, Germany, to learn about new technologies, innovative products and latest trends. Preceding the Vision, we present to our readers which highlights from the broad area of industrial and scientific cameras must not be missed at the show.

To avoid a mere press release listing and to ensure instead a high level of information and news value, we have asked the camera providers exhibiting at the Vision trade show:

> Which camera innovation will from your point of view bring the biggest benefit for the customer?

On the following pages you will see which innovations are awaiting you at the trade show and what is the benefit you can expect of these for your applications.

Point Grey Research

At 5 Gbit/s, SuperSpeed USB (aka USB 3.0) promises a major leap forward in transfer speeds and reliability, while continuing to build on USB 2.0's low cost and easy integration. At Vision 2010, Point Grey will deliver on this promise with yet another industry first: the Flea3 line of ultra-compact, USB 3.0-enabled digital cameras. Measuring just 29 x 29 x 30 mm in size and with frame rates up to 150 FPS, the new Flea3 is the smallest and fastest USB 3.0 camera in the world. The Flea3 camera series will offer a variety of low-cost, high-speed, CMOS image sensors ranging from 1.3 Mpixel at 150 FPS to 6.3 MPixel at 60 FPS. Other features of the camera include opto-isolated GPIO for industrial triggering and strobe output; built-in frame buffer and flash memory; on-board color processing; and USB 3.0 locking screw connection. Two sensor models will be demonstrated in Stuttgart: the 3 Mpixel Sony IMX036, capable of streaming uncompressed high-definition 1,080 p video at 60 FPS; and the Cypress VITA1300, a 1.3 Mpixel 150 FPS global shutter sensor developed specifically for machine vision.

Mike Gibbons, Product Marketing Manager
Vision 2010: Hall 4, Booth A31

VRmagic

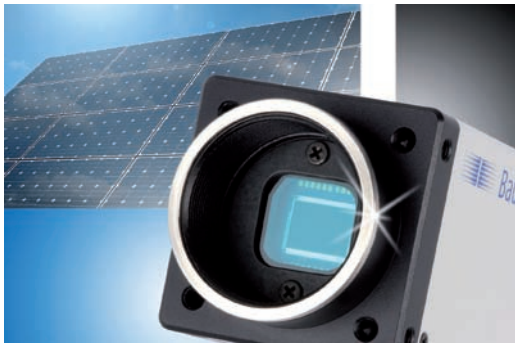
3D is now firmly establishing itself in image processing and can replace 2D for many tasks. The benefits for the user are above all decoupling of lighting problems and problems due to insufficient contrast. With the AreaScan3D, VRmagic will present the first 3D sensor based on stripe light projection at the Vision 2010. This sensor supplies 3D data in standard output formats for industrial image processing. We are therefore now making available a turnkey technology in the lower price segment that allows 3D image processing tasks to be performed directly – without additional hardware. The AreaScan3D outputs the image data to the server via the standardized Ethernet interface. The data is output directly as a point cloud, metric-scaled 3D profile or as a height-map. With a GenICam TL interface, the AreaScan3D is compatible with Common Vision Blox, Halcon and other image processing libraries.

The 3D sensor is based on an intelligent camera from VRmagic, which can also be used as a platform for other integrated solutions. As an OEM module, the intelligent camera will in future be available with up to four pixel-synchronous sensors.

Oliver Menken, Sales & Marketing
Vision 2010: Hall 4, Booth B72

Baumer Optronic

At Baumer we are recognizing a trend to higher resolutions and frame rates. Through state-of-the-art sensors it's possible to target new markets. At the same time applications with high complexity can be solved even easier. Additionally, an increase of the sensitivity in the NIR and UV region will improve and address several applications. Here not only the photovoltaic system integrators see advantages. Caused by the higher data rates new interfaces like Dual GigE or USB3 will be requested. But there are already sensors out there where even this higher bandwidth will not cover the needs. In this case an internal preprocessing will become important. The images will be processed



or compressed inside the camera to reduce the amount of data.

Jens Klattenhoff, Head of Sales & Marketing
Vision 2010: Hall 4, Booth D25

Framos

One of our biggest innovations, shown at the Vision this year, will be the new GigE Vision compatible 10 Gigabit Ethernet interface. The key features in comparison to other interfaces are speed, maturity of the standard, networkability and the wide availability of components.

Introduced in 2006, GigE Vision is a mature, well-defined, industry-supported standard leveraging the advantages of Ethernet, including an evolution path on 10 GigE to allow for high-speed bandwidths to support future application needs.

GigE Vision is the only interface that meets growing demand for multi-camera systems delivered over switched video networking architectures. Ethernet is the only technology that has native support for video distribution to multiple end-points. Ethernet features dedicated, unshared links that scale seamlessly from 10 Mb/s to 10 Gb/s over 100 m cable lengths. With switches or fiber, the reach is unlimited.

Ethernet components are widely available and easily accessible. In addition, Ethernet's physical layer inter-

Which camera innovation will from your point of view bring the biggest benefit for the customer?

face is driven by industry leaders, such as Cisco and Intel. This continues the development and advancement of the technology for example, reducing footprint and power requirements.
Simon Che'Rose, Senior Manager Engineering & Support
Vision 2010: Hall 4, Booth E76

Stemmer Imaging

From my point of view, there were no camera innovations during the last year that had a similar effect as e.g. the development of the GigE Vision standard some years ago. Many suppliers have introduced interesting new products, but the question which development offers the most benefit cannot be answered globally, as the answer to that is highly depending on the application area.

I personally see four trends in camera technology: First of all, higher resolutions get more and more affordable, all users will benefit from that. Secondly, we still have a tendency towards higher speeds and/or resolution, which is proofed by cameras of several suppliers. Thirdly, I see cameras based on CMOS sensors gaining an increasing market share compared to CCD cameras. CMOS steadily offers higher resolutions and frame rates at a given image quality and continues to outperform CCD type cameras. A fourth trend from my point of view

is the increasing specialization of cameras. Special innovations such as 3D cameras in different characteristics, e.g. from companies such as Automation Technologies or VRmagic, line scan sensors from Tichawa, 2 and 4 CCD cameras from JAI, cameras with different interfaces, with special HDR sensors or with industrial housings offer certain benefits for the customer that are very valuable in the addressed applications or markets.
Patrick Gailer, Business Development
Vision 2010: Hall 4, Booth C51

Kappa

No question: GigE Vision as part of a convincing overall concept is offering the biggest customer benefit. We intend to match the customer´s needs: easy integration and ease-of-use. To this end we offer control software, real-time recording and a software development kit, also for Linux. In addition

3D is more and more getting into our focus. Purely hardware: Kappa´s GigE Vision line scan camera series Zelos offers a well thought-through choice of models with HD resolution, 5 Megapixel, WVGA and VGA. Zelos cameras convince at crystal-clear signal quality, clean characterization and precise synchronization – not only solo but even as "identical twins" at the core of 3D systems.

Especially directed at the end customer is the convenient control software. A real highlight here is our new real-time recording. Live sequences (also in HD) can be compressed at full resolution and full frame rate in real-time and can be stored loss-free as high quality video file (H.264, MPEG4).

For integrators naturally the ability for integration has topmost priority. Kappa offers here in addition to the standardized options of GigE Vision/GenICam and Twain an SDK for specific adaptations (also in Linux).
Karl-Heinz Bornemann, Manager Sales and Marketing
Vision 2010: Hall 4, Booth D01

Matrox Imaging

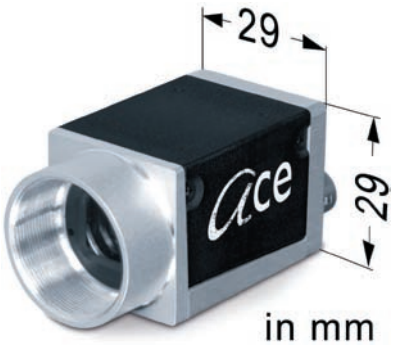
Matrox Imaging believes that customers will realize the biggest benefit by seeing higher frame (read-out) rates, which will reduce the cycle time of their systems. Also, the continual trend towards higher-resolution cameras will allow users to see finer details in their field of view, or allow them to see larger objects without having to move the object under the camera or move the camera above the object.

Pierantonio Boriero, Product Line Manager
Vision 2010: Hall 4, Booth C18

Rauscher

Clearly GigE Vision has become the norm for new developments of standard applications. The interface is well suited for most of the sensors common in machine vision and offers significant advantages like cable length, easy integration, and much more.

Customers benefit from the increasing miniaturization of GigE Vision cameras. In many industries analogue cameras with the small footprint of 29 mm x 29 mm can still be found. New GigE Vision cameras now offer these exact measures and thus allow for the switch from outdated analogue technology to modern Ethernet components without requiring any costly mechanical modifications. In addition to that Power-over-Ethernet (PoE) leads to even more savings: on space, weight and integration effort. With the advance of PoE GigE Vision can now also offer true one-cable-solutions. The Basler ace series offers the 29 mm x 29 mm sugar cube footprint in combination with Power-over-Ethernet. With a lineup of five models the series covers a resolution range from VGA to 5 Megapixel and at the same time advances into a price area that so far has been the home turf of simple low-cost cameras.



With these technical and economical developments the possibilities for deployment more and more increase in new application areas.
Raoul Kimmelmann, Manager Product Marketing
Vision 2010: Hall 4, Booth C15

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Matrix Vision

Customer requirements are as special and individual as customers themselves. So the best innovations are those providing each customer with the shortest time-to-market, the ideal sensor and the most suitable pre-processing system, whilst simultaneously using a standard interface. For this reason, a modular approach for the sensors as well as a library for pre-processing functions are both needed. These can be combined to an attractive and individual product by the manufacturer. The standard interface makes it possible for customers to integrate this individual product without difficulty. In brief: modular sensor front-end + configurable pre-processing + standard interface.

If a customer needs more freedom to use his own processing functions in a camera, smart vision sensors will come into play. Here again, the same modular approach applies: different sensor on the same front-end + configurable hardware options (powerful processor, main memory, etc.) + selectable software modules.

Horst A. Mattfeldt, Product Manager

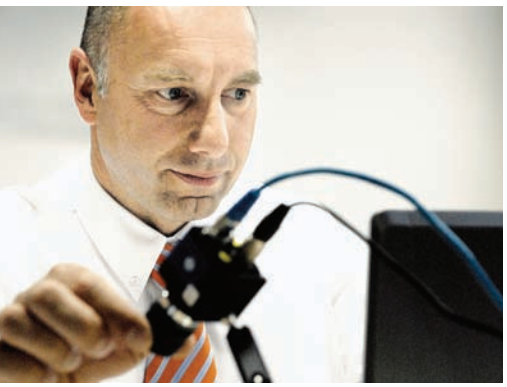
Vision 2010: Hall 4, Booth B31

SVS-Vistek

Digital industrial cameras can be obtained for almost all sensor and interface technologies. Never before has the offering been as rich as it is today. This must be paradise for procurement. The winner is: the cheapest, the biggest, the loudest?

Not at all! A trend to be seen is the yet increasing value of a growing business relationship, becoming invaluable for both partners due to competence, trust and service mentality. Investments do not go up in smoke but experience a trusted sustainability.

As long as technical excellence, like dual GigE output (LAG), highest frame rate, outstanding image quality and I/O functionality are matched with knowledge gained from practical experience and work is offered at prices in line with the market, the increasing benefit of a good business relationship will remain "en vogue."



Performance and scalability of modern industrial PCs is well suited for our high-resolution fast cameras. Additional horse power from GPU or FPGA applets further promote the use of these fast pixel giants. A lot of demanding applications are becoming solvable at an attractive price/performance ratio – this is also a trend for 2011.

Andreas Schaarschmidt, Managing Director

Vision 2010: Hall 4, Booth B35

Lumenera

Users of machine vision cameras will benefit from the new USB 3.0 platform, because the new data interface will make it possible to, e.g., operate ten cameras with a resolution of 1.3 megapixel each from one single USB hub. USB 3.0 will manage these massive data streams from the cameras, and will do so at lower hardware requirements.

With the additional available bandwidth provided by USB 3.0 camera manufacturers are enabled to integrate new sensors with higher resolution and higher frame rates into their systems. One already existing example are HD sensors with 1080p30 and 1080p60, respectively. The bandwidth requirement of these sensors is increasing, especially when transferring uncompressed raw data. USB 3.0 will transfer these data safe and sound. As a result, the user of USB 3.0 cameras will not need costly bus technologies but can employ standard cables and interface boards without having to make compromises on camera performance.

Lutz Schmidt, Director of Business Development

Vision 2010: Hall 4, Booth E 77

Leutron Vision

From our point of view, the biggest benefit for the customer will come from importing intelligence into the camera. The border between digital standard cameras and smart cameras is becoming more and more hazy, image processing within the camera is getting more and more powerful. New PC-compatible cameras with an integrated Atom processor like, e.g., our CheckSight camera series allow the easy outsourcing of image processing to the camera and the standardized integration of the camera into a network. Image processing will be distributed arbitrarily to the cameras, and to additional computers, if needed. Software will be developed directly on the camera. Similar to PC-based systems operating systems like Windows Embedded Standard and Linux are being used. The customer can operate the camera with the image processing software he is used to. A host PC can take over higher-ranking tasks, or can be substituted totally. More cameras can be attached to CheckSight via Gigabit Ethernet. PC cameras open up enormous creative potential for the customer.

Meinrad Simnacher, Managing Director

Vision 2010: Hall 4, Booth B17

New Imaging Technologies

From our point of view, innovation in High Dynamic Range sensors (HDR) for HDR cameras is one of the biggest benefits for the customer. Capturing images with rich details in brightness over a high range of local intensities has been a big challenge for ages. Until now, in order to obtain a high details level, classical HDR sensors with multi-slope-integration are used, but they require complex settings. Moreover, these settings are often defined for a certain kind of light conditions: changing the working environment implies a new configuration and new settings.

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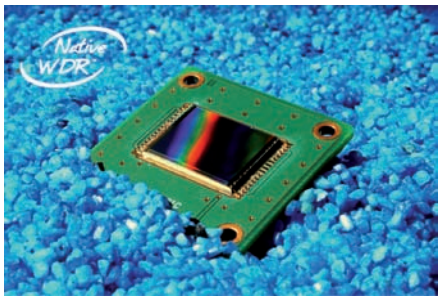
SEEING IS BELIEVING

Which camera innovation will from your point of view bring the biggest benefit for the customer?

With a logarithmic approach, these troubles are completely out of customers' mind. These new native WDR (Wide Dynamic range) sensors have a natural and intrinsic high dynamic response, like a human eye, and they offer pleasant images with high contrast even under high illumination and without the need of external control. No saturation and no contrast losses whatever the environment. Considering their extreme ease of use, customers can quickly design highly reliable smart cameras for industrial applications, robotic welding or outdoor applications.



Nicolas Baroan, Marketing & Sales Engineer
Vision 2010: Hall 4, Booth E35

Optronis

Future High-speed imaging applications will include different camera technologies and data acquisition systems: Acquisition, detection and analysis of a fast moving process is performed by the completely new TimeBench software. The software integrates high-speed cameras of the Optronis CR series and, independent of the Optronis camera technology, GigE cameras with CVB (Common Vision Blox) interface and DAQs (Data Acquisition systems). Optronis goes with the TimeBench Software a new, innovative way that was up to now reserved for complex and individual systems. Optronis spotlights with TimeBench the interaction of different camera technologies and data acquisition systems to completely and time-synchronously acquire, analyse and report complex and fast movements.

Dr. Bernd Reinke, Product Manager
Vision 2010: Hall 6, Booth D33

Adimec

The machine vision inspection industry has always demanded high resolution image sensors at increasing speeds for their high end inspection camera systems. An ever increasing need exists also for less bulkier, easy to handle and more cost effective interfacing. In contrast to existing and emerging interfaces CoaXPress supports these trends in all aspects. Adimec believes that the new CoaXPress standard will open up new dimensions to the industry for using cameras within Vision based applications. For example, HD (1,080 p – 60 fps) real-time video via one coax cable and slip-ring with endless rotating camera. At Vision2010 Adimec is presenting such camera solutions that increase the productivity and cost-efficiency of inspection systems.

Joost van Kuijk, VP Marketing & Technology
Vision 2010: Hall 4, Booth D19

Fast Vision

At FastVision, we believe that continually improving smart cameras potentially brings the most benefit to the customer. At the same time, the return on investment (i.e. total cost of ownership) for more expensive and powerful smart cameras is an important consideration when making a purchase. Unless there is a justifiable return on the investment in a high speed smart camera, developers and engineers will continue to rely upon intelligent frame grabbers and integrated subsystems to allow for the development of prototypes and deployment of lower performance applications.

Candace Clemens, Sales & Marketing
Vision 2010: Hall 6, Booth A32

Basler Vision Technologies

We at Basler think that users of machine vision technology will directly benefit from the current trends in the camera field. Here, product innovations in the area of Gigabit Ethernet cameras will be of special relevance. In the segment of mainstream cameras with data rates below 100 MByte/s we see the biggest customer benefit in the fact that with new inexpensive Gigabit Ethernet cameras and a compact form factor finally the replacement of classical analogue technology by superior digital technology is possible at attractive cost. This will lead to the increased use of high performance vision solutions also in cost-sensitive applications as well as in space-restrictive environments.

Apart from that we expect that also the users of cameras with higher resolution and/or higher frame rate can count on significant cost improvements in the foreseeable future. This will be made possible by the substitution of relatively higher cost CCD image sensors by lower cost but at the same time high performance CMOS image sensors. In com-

bination with the distinctively smaller footprint expected for this camera, new commercial and technical playgrounds will open up for the user.

Dr. Dietmar Ley, CEO

Vision 2010: Hall 4, Booth B59

Xenics

Xenics has developed a unique high-speed linescan camera in the SWIR range for machine vision, medical and scientific applications. The main feature, which makes this linescan camera unique, is the combination of its high resolution (1 x 1,024 or 1 x 2,048 pixels) with the smallest pixel pitch of 12.5 µm. This enables smaller particle detection and provides the user more detailed information than other systems.

The main benefit for the customers is in fact that these resolution levels could only be obtained using complex multi-camera solutions. Use of the Lynx camera not only makes these types of setups simpler, but also much cheaper than before.

Koen Jacobs, Sales Support

Vision 2010: Hall 4, Booth E82

The Imaging Solutions Group

The Imaging Solutions Group believes that High-integration Camera Technology is the biggest benefit for customers. ISG's new Plus Smart Camera Family is one example of this innovation in camera design. The ability to offer multiple interfaces on a single camera offers unparalleled flexibility. The Plus camera family will support GigE Vision, USB, NTSC and CameraLink interfaces in a single package.

Highly integrated intelligence has been designed into the camera. The cameras will have a workstation class high-performance Linux CPU and a large FPGA. External triggering and strobe functions are integrated along with a NTSC Composite Video Output and two USB2 interfaces. Additionally, the ability for customers to program advanced imaging algorithms in C++ and run them on a high-performance Linux CPU offers easy customization and video analytic capabilities. A very low-noise analog front-end and the Kodak CCD's will offer stellar image quality.

The Plus Smart Camera family will find uses in traditional machine vision, security & surveillance and other government and military applications.

Kerry Van Iseghem, Founder

Vision 2010: Hall 4, Booth B75

Contact

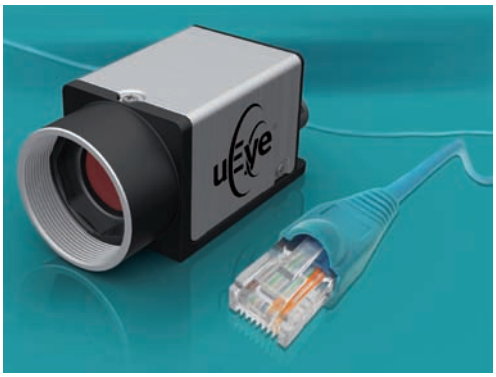
www.adimec.nl, www.baslerweb.com, www.baumer.com, www.fast-vision.com, www.framos.de, www.isgchips.com, www.kappa-vision.com, www.leutron.com, www.lumenera.com, www.matrix-vision.de, www.matrox.com/imaging, www.new-imaging-technologies.com, www.optronis.com, www.ptgrey.com, www.rauscher.de, www.stemmer-imaging.de, www.svs-vistek.de, www.vrmagic.de, www.xenics.com

Wherever the Journey Goes

New CMOS Sensors Conquer CCD Applications

Easier to handle and more compact and powerful: These are the characteristics new camera models should have when introduced to the market. Thereby, the cameras' performance is pushed by the developments in the consumer market. One consequence is the availability of new CMOS sensors with a resolution of 1.3 megapixels and global shutter technology. According to first tests, these sensors exceed the light sensitivity of existing sensors. Does this mean that CCD cameras are now becoming redundant?

The camera specialist IDS is about to introduce its new series GigE uEye CP. The models are more compact, link the simplicity of USB with the performance of GigE and are based on innovative CMOS sensors.



The new uEye camera series GigE uEye CP offers plug-and-play comfort and needs only one cable: Power and data transmission can be supplied with the same cable

The "C" stands for compact and is the camera's most striking feature. With a cross section of 29 x 29 mm and a length of just over 4 cm, the tiny model is amongst the smallest in its range. The "P" stands for the technology Power over Ethernet. Thus, the camera's power can be supplied via the data cable.

"As a USB camera manufacturer, we wanted to link the simplicity of USB with the performance of GigE. This is what we have done with the GigE uEye CP: It is connected with just one cable and offers genuine plug-and-play convenience – that is to say it feels like USB with all the advantages of Gigabit Ethernet," explains Product Manager Daniel Diezemann.

And indeed, the camera behaves in exactly the same way as its USB sister models: It is connected to the PC with a single cable and, after a few seconds, the uEye camera manager displays the model. At IDS, however, plug-and-play means more than just being able to connect a camera quickly: "As an example: for us, industrial suitability means that cameras can be unplugged and plugged in again during operation – and the camera continues to work without any problems."

New CMOS Global Shutter

The manufacturer has fully equipped the first three models with CMOS sensors, which can cover a broad application spectrum. This includes a high-resolution model with a 5 megapixel image capturing device from Aptina and a fast camera, whose WVGA sensor transmits up to 100 full frames per second. However, it is the third model which promises the greatest success: The UI-5240CP has a brand new CMOS sensor, which offers a 1.3 megapixel resolution as well as

a global shutter as a special feature – a first for this type of sensor.

The new sensor is not just fast – it offers 50 frames/second in the GigE uEye CP model – but according to tests at IDS, it also exceeds the light sensitivity of previous CCD sensors.

"We are currently seeing great progress and interesting developments in CMOS sensors," explains Diezemann. "They are increasingly penetrating fields of application which were previously reserved for CCD cameras. This market is naturally strongly influenced by products in the consumer sector – however, industrial camera manufacturers can benefit from this. For example, the resolution of CMOS sensors is currently rising rapidly – the pixels are becoming smaller and at the same time manufacturers are developing new methods of increasing light yield. All cameras include video functions as standard, which means that sensors are becoming faster. The CMOS technology also enables simple image pre-processing functions to be carried out directly at the sensor."

A Single Flexible Solution

The 1.3 megapixel sensor from e2v, recently introduced in industrial cameras for the first time by IDS, combines many of these features. Thanks to the global shutter mode, the affordable CMOS sensor is suitable for many applications which were previously reserved for more expensive CCD models or required powerful flashes. The maximum frame rate of 60 frames/second in high end GigE uEye HE camera models and a fast 12 kHz line mode will find many applications in the fields of automation and inspection. The exceptionally high light sensitivity and good color reproduction open up further possible uses, for example in microscopy.

Many users will also appreciate the flexible additional functions of cameras with the e2v sensor: multiple areas of interest (AOI) within one capture, integrated hot pixel correction, and virtually stepless digital scaling offer genuine added value.

These examples also illustrate how the camera market is developing, in particular for CMOS models: the individual camera gains increasingly more options and functions. Where previously several different models were required – for example, for high-resolution area and fast line applications – these different tasks will in future often be carried out by a single flexible CMOS camera.

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Highly Coveted

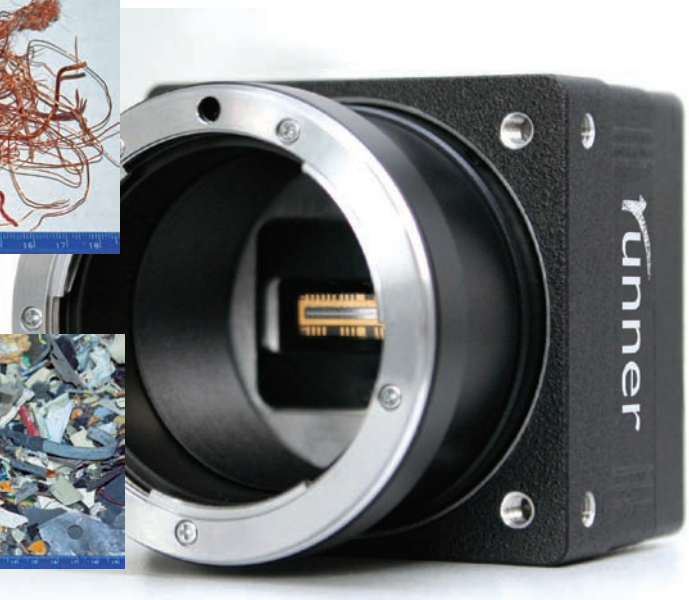
GigE Line Scan Cameras in Sorting Machines Identify Valuable, Recyclable Raw Materials

Metals, but above all copper, are highly coveted raw materials. This is due to the sharp rise in prices of semi-precious metals and is reason enough to search trash for valuable raw materials. Now, an electro-optical sorting machine with GigE line scan cameras helps to correctly separate all kinds of materials.

Recycling is a booming market. Some materials are sorted in order to dispose of them correctly, others to reuse them. Very often, this fails due to insufficient separation of waste. That is why manufacturers like the specialist MSS company in the USA are developing their sorting machines on an ongoing basis. They are working on the machine's availability and reliability as well as on the reduction of personnel costs. MSS has been selling automated optical sorting equipment for the recycling industry (paper, plastics, glass, metals, electronics scrap) for 35 years. One of their recent developments for color and shape sorting of small particles is the [L]-VIS system, which uses Basler's runner GigE color line scan cameras to optically sort the particles and to make them available for recycling purposes.

Copper pieces after the sorting process

Unsorted raw material before it enters the system



Basler's GigE line scan camera runner is an ideal fit for the sorting of small particles

Is It Copper or Not?

The main challenge for any optical identification and sorting technology in recycling applications is that the processed particles are of highly irregular shape and size. For example, when sorting shredded electronic scrap particles, a long and thin single-stranded copper wire needs to be identified just as correctly as copper as does a randomly shaped piece of flat copper plate. Or, a heavily populated piece of circuit board still needs to be correctly detected even though not much surface area showing the circuit board's specific color is available for proper identification. In addition to the appropriate hardware components such as the camera itself, the main emphasis lays on proprietary image processing software that is much more complex than an off-the-shelf machine vision software package for conventional inspection and sorting processes.

Standardized Setup and Procedures

Just as most other optical sorting systems, the [L]-VIS system works like this: The incoming mixed material stream is

sized and metered properly, then spread over the full width of the optical sorter in a single-layer configuration. A vibratory feeder is used, which also helps to pre-accelerate the particles as they are spread. Depending on the application, the material stream then either enters a fast moving conveyor or a steep slide that accelerates the particle flow to about 2.5 m per second. At that speed, the particles travel through the sensing zone, sometimes thousands of them per second over the full width of the machine. Immediately following the sensing zone, one or two rows of air ejectors are used to divert the targeted materials away from the main material stream. Depending on the material stream, a positive sort (ejecting the desired fraction) or a negative sort (ejecting the non-desired fraction) is performed. Special requirements apply to the magnetic valves that activate the air injectors. They must react quickly (turn on and off within 5 ms) to avoid material loss. At the same time, they must be strong enough to move heavier round pieces of material such as brass that offer only a small surface area for the air injectors to act on. The imaging software is challenged too. Thousands of different small pieces must be checked for color, size, and form in real time because the air injectors are placed only a few centimeters past the sensing zone. This short distance is needed to avoid turbulences or shifts in the material's position between recognition and exfiltration.

Challenges for the Camera System

Optical sorting machines require precise spatial alignment, high data acquisition rates, high color bit depth, and ultra-fast, real-time numerical processing. The optical sorting in this application requires the acquisition of approximately 10 million color pixels per second while using minimal CPU resources. Recycling systems are usually large and wide. Therefore, GigE cameras are a good solution because they provide cable lengths of up to 100 m from the camera to the PC. The camera alignment in optical sorting systems can vary dramatically and normally depends on the specific task, i.e., what type of material is being processed and sorted. Detailed questions are, for example: Is the identification performed on a dark/black background (which causes reflection) or on a white/clear background (transmission or transflectance is the consequence)? Is the identification performed on a fast-moving conveyor, steep slide, or in mid air? Which illumination techniques will be employed, such as LEDs, halogen lights, etc.? These questions and more must be individually clarified to determine the optimal setup. With the Basler runner color line scan camera, MSS has found an ideal solution.

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In the Footsteps of Da Vinci

A New Class of Camera Systems Simplifies Machine Vision Integration

The use of machine vision solutions is still often severely restricted by the non-trivial integration of individual components. Limited by system integration constraints, these components are no longer capable of performing their full potential. Now, a new class of camera systems – the IVS (Intelligent Vision System) – is to change this situation and to revolutionize machine vision.

Today, Leonardo da Vinci is regarded as one of the greatest geniuses of all times. He worked as a painter, sculptor, architect, engineer, anatomist and nature-philosopher. Many of his works are world-famous, like the portrait of the Mona Lisa or his anatomical studies. He also created the saying "Simplicity is the Ultimate Sophistication." Precisely these words have become the mission statement of the company Ximea for their goal to facilitate machine vision systems. The construction of machine vision systems and solutions is still a complex and non-trivial business, limited by system integration constraints. The necessary components, like camera modules, PC based imaging systems, PLC, further accessories such as lighting, shutters or servos, tend to lose their full potential in the system as a whole. As one of the results, systems cannot be miniaturized sufficiently. But how is this translated into Ximea's products ranging from subminiature USB Cameras, high-end X-ray cameras to low light and multispectral cameras? Which sophisticated design can meet the needs of thousands of imaging and machine vision professionals and defines simplicity?

Accepting the Challenge

The answer is the Currera camera system family, which was first introduced at the Vision 2009, trade fair for machine vision, by Softhard Technology. At the time, the managing director Maxim Larin pointed out:"Referring Currera simply to a smart camera is misleading, it is much more. This new device is an intelligent vision appliance which by itself is an absolute new class of camera system." And this new class bears the name IVS, Intelligent Vision System. Ximea's managing director Dr. Vasant Desai explains the concept: "Apart from having all imaging components just millimeters apart and all the benefits resulting from that, e.g. fewer cables and connectors, reduced power requirements, no interface hassles, no unnecessary protocol overheads etc., the main difference is really quite a revolution. By actually fusing the components, the whole load of image acquisition requires less than 1% of the embedded CPU's resources. An FPGA writes the image data directly to PC memory."

Solution seekers can now interact with solution providers. In addition to offering off-the-shelf applications, both customers and suppliers can enter into remote desktop sessions analyzing, building, tuning, or test-running the problems and respective solutions right on the target machine. Moreover, Ximea aims to establish an open moderated online community. Customers will be encouraged to contribute their cases, solutions and examples, helping each other in this manner so as to implement a robust imaging system within the shortest time possible.

Complete Package

The camera system integrates a full industrial Intel Atom based PC in a very small housing with a full set of interfaces for external vision applications including GigE, USB, and serial etc. Also preinstalled are the executable code, including ready-to-go demo solutions from various solution providers, an abundance of imaging libraries, preinstalled drivers and a full development environment. It runs standard operating systems like Windows XP or Linux.

Getting to Know the Founders

To exploit the full potential of this and further new designs, Softhard decided to partner with Delaro and co-founded the company Ximea GmbH in Münster, Ger-

many, in July 2010. Ximea has the full access to all technologies owned by Softhard, personnel, technical know-how and all resources of Delaro. The company will develop, manufacture and distribute components and systems in the field of digital image acquisition, analysis and processing as well as provide services for customer support. Ximea products are distributed directly from the company's website together with transparent order and shipping conditions.

For the realization of the company's targets, Ximea relies on the experiences and achievements of its founders:

Dr. Vasant Desai has been active in the field of image processing since the mid-eighties. He was the founder of the company Soft Imaging System. Desai sold the company with more than 180 employees, four subsidiaries in the US and further branches in Asia and Great Britain successfully to the international operating Olympus Group in 2004. In 2006 he resigned as the CEO of the company and has since been working as an investor and entrepreneur for Delaro; he is also involved in various capacities in other companies and ventures. Desai is highly qualified in creating scalable businesses.

Maxim Larin started his professional career in the early eighties in the development of hardware-controllers and drivers for operating systems for a variety of different computer systems, from PCs to mainframe-supercomputers. He was involved in various hardware and software projects such as crystallographic and electron diffraction based image processing software, USB and Firewire-CCD cameras as well as multi-spectral, DSP-driven surveillance systems. Larin has the edge, when it comes to transforming leading edge technology into products.

Vjaceslav Klimkovic developed his first PC, based on a LSI11-compatible micro processor, in 1981. The equipment of this PC included several peripheral devices such as wireless touch-keyboards and high-resolution monitors. Since then he has created hundreds of hardware devices, like video-frame-grabber, scientific CCD- and X-ray cameras as well as intelligent software algorithms such as real-time FFT and super-resolution-image enhancement. Klimkovic's greatest talents are miniaturizations: pursuing the maximum function on the smallest space at the lowest power consumption.

Ambitious Goals

Based on the know-how of these imaging industry veterans with proven track records and high reputation, Ximea is aiming to provide vision system builders and system integrators with a unique tool for solving complex tasks while consuming significantly fewer resources, following da Vinci's lead of "Simplicity is the Ultimate Sophistication."

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Technology for Champions

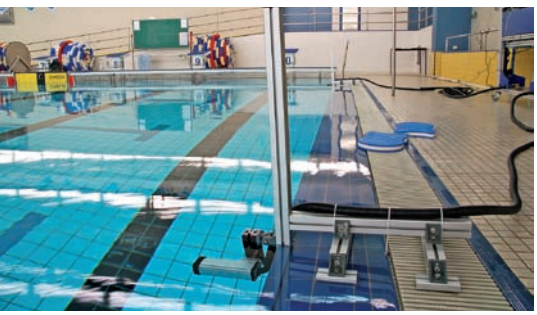
Robust Protective Enclosures for Underwater Cameras

Machine vision systems are not only used on the factory floor but are now also gaining ground in non-industrial applications, e.g. in competitive sports, where they often need to be adapted to unusual environments. The following article explains how suitable protective measures can be used to implement even underwater applications.

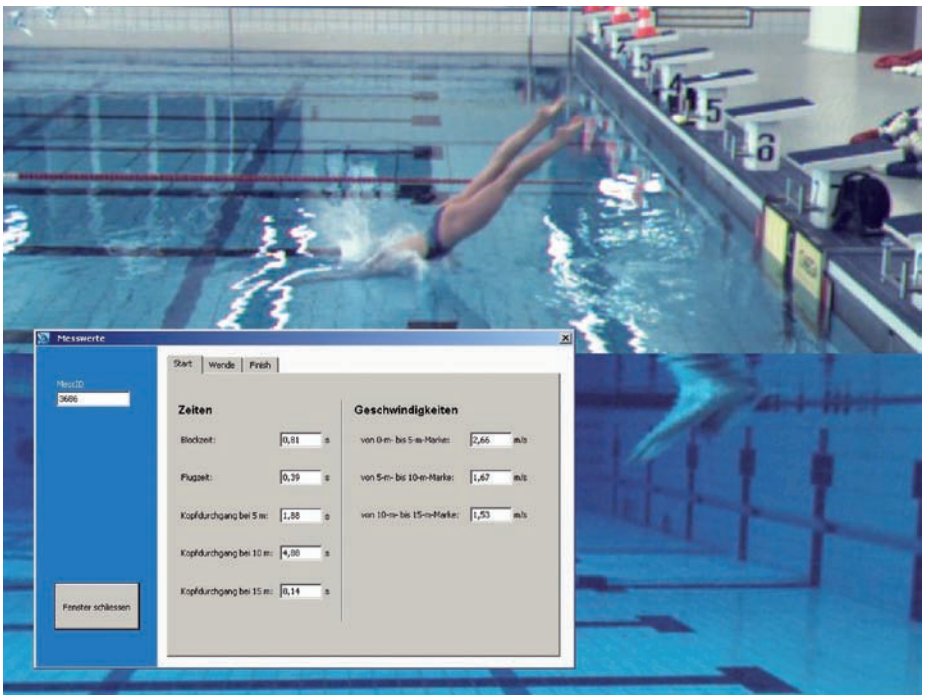
Swimming pools are a hostile environment for technology: low temperatures, humidity, spray water, chlorine, and ozone can harm all installed components. These conditions become even more complicated when cameras must be equipped for underwater use. This is the case at the German Olympic Training Center for the Rhine/Neckar region, where a flexible measuring system is used to monitor and analyze the starting and turning technique of swimmers. For that purpose, two cameras are installed above the surface and two cameras are installed underwater, situated at the starting block and at 5, 10 and 15 m distances. The underwater cameras are installed at a 0.5 m depth. The measuring system is used for up to 10 hours at a time.

Starting and Turning Measuring Station

A measuring system developed by tupitec Software allows users to record and analyze the starting and turning phases which are essential in competitive swimming. The measured time and speed parameters comply with the standards of the German Swimming Association. The measuring system consists of four cameras (FireWire cameras from Basler), contact mats on the starting block and at the side of the pool and a signal horn. During start monitoring, a distance of 15 m is monitored, while 2 x 15 m are recorded for the analysis of the turning technique. These distances are divided into three parts: the starting and turning area (0–5 m) is simultaneously monitored by one camera underwater and one above the surface, while the other areas (5–10 m and 10–15 m) are monitored by an underwater and an above-surface camera, respectively. The digital cameras enable recordings with a maximum frame rate of 100 Hz. A PC-based measuring station, which can be installed directly at the side of the pool, enables the analysis of the recorded data. Various analysis tools developed by tupitec and an extensive database facilitate diagnosis. Measuring protocols and videos can be exported in a wide range of formats.



▲ Starting and turning overview: the start, the diving phase and the first underwater phase are recorded synchronously by one camera underwater and one above the surface. Further phases are monitored by single cameras.



▶ Recording and analyzing the starting technique at the measuring station: a split screen shows the swimmer diving underwater and above the surface.

Salamander enclosure with a lighting holder

Well Protected under Water

The underwater cameras are installed in compact, reliable Salamander enclosures from autoVimation which provide IP67 protection. Protective conduit tubes for cables and separable cable glands ensure that cables and plug combinations with a maximum diameter of 23 mm can be routed into the enclosure without water ingress. The units provide reliable protection: "We have been employing Salamander housings for approximately six months and are very happy with the results," says Dr. Markus Buchner, managing director at tupitec. "The enclosures are much more compact, more robust and more reliable than the units we used to manufacture before, which required a lot of time and effort. Operation is smooth and trouble-free – there is no condensation inside the enclosures, and there are no air bubbles at the windows." Moreover, the whole system can be disassembled for transport, and thus be used in training camps worldwide. For that purpose, autoVimation has delivered special new back walls with single cable glands for the enclosures. These have proven to be especially watertight, which means that conduit tubes for cables are not required during mobile use.

Salamanders for Compact Cameras

Enclosures from autoVimation's IP67-protected Salamander series, which are also used by various Dutch Olympic Training Centers for similar purposes, were developed for small compact cameras with cross sections between 29 x 46 mm and 38 x 38 mm. Measuring only 66 x 66 mm, the enclosures are suitable for installation in tight spaces. Just like their "big brothers" from the Gecko enclosure series, Salamander enclosures are available in various lengths starting at 140 mm. Thanks to a patented quick lock and heat guide system, cameras can be easily installed in the enclosure. These mounting elements also serve to dissipate heat to the outer housing which then acts as a heat sink, effectively cooling the camera. Within the enclosure, the camera can be positioned anywhere along its central axis and at any required angle. A wide range of mounting brackets allows users to adapt the camera installation to any application.

Salamander enclosures are based on the standardized "Mechanical Machine Vision Interface" developed by autoVimation, which allows for all compatible machine vision components to be connected directly with the enclosure. Dedicated lighting holders, which require a lot of effort to manufacture, are therefore no longer necessary. The Salamander mounting block is available as an alternative for compact cameras in applications where no IP protection is required.

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A New Level

High-speed Invariant Pattern Matching

One of the core capabilities of any machine vision software is pattern matching. Many new methods have been proposed and published already by the research community, each of which being suitable for a specific class of patterns, having its own characteristic strengths and weaknesses.

Traditional industrial machine vision still often assumes homogeneous backgrounds and uses simple thresholding for the purpose of segmentation. A more general technique is the normalized grayscale correlation (NGC). While for some tasks still being a good choice, most modern pattern matching software operates on edge-based representations. These significantly reduce the amount of data to be processed and furthermore allow efficient sub-pixel processing. The main disadvantage of edge-based approaches is, however, that scale invariance and invariance to perspective skew are offered only to some degree and are achieved at the expense of lower processing speeds.

For many years, pattern matching on the basis of local point features has been applied in robotics research. This fundamentally different approach started to become popular with the Scale Invariant Feature Transform (SIFT). Only recently, pattern matching based on point features has entered industrial machine vision software, such as the descriptor-based matching as part of MVTec's Halcon software.

High-speed Pattern Matching

Keyetech aims at taking pattern matching based on point features to the next level. Thus the Keyetech Texture-based Recognizer allows matching complex patterns with sub-pixel accuracy at frame rates of up to 100 Hz. This achievement is due to the Harris-SIFT features, developed by Keyetech CEO Dr. Pedram Azad, and the exploitation of all available technology offered by current computer hardware. On CPU level, SIMD instructions (single instruction, multiple data) and multi-core technology are fully exploited. Optionally, a GPU version is available for achieving maximum speedups of up to a factor of 30. This approach is based on the philosophy that optimization is a lot more than a low-level engineering skill, but requires profound understanding of all involved levels: the

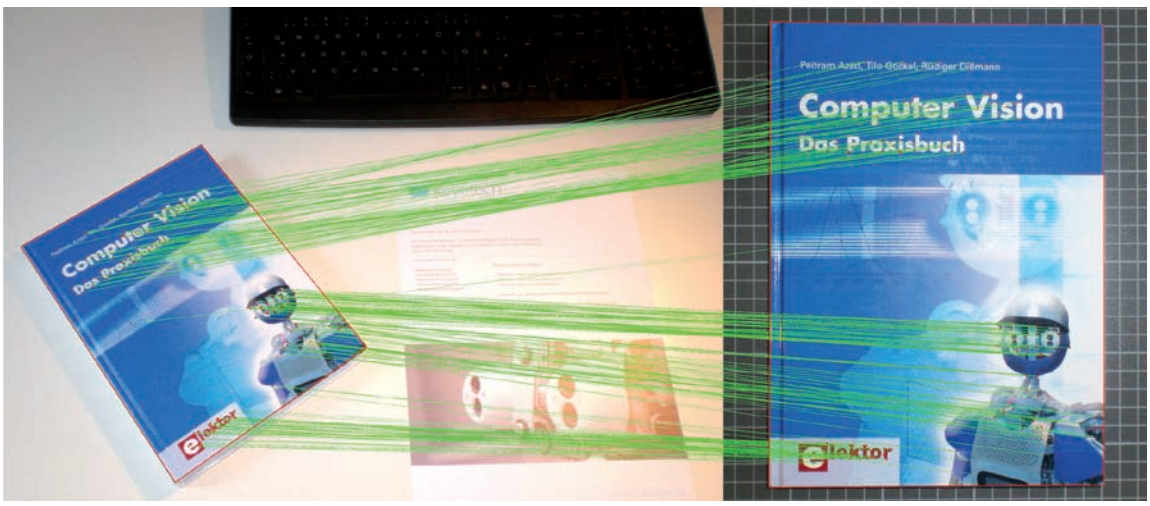

Fig. 1: Recognition and localization result computed by the Keyetech Texture-based Recognizer. The red frame visualizes the localization result; the green lines visualize the computed feature correspondences.

Fig. 2: Recognition and localization of different objects. For 3D objects, the 6-DoF pose is computed with the Keyetech 3D Extension.

approach, relevant algorithms, the implementation, and the hardware. Only then it is possible to develop optimal solutions in a holistic sense.

Texture-based Pattern Matching: How Does It Work?

"With the Texture-based Recognizer, we target to offer the optimal and universal tool for pattern matching based on local point features," says Dr. Azad. He understands the term "texture-based" in the sense that the patterns to be matched must contain a sufficient amount of textural information in the form of corner-like features. Each sub-pixel corner in the image is internally represented with a so-called descriptor, which allows for efficient feature matching. Recognition and localization take place on the basis of matched features and are invariant to all possible perspective changes of a planar pattern, including scale, and to changing lighting conditions (see fig. 1).

Intuitively speaking, matching a complex pattern is broken down to matching a set of puzzle pieces, while enforcing all present geometric constraints. Already five feature correspondences can yield a verifiable recognition result. Another strength of this approach is that it is naturally robust to occlusions, as already a small subset of successfully matched features is sufficient for reliable recognition and localization.

Going to 3D

Pattern or object localization in 3D means to compute the full 6-DoF (degrees of freedom) pose in 3D space, consisting of a 3-DoF position and a 3-DoF orientation. For many applications the pose can be reduced to a planar pose with 3 DoF, consisting of a 2-DoF position and a 1-DoF rotation within the plane of interest. In both cases the observing camera must have been calibrated beforehand, i.e. the parameters of the projection must be determined. 6-DoF pose computation requires a full camera model that specifies the projection from 3D space to the 2D image sensor. For 3-DoF pose computation, a simplified camera model is sufficient, which specifies the projection from a 2D plane (in 3D space) to the 2D image sensor.

Keyetech offers a 3D extension for the Texture-based Recognizer, which directly computes the 6-DoF or 3-DoF pose for a recognized object, given a single camera image only (see fig. 2).

Software Interfaces

All software by Keyetech is implemented with the Integrating Vision Toolkit (IVT, ivt.sourceforge.net) – an open source C++ computer vision library originally developed by Dr. Azad at the Karlsruhe Institute of Technology (KIT), now being maintained and developed further in cooperation with Keyetech. The IVT has been especially designed for industrial applications: It is reliable, efficient, easy-to-use, stand-alone, and platform-independent. The IVT offers its own GUI toolkit and its own camera interface. Ready-to-use camera modules are available for various cameras. Keyetech's software products are offered in form of dynamic libraries for the operating systems Windows, Linux, and Mac OS X.

Manifold Applications

The Keyetech Texture-based Recognizer is suitable for various applications, such as industrial automation and robotic manipulation, but also for instance image retrieval. Once a pattern is trained, it can be recognized and localized in images of arbitrary resolution, with even up to 20 megapixels and higher.

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Software Trends: Where Will the Journey Lead?

INSPECT Survey among the Software Providers at Vision 2010

The annual market data survey conducted by the EMVA (European Machine Vision Association) points out two significant trends for machine vision software in its current edition: software for 3D applications is on the rise and the support of multi-core processors is required. In the run-up to the Vision 2010, leading trade show for machine vision, we have asked the exhibitors about the trends they see for machine vision software.

On the following pages you can read about the individual focus of the exhibitors and what they decided to share with us in answering the following question:

> Which developments can be expected in the area of machine vision software and how will the user benefit from these developments?

NeuroCheck

Allowing the user access to the functionality of modern multi core processors within our software is an important task in our software development. This not only applies to the standard parallel processing of algorithms during image evaluation but by considering a more intelligent architecture overall we have leveraged multi-core functionality in another vital part of our current NeuroCheck software: the user interface and the digital communication for process control – both now utilize the new processor technology. Our customers benefit with shorter cycle times, attractive and ergonomic graphical visualizations and vastly improved handling of the system during operation.

We also focus on improving the integration of our image processing system into complex, networked production facilities. We aim at reducing deployment time with extended interactive configuration functions due to the increasingly important aspect of „time to market“ for installing modern machine vision solutions.

Christian Demant, Managing Director
Vision 2010: Hall 4, Booth D61

Stemmer Imaging

To keep the imaging application independent from the acquisition hardware is an important step towards a guaranteed future. This is something that Common Vision Blox has achieved since 1997 and that was also taken into consideration within the GigE Vision standard. Not least, this feature of the standard is the reason for its acceptance.

Based on the GigE Vision standard we see a tendency towards systems with multiple cameras. PC systems with more than ten cameras are now considered normal. This trend shows users of 32 Bit operating systems quite fast the limits of the addressable memory. This is the reason why 64-bit versions of Windows 7 are more and more used. With the CVB CameraSuite WIN64 from Stemmer Imaging users get a powerful GigE Vision SDK for this operating system.

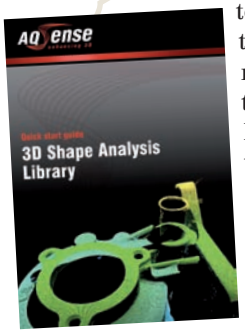
The independency of the GigE Vision standard makes this technology also ideally suited for use with 64-bit versions of Linux. With the CVB CameraSuite Linux64 an independent SDK for GigE Vision cameras is available now, so that users are no longer dependent on proprietary drivers. We think that the trend towards Linux as an operating system for imaging applications will continue due to these reasons.

Peter Keppler, Sales Manager System Solutions
Vision 2010: Hall 4, Booth C51

Aqsense

Still today, 3D technology is at its very beginning in our industry, even though other fields (reverse engineering or metrology) strongly rely on 3D since long ago. In order to embed 3D machine vision in production line applications, three conditions must be met: robustness, speed and ease-of-use.

Any piece of software must have very high levels of robustness when a production process depends on it. As well, sufficient working speed must be met, according to the specifications. Ease-of-use in 3D, according to the youth of the technology in our field, must be achieved through the adoption of simple programming concepts, by not conveying to the system integrator the overload of a very steep learning curve with totally new concepts they never saw before. However, straightforward, conceptually clear training must be provided.



For Aqsense meeting the three conditions is our normal working way, providing, as well, training and consultancy services. The adoption of easy-to-use 3D technology will enable applications impossible to solve today, or making some current applications much easier, by simplifying coding and lighting to the minimum, yet providing solutions to complex tasks.

Dr. Josep Forest, Technical Director
Vision 2010: Hall 4, Booth E58

Cognex

Both areas – hardware-independent software and software optimized for vision hardware – are developing rapidly. These development strands should not be considered separately. There are a lot of synergy effects.

Really groundbreaking new vision algorithms are rather not to be expected. Instead, software development will be seen for making the total process of a vision solution – planning, integration and service – more convenient, safer, faster and more economical. The communication platform Cognex Connect of Vision Pro, e.g., enables the integration of any image source from either frame grabber or direct connect camera via GigE, FireWire and USB in a very easy manner. The platform supports almost all commonly used PLC, MMI, robot controllers and fieldbus systems. Whole networks of various vision components can be built.

A strong trend can be seen in integration of high performance vision software directly into the ever-smaller vision hardware. Ever higher performing and customized hardware enables huge synergy effects with directly integrated optimized vision software. The portfolio of easy installation, operation, programming and process integration offered in this way is easy to grasp for the user as far as technology and cost-effectiveness is concerned. In this way, ID readers of the DataMan series with ID software 1DMax and 2D Max and the unique liquid lens technology enable highest flexibility in applications as well as much more compact integration.

Torsten Zöller, European Marketing Communication Manager
Vision 2010: Hall 4, Booth D63

Which developments can be expected in the area of machine vision software and how will the user benefit from these developments?

Silicon Software

The last generation of industrial cameras integrated sensors with an enhanced spectral range and new combinations from various sensor types. These ones enable the parallel use of different analysis methods for an inspection task which in turn methods increases the quality assurance. The Machine Vision software has to guarantee to process the higher amount of image data, as well as to analyze the synchronous images in parallel. The announcements of Machine Vision components with new high speed interfaces require new strategies to process even higher amounts of data. Modern image processing software supports extensive and complex calculations by use of all available hardware resources more efficiently. Hereby the user approaches a 100% quality inspection and distributes computationally intensive tasks to specialized processors.

The industrial use of inspection systems requires robust and powerful algorithmic in machine vision software. Influenced by temporal changes in systems, contamination or changing illumination conditions, the quality of inspection will be lowered. Self adjusting or intelligent algorithms reduce the need of a repeated calibration, followed by a temporal system shutdown. 95% of applications use a binarisation. Especially in these cases, the use of an adaptive method will guarantee a constantly high detection quality and is an ideal base for successive image analysis. An automatic exposure control of the camera won't guarantee most requirements on allowed time condition.

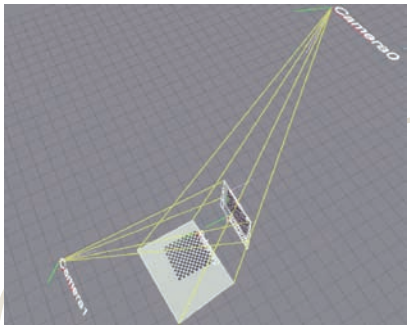
A further important application field is the object segmentation. Only powerful algorithms ensure the detection of all relevant parts of the image with attributes of an object, which are filtered and reduced in quantity by feature lists. The use of adaptive image processing algorithmic will shorten the time of system integration and programming of manual readjustment.

Michael Noffz, Marketing Manager
Vision 2010: Hall 4, Booth D72

Rauscher

Apart from enlarging the range of functionality another core aspect of modern software development is always time. How much time is needed for the development of the application solution? And how much cycle time will then be needed to solve the task in the industrial environment?

Release 2 of the Matrox Imaging Library MIL 9 provides new functions for shortening the development time. Convenient tools like MIL Bead Inspection simplify the quality control of adhesive beads by automatically generating the inspection areas, tracking and tracing them image-to-image and performing automated image analysis. Interactive GUIs like those for MIL Color Analysis or MIL GigE Vision Assistant, respectively, support the user in design, evaluation and optimization of new applications.



Especially 3D applications show the performance hunger of modern image processing: the generating of calibrated 3D data (reconstruction) as well as the 3D matching of clouds of points demand very high computing performance.

In tasks as demanding as these the user benefits as well from the extension and optimization of the algorithms and from the new software technologies as, e.g., Distributed MIL for the distribution of applications over several PCs.

Raoul Kimmelmann, Manager Product Marketing
Vision 2010: Hall 4, Booth C15

Tordivel

I believe that 3D machine vision is the most important development in machine vision software at the moment. In 2010 we do not recommend 2D robot vision anymore. I believe that 3D camera calibration is the next fundamental advance in machine vision after the invention of pixel based processing and sub-pixel measurement. This makes 2D robot vision obsolete when you know better.

There will be advances in 3D camera calibration. The procedures will be automated to improve the accuracy and the reliability. This automation will also significantly reduce the time to recalibrate a system. The different methods for calibration will also be improved. We believe that the ease of use will favour the methods using reference objects from the more academic approaches of chessboard pattern calibration.

The best 3D machine vision systems will never crash or fail. This means that they will never output a result which is wrong. Based on the redundancy in a 3D stereo vision system there should be reliable quality data available. When the quality is bad the system will not output void data but indicate that something is wrong to enable the master system to act in accordance.

In 3D robot vision there are great productivity gains from a more reliable and accurate machine vision infrastructure. With a 3D system 99.9% location rate or better can be guaranteed. Improving the accuracy 10x with 3D sub-pixel measure-

ments can increase the value of a system or lower the hardware cost significantly or maybe make new innovative designs feasible.

All in all the value of a good 3D solution can be much greater and in many cases the total cost of ownership is significantly lower than a traditional 2D solution.

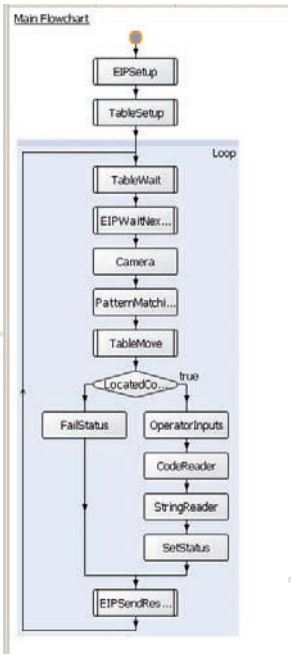
Thor Vollset, CEO, Founder and Owner
Vision 2010: Hall 6, Booth B19

Keyetech

Modern industrial machine vision software for pattern recognition usually operates on edge-based representations. In the presence of large scale changes and perspective skew, however, such approaches often reach their limits. Only recently, methods based on local point features have found their way into industrial machine vision software. If the pattern to be recognized offers a sufficient amount of local image information, such methods are able to find patterns efficiently and reliably with sub-pixel accuracy despite large skew and scale changes. Keyetech targets to offer with its Keyetech Texture-based Recognizer the optimal tool in this domain. Due to the exploitation of all available technology offered by current computer hardware, complex patterns can be recognized with processing rates up to 100 Hz. The philosophy of Keyetech is to offer the appropriate tool for each type of object. Thus, for edge-based pattern matching, Keyetech offers with its Keyetech Edge-based Recognizer the suitable product.

Dr. Pedram Azad, Managing Director and Owner
Vision 2010: Hall 6, Booth A55/5

Matrox Imaging



Matrox Imaging sees traditional programming or coding having become a highly-specialized skill. A growing number of machine vision developers do not possess or want to acquire this skill. Therefore, we believe that it is important to ensure that machine vision remains accessible to people who don't necessarily code. Matrox ensures this "accessibility" through Design Assistant, an integrated development environment (IDE) for our smart cameras where applications are created by constructing a flowchart rather than requiring conventional coding. By providing this software environment, we ensure that all users benefit from simplified and accelerated machine vision application development.

Matrox is also noticing a growing requirement for ready-made productivity-enhancing tools (i.e., fixturing, masking, interactive graphics tools, etc.) that enable traditional machine vision developers, who are increasingly pressed for time, to focus on addressing the application at hand instead of developing and maintaining these peripheral tools. Moreover, developers have grown to expect tools that work more "out-of-the-box" and require little to no parameter-tuning. As well, developers expect their machine vision software to make maximum use of the latest hardware technology including massive parallel architectures (e.g., GPUs).

Pierantonio Boriero, Product Line Manager
Vision 2010: Hall 4, Booth C18

National Instruments

Today there is a whole bunch of software available dedicated to machine vision (MV). The Vision Builder for Automated Inspection (AI) by National Instruments is even a very flexible configurable development environment for MV with no need for actual programming. More and more users, however, require a better integration of such dedicated tools in larger development environments surpassing by far the MV world. This need is addressed now by National Instruments with the new Vision Builder AI 2010. The improved integration into development environments like NI LabView and NI TestStand supports the user in the design of user interfaces, the control of several target systems at the same time, and the work with larger systems. With the Vision Builder AI the MV part of a larger application can be easily addressed. Synchronization and control of several visual inspection as well as other parts of larger applications can be as well important. With the new LabView functions the Vision Builder Engine can be directly controlled to call up and synchronize several MV applications generated with the Vision Builder AI.

Rahman Jamal, Technical Director Central Europe

Vision 2010: Hall 4, Booth A15

MVTec

As manufacturer of standard software for machine vision, MVTec must have a sense for a trend before the market actually requests for it. Thus, MVTec's new software versions each represent the state of the art as it does the new version Halcon 10. 3D vision has a great future. The development has not completed so far. E.g., surface-based 3D matching is a uniquely robust method to find objects with arbitrarily shaped surfaces in distance images especially in the case of rounded and rather edgeless objects. Another emerging technology is the fitting of 3D primitives by analyzing 2½D point clouds. Also stereo vision is advancing. E.g., multi-view stereo enables to use an unlimited number of cameras for more detailed 3D reconstruction and guarantees highly robust robotics applications. Special new matching methods will be developed, e.g., local deformable matching to even find objects with deformed or wrinkled surfaces. Moreover, acceleration is permanently increasing, e.g., by new algorithms or automatic use of hardware. Thereby, even need for main memory can be significantly reduced. Of course, all other fields of imaging are still forced as there are, e.g., OCR and data code reading.

Dr. Lutz Kreutzer, Marketing Manager

Vision 2010: Hall 4, Booth C55

Kontakt

www.aqsense.com, www.cognex.com, www.keyetech.de, www.matrox.com, www.mvtec.com, www.neurocheck.com, www.ni.com, www.rauscher.de, www.silicon-software.de, www.stemmer-imaging.de, www.tordivel.no

Calendar

DATE	TOPIC · INFO
27.10.–29.10.2010 Bilbao, Spain	**QA&Test** 9th International Conference on Software QA and Testing on Embedded Systems www.qatest.org
27.10.–29.10.2010 Beijing, China	**Vision China 2010** China International Machine Vision Exhibition and Machine Vision Technology & Application Conference www.visionchinashow.net
09.11.–11.11.2010 Stuttgart, Germany	**Vision** International Trade Fair for Machine Vision www.vision-messe.de
09.11.–12.11.2010 Munich, Germany	**Electronica** International Trade Fair for Components, Systems, Applications www.electronica.de
21.03.–24.03.2011 Chicago, IL, USA	**Automate International Robots, Vision & Motion Control Show** www.promatshow.com

Find these and more events with detailed information at
http://www.inspect-online.com/en/events

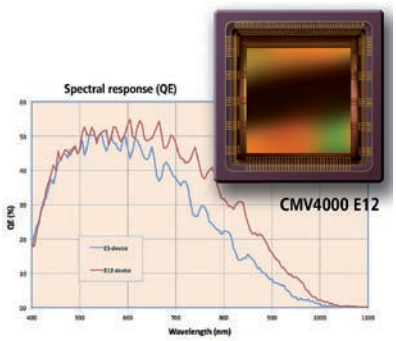
Including F/1 Designs and Small Diameters

Edmund Optics, provider of optical components, expands its selection of Techspec MgF2 Coated Achromatic Lenses. Consisting of two optical components cemented together to form an achromatic doublet, these high performance lenses include fast achromatic lenses and micro achromats. The versatile lenses are computer-optimized to correct for on-axis spherical and chromatic aberrations and offer a wide range of optical solutions for polychromatic illumination and imaging needs. Featuring F/1 designs, these lenses have been optimally designed to minimize chromatic and spherical aberration for excellent focused spots at short working distances. Fast achromatic lenses are available with a single layer MgF2 coating in diameters ranging from 9–25 mm. Other designs and coating options are also available.

Edmund Optics, Inc. · Tel.: +1 800 363 1992 · sales@edmundoptics.com · www.edmundoptics.com

CMOS Sensor for the Near Infrared

Cmosis will introduce a new member of its standard high-end CMOS image sensor family: the 4.2 megapixel CMV4000E12. The new off-the-shelf image sensor features a square 5.5 x 5.5 µm (2,048 x 2,048) pixel format. It offers high NIR sensitivity, low noise, central shutter and full frame rate of 180 fps. The CMV4000 is suited for advanced applications in the visible and near infrared spectrum. The unique feature of the CMV 4000 is its novel pixel structure, which combines pipelined global shutter operation with correlated double sampling (CDS). This technique yields an unprecedented low noise level below 13 e- and a high full well charge of 13,500 electrons. The image sensor offers 16 LVDS output channels at 480 Mbit/sec each. They can be multiplexed to 8, 4 or 2 channels at a reduced data rate. Pipelined operation allows for integrating a frame during readout of the foregoing frame.



CMOSIS
Tel.: +32 3260 1730 · info@cmosis.com · www.cmosis.com

A Large New Smart Camera Family

The Imaging Solutions Group introduces its new Plus Smart Camera Family which supports both GigE Vision and CameraLink interfaces. The family will have a number of members, initially based on the Eastman Kodak KAI CCD family. Starting with a 16 megapixel camera (7.4 micron pixel) the family will support all of Kodak's 5.5 micron CCD sensors. Additional sensors from other manufactures may be used in the future. The cameras will have a workstation class high-performance Linux CPU and a large FPGA. External triggering and strobe functions are integrated along with a NTSC Composite Video Output and USB 2.0 interfaces. "A low-noise analog front-end and the Kodak CCD's will offer stellar image quality," according to Kerry Van Iseghem, founder at Imaging Solutions Group.

Imaging Solutions Group
Tel.: +1 585 388 5220 · sales@isgchips.com · www.isgchips.com

Machine Vision Software Runs on Mobile Phone

The standard machine vision software Halcon Embedded runs on the mobile phone Nokia N900 (Linux-based operating system Maemo). Tests have proven that applications based on Halcon can successfully be built for the Nokia N900. First, the application can be developed on a PC. After this, the exported code is compiled for the Nokia N900 to run the application on this mobile platform. MVTec will assist customers anytime who are interested in Halcon applications on this mobile phone. Thus, all image processing applications are possible which are interesting for mobile platforms as there are character recognition (OCR) up to hand written characters, reading of documents, bar code and data code reading, pattern matching, and the counting of objects. Moreover, Halcon provides image enhancement and an automatic calibration for camera lens distortions.

MVTec Software GmbH · Tel.: +49 89 457695 0 · www.mvtec.com · sales@mvtec.com

Asynchronously-triggered Four-Camera System

PPT Vision announces a breakthrough in vision system technology and capabilities with their just-released Impact M-Series Embedded Vision System. The new M-Series System allows users to perform up to four unique inspections that can be initiated independently – at different times or simultaneously – utilizing a single vision processor. Cost savings are achieved by eliminating the need to purchase multiple systems for separate inspection or guidance programs, as well as greatly reducing setup and networking time. Unlike other smart cameras, no PC is required for configuring and operating the Impact M-Series Embedded Vision System. The M40 processor utilizes PPT Vision's Impact software, which works with the Microsoft Windows XP operating system and features direct connections to a monitor, keyboard and mouse.

PPT Vision, Inc.
Tel.: +1 952 996 9500 · info@pptvision.com · www.pptvision.com

New Sony Smart Camera

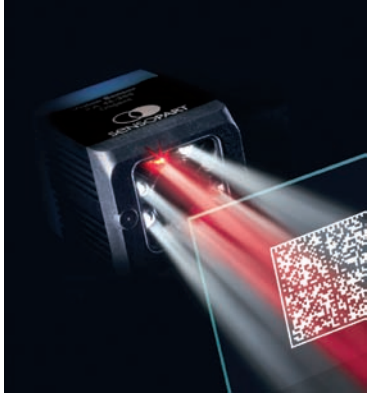
Sony introduces a new addition to its machine vision camera line-up, the all-in-one XCI-SX1 Intelligent Camera. This camera is equipped with a 1/2-type high resolution (1,280 x 1,024) progressive scan CCD, an embedded CPU and a 10Base-T/100Base-TX interface for network connectivity. Incorporating the high-performance and flexible AMD Geode GX533 processor with a fully customisable Windows or Linux operating system, the XCI-SX1 camera is designed to allow integrators to install a variety of image-processing software applications or to develop and apply customised applications to meet specific user needs. Unlike conventional machine vision cameras, images captured by the XCI-SX1 are processed within the camera and the processed-data is directly transmitted to a PC over a network, RS-232C link or Digital I/Os. The XCI-SX1 camera eliminates the need for conventional image-processing systems and allows for simple setup and efficient factory workflow.

Sony France
Tel.: +331 55 90 36 61 · info@eu.sony.com · www.pro.sony.eu/vision

Module for Camera Link FPGA Image Processing

National Instruments today announced the release of a new vision module for the PXI platform that provides a high-performance parallel processing architecture for hardware-defined timing, control and image preprocessing. The new NI 1483 Camera Link adapter module, in combination with an NI FlexRIO field-programmable gate array (FPGA) board, offers a solution for embedding vision and control algorithms directly on FPGAs. Engineers and scientists can use FPGAs to process and analyze an image in real time with little to no CPU intervention. Additionally, using FPGAs helps eliminate the need to design custom hardware. The NI 1483 is ideal for optical coherence tomography (OCT) and high-speed control systems for applications such as laser alignment and sorting.

National Instruments Germany GmbH
Tel.: +49 89 7413130 · info.germany@ni.com · www.ni.com



Code Reader Includes Object Detection

The new FA 46 code reader from Sensopart combines code evaluation and object detection in one device. It reads both standard 1D bar codes and 2D data matrix codes (ECC 200). The versatile vision sensor can analyse up to five data matrix and bar codes in one search zone, and an unlimited number of search zones can be defined. It can also identify other object characteristics such as date stamps or markings in the same reading process. It has three additional detectors for object detection (pattern recognition, grey level and contrast). Thanks to the integrated position tracking option, codes and object characteristics can be reliably detected even when offset from the taught position. Equipped with such features, the FA 46 is also able to manage complex automation tasks which previously required a classical image processing system or the use of several.

SensoPart Industriesensorik GmbH
Tel.: +49 7673 821 0 · info@sensopart.de · www.sensopart.de

Vision Sensors with HDR Technology

Omron announces a new era of vision sensors in the FQ range. The first products of their type to employ HDR (high dynamic range) technology, FQ vision sensors incorporate full colour processing with up to 16 million colours, built-in polarising and halation filters and integrated high-intensity LED lighting. These features enable them to provide stable inspection even with highly reflective, low contrast and similarly difficult targets. So that users can select a sensor that accurately meets their particular requirements, Omron supplies its new vision sensors in versions with fields of view from 7.4 mm to 300 mm. All models have an IP67 ingress protection rating, making them suitable for use in tough operating environments. For applications requiring more than one vision sensor, multiple units can readily be networked together and controlled from a single point.

Omron Electronics GmbH
Tel.: +49 2173 6800 0 · info@eu.omron.com · www.industrial.omron.de

New GigE Vision Camera Series

The first available Grasshopper2 GS2-GE models incorporate a Gigabit Ethernet digital interface and are based on mono and color versions of the Sony ICX274, a 2 megapixel CCD that runs at 30 fps; and the ICX625, a 5 megapixel CCD that runs at 15 fps. The compact Grasshopper2 measures 44 x 29 x 58 mm in size, and offers new features such as opto-isolated GPIO for industrial triggering and strobe output, new multi-exposure trigger modes, and improved on-camera status monitoring. Every Grasshopper2 GS2-GE camera is equipped with a 14-bit analog-to-digital converter, 32 MByte frame buffer, 512 KByte non-volatile flash memory, and on-board temperature and power sensors to monitor camera status. The models are now available.

Point Grey
Tel.: +1 604 242 9937 · sales@ptgrey.com · www.ptgrey.com

GigE Vision for 64 Bit Operating Systems

Stemmer Imaging announces the availability of their sophisticated hardware-independent SDK CVB CameraSuite for Windows and Linux 64 bit operating systems. CVB CameraSuite is based on the most comprehensive and powerful implementation of the GigE Vision and GenICam standards and is certified by the standards committee. The fully featured hardware-independent SDK is the preferred engine for acquisition from any GigE Vision compatible camera from Stemmer Imaging. It is licensed to the individual MAC address of each GigE Vision camera by means of an individual code number and is therefore not bound to the computer hardware or to special dongles. Licences for CVB CameraSuite Win32, CVB CameraSuite Win64 and CVB CameraSuite Linux64 are delivered free of charge with all GigE Vision cameras from Stemmer.

Stemmer Imaging Ltd · Tel.: +44 1252 7800 00
info@stemmer-imaging.co.uk · www.stemmer-imaging.co.uk

Reliably Reading of 1D-Codes

Cognex introduced two new 1D barcode readers to its DataMan line of industrial ID readers: the DataMan 100 QL and DataMan 200 QL. The fixed-mount readers features Cognex 1DMax, a totally new 1D code reading algorithm which sets a new standard for 1D code reading performance. In addition to reading blurred or damaged codes, 1DMax successfully handles quiet zone violations that can occur when codes are printed close to the edge of a label. DataMan QL readers are very easy to deploy in any environment using the system's Setup Tool. The Setup Tool also includes an image archiving feature which enables users to store images of read failures and download them to a PC in order to diagnose the root cause of a problem. Furthermore, Cognex has released a new version of its DataMan Software which adds 1DMax for best-in-class 1D barcode reading.

Cognex Corporation
Tel.: +1 508 650 3000 · info@cognex.com · www.cognex.com

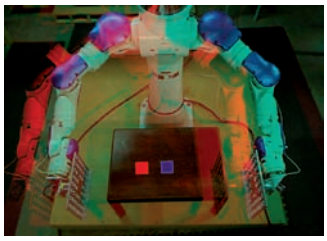
Acquiring 2D and 3D Data Simultaneously

The companies Tordivel and Sick have released a new interface for all Sick 3D cameras with Gigabit Ethernet interface to allow a superior performance with Scorpion Vision Software. The interface makes the whole functionality of the 3D cameras available inside Scorpion, including the unique MultiScan capacity to simultaneously acquire 3D and 2D data. Moreover, it is possible to acquire calibrated and rectified 3D data. "In Scorpion, the 3D data is treated as true 3D Point Clouds that directly can be visualized and efficiently processed. This gives a high degree of flexibility and creates new opportunities for application solutions using the high quality 3D and MultiScan data from our cameras," acknowledges Fredrik Nilsson, product manager for the Sick 3D cameras.

Tordivel AS
Tel.: +47 2315 8700 · office@tordivel.com · www.tordivel.no

Turning a Webcam in a Vision System

Universal Robotics, a software engineering company, has announced the launch of two 3D vision software products: Spatial Vision and Spatial Vision Robotics. The products can turn any pair of webcams into a highly accurate, cost-efficient 3D vision system that can be employed in virtually any setting without expensive equipment. 3D vision systems offer many benefits over their 2D counterparts, including better accuracy and object identification and tracking, which are essential features in security, engineering and robotics applications from biometrics to real-time control of machines. Despite their benefits, broad adoption of 3D vision systems has been limited in many markets because the systems can be costly to implement and maintain. Spatial Vision Robotics has been specially designed to be used in concert with automated machines.



Universal Robotics, Inc. · Tel.: +1 615 366 7281
info@universalrobotics.com · www.universalrobotics.com

For Any Environmental Conditions

Autovimation's standardized mechanical interface system for machine vision components (Mechanical Machine Vision Interface, MMVI) has been expanded by a wide range of accessories, and now enables the assembly and operation of machine vision systems under virtually any environmental conditions. New components include the stainless steel fire salamander enclosures which protect cameras in pharmaceutical and food industry applications and a wind curtain which keeps the enclosure's front window free from dust and oil mist, thus ensuring a clear view. Moreover, Autovimation now also supplies tried-and-tested underwater enclosures, an extended range of the patent pending quick lock camera brackets which now enable users to mount virtually any standard camera, and complete solutions e.g. for laser triangulation, which allow for the assembly of special applications from prefabricated parts.

autoVimation · Tel.: +49 721 6276756
sales@autovimation.com · www.autovimation.com

New Low-reflectivity Neutral Density Filters

Midwest Optical Systems has developed a new line of neutral density filters for imaging at visible, near-infrared and near-UV wavelengths (350 to 1,100 nm). These NI filters are available from stock in four optical densities that range from 50% to 6.25% overall transmission, in all popular filter thread sizes, ready for next-day delivery. Neutral density filters are used to reduce the amount of light reaching the sensor. This allows for longer exposure times and reduced depth of field by using a wider iris opening, thus improving the separation of subject matter from the background. Unlike absorptive filter glass and non-reflective neutral density filters, the low-reflectivity NI filters from MidOpt feature uniform attenuation simultaneously over the entire visible and near-IR range imaged by most industrial CCD/CMOS cameras, with the actual percent transmission (or optical density) remaining constant.

Midwest Optical Systems, Inc.
Tel.: +1 847 359 3550
info@midopt.com · www.midopt.com

Unified Software Solutions for Hardware Components

EVT will publish its released EyeVision version 2.5 UR on June 1, 2010. Therewith the company launches one software platform for all hardware platforms – ranging from Vision Sensors and smart cameras to PC platforms with standard access (GigE, USB, Firewire, and CameraLink). The new version is released for Windows 7; therefore all platforms ranging from W2K to W7 are supported. Revised high-speed algorithms guarantee the user a faster imaging processing for example by high-speed contour correlation. One highlight of the version 2.5 is the Process Designer which allows to position and display camera images and inspection results per drag-and-drop. The numerous interfaces range from simple I/O to data transfer to SAP, to Oracle or to a SQL-data base and allow a simple data connection and data storage.

EVT Eye Vision Technology
Tel.: +49 721 626905 82
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www.evt-web.com

Compatible with USB 3.0 Interface

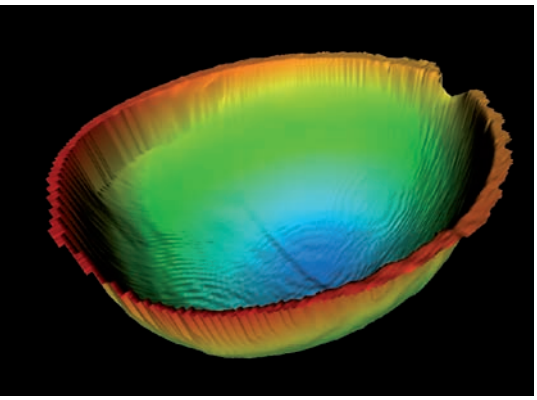
USB 3.0 is on the advance. The interface is increasingly being found on new PCs, mainboards and USB plug-in cards. This latest generation of the serial bus could already replace version 2.0 in the medium term. Camera manufacturer IDS Imaging Development Systems has therefore tested all of its uEye camera models equipped with a USB 2.0 port for compatibility with the latest mainboards featuring a USB 3.0 or SuperSpeed USB connection. The company is pleased to confirm to its customers the full compatibility and, accordingly, investment security. When used with a USB 3.0 connection, 100% of the performance and functionality of the cameras is available. This compatibility also includes the cables and hubs which have been used so far. Data transfer rates of up to 5 Gbit/s, or 10 times faster than via copper wire, are possible now.

IDS Imaging Development Systems GmbH
Tel.: +49 7134 96196 0 · info@ids-imaging.de
www.ids-imaging.de

What Teeth, Cars, Ice Cream and Sausages Have in Common ….

Versatile Use of 3D Cloud of Points Analysis

Regardless of whether uniform portions of sausage, cheese or ice cream are required in the food industry, economical and absolutely precise testing of components in the automotive industry or micro-precision fitting accuracy for dental prostheses – the SAL3D library from the Spanish software company, Aqsense, guarantees quick and precise capture of three-dimensional objects using 3D point clouds.



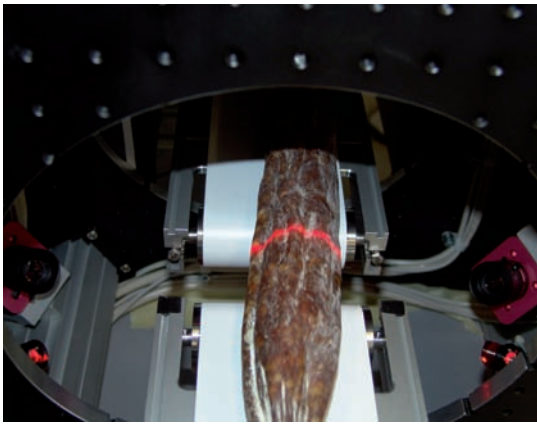
The exact shape measurement of the coconut halves allows for the automated filling with ice cream later on

Imagine a delicatessen producer wanting to fill precut halves of coconut shells automatically with ice cream on a mass production line. Of course each of these naturally grown ice cream shells are unique in size and form, each with a slightly different shape and holding capacity. Nevertheless the filling height and quantity of ice cream must correspond to a defined model, describing a standard half-shell and defining the possible tolerance range for filling. Since production is to be accomplished on a conveyor belt, this measuring process must be completed quickly and it should also be associated with minimum effort and cost. This is exactly where SAL3D from the Spanish provider, Aqsense, excels. SAL3D is a modular, standard software library for 3D image processing applications, which is completely independent of any specific hardware platform. Based on point cloud coordinates it provides an extremely accurate, digital 3D model of any object measured. In simpler terms this means in our coconut example: Based on a laser sheet-of-light method 3D data of the object are calculated and thus a precise 3D image of the object right down to the smallest detail is generated. The ice cream manufacturer is now able to automatically classify the coconut shells delivered into eight different volume classes. This classification allows the machines to fill in precisely the right quantity of ice cream without any further manual intervention. The advantage: This process eliminates any waste of ice cream and produces finished shells which appear uniform to the eye of the customer. Previously the shells were sorted manually and this only al-

lowed classification into three volume sizes. The new technology, industrially implemented by Baixcat, system integrator out of Girona and Aqsense´s partner in 3D applications, immediately reduced the error and reject quota. „This example shows, in a simple and graphical way, the performance capabilities and variety of applications for our proven SAL3D tool set," stated Ramon Palli, CEO of the innovative company out of Girona, Spain. Aqsense has been present on the market since 2006 with standard software libraries for 3D image processing applications and is today the only software supplier to offer a high speed, precise and robust tool for real 3D point cloud recognition and processing in production environments. The company offers mature, high-tech, practice-proven solutions and is proud to support customers with practice-oriented knowhow, detailed consulting, feasibility studies and training as well as intensive aftersales support to ensure perfect and successful integration of the 3D applications into existing production processes.

No Matter if Fish or Fowl….

Staying in the field of food, further examples of the many flexible applications for this library can be provided. For instance in the portioning process for food, when foodstuff has to be processed that differs in form and structure. This is true for almost all nature-based food provided to the customer in a packaged or refined form: sausage, ham, fish, cheese and so forth. None of these products have a standardised size in their raw format. Portioning and cutting have to therefore "naturally" follow a similar concept as mentioned before. Here again the basis is a measuring process for determining the volume of a body: The cross-sectional area of the product, i.e. a fish or a ham, is measured as it moves along a conveyor belt. The cross section area is determined and provides precise information about the volume of the body. Once the predefined weight of a portion is reached, the cutting machine seperates that particular portion. This avoids the otherwise common practice of „overfilling" the sales package and is thereby saving costs.



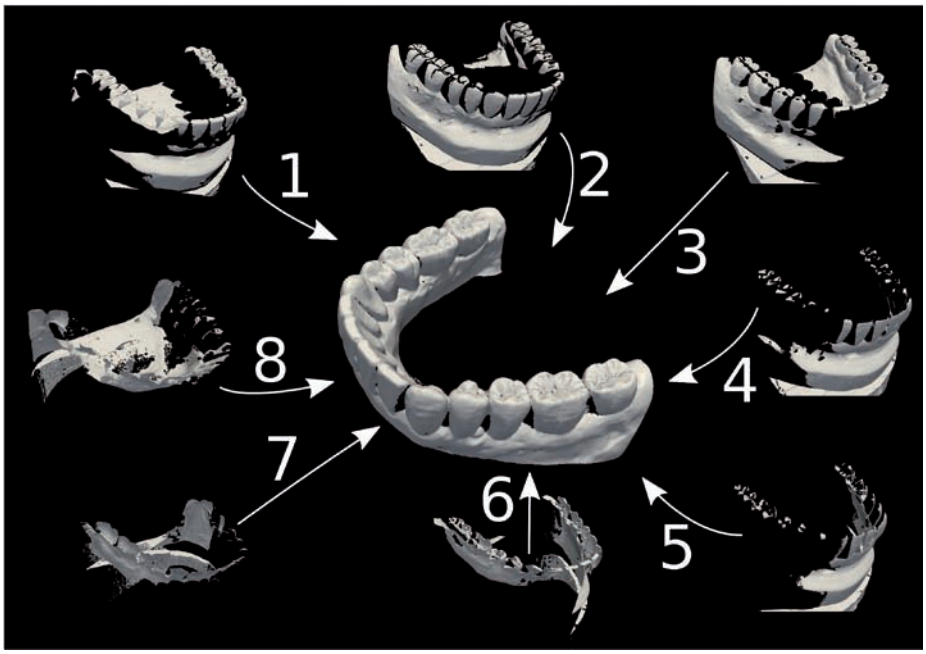
360° scanner for the optimization of portioning in slicing machines

Implementation requires consideration of a series of high requirements, because no two fish or hams are like two peas in a pod. Thus, it is necessary to calculate the cross-section on the basis of a number of height profiles. These requirements can be solved with the aid of three cameras and the laser light intersection method. The cameras record different views of the object illuminated by laser

lines, while it is located between two conveyor belts. Comprehensive measurement is accomplished here within seconds.

Independent calibration of the three camera/laser combinations is ensured by a special, precision manufactured calibration element. Only this guarantees that the measuring range of each individual section is defined precisely and nothing is captured twice.

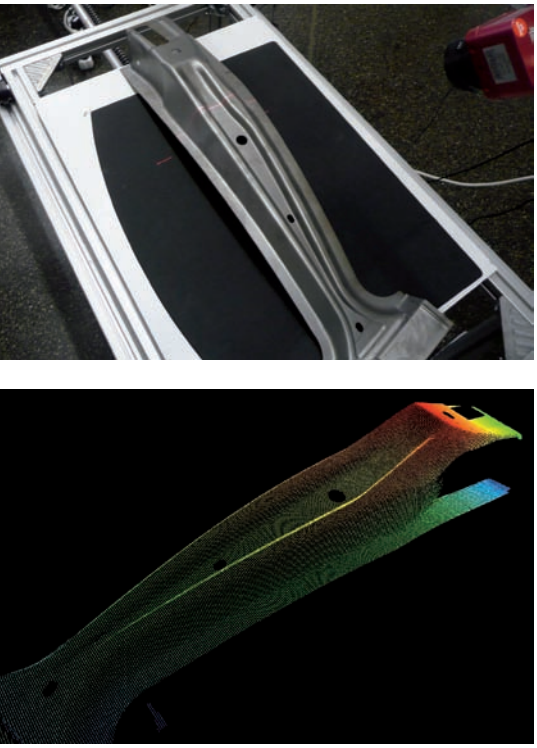
The high performance SAL3D software is predestined for performing such calculations in real time in industrial surroundings. Detailed simulations are made by Aqsense at the request of the customer before starting the project to ensure that the measured results and performance parameters will meet the requirements.



Only a few image acquisitions are required for the precise 3D representation of the dental imprint

Perfection from One Mold

The advantages of this measuring process have already been recognized for some time in the automotive industry. Because in the automotive field precision, use of absolutely defect-free components and rapid inspection processes are of utmost importance to satisfy the high safety requirements of the automobile while simultaneously producing profitably. A particular challenge here, for example, is quality control of cast parts, such as cylinder heads or brake discs. These cast parts, supplied directly from the foundry, may have defects such as air inclusions, irregularities or excess material.



Prototype of the press part inspection system for BMW: top measurement set-up, bottom point cloud representation of the body-in-white part

Today such parts are still tested visually on a random sample basis. However, visual inspection poses the danger of not sorting out all parts with defects. This, on the other hand, increases the risk of having to disassemble the components in a time-consuming process at a later stage in the assembly process, thereby reducing the productivity of the production process. An automatic inspection system was developed which is capable of testing all constituents of a complex cast part at the very beginning of the assembly process using 3D cameras in combination with the SAL3D software library. The cast part is transported by a conveyor belt or a linear shaft below a system consisting of 3D cameras and a laser. To avoid shadows on the cast part – and therefore missing surface information - two cameras are used for each view.

Here the 3D software tools developed by Aqsense allow metric calibration and consolidation of the images from the two 3D cameras to form one single, calibrated 3D image. The next step is access to the 3D library to compare the 3D scan of the cast part with the reference model stored on the computer. The deviation test leads to the decision whether or not the scanned part is within the quality specification. A comprehensive 3D scan, the analysis of one million 3D points and the go/no go decision are reached within less than one second. This means the inspection system is capable of a fast and absolutely reliable 3D inspection of complex cast parts – in glaring contrast to the previously common visual quality control on a random sample basis. This 3D process also significantly reduces the mechanical effort required for precise part positioning and guarantees high throughput while completely inspecting all parts. Edixia, leading French producer of inspection systems for the automotive industry, was able to build a quality control system based on the speed of the Match3D tools for 3D position compensation and 3D defect recognition for 100% inspection of the six sides of a cylinder head within the given cycle time of only 11 seconds.

Faster Processes

A further application for point cloud analysis based measuring equipment in the automotive industry is for checking body parts for faults and dimensional accuracy immediately after metal forming in the press plant. A prototype for this application was developed for BMW in a cooperative effort between Aqsense, Photonfocus and Heitec, which successfully proved the technical feasibility of such a concept. Here analysis of the point clouds provides for exact measurement of complex 3D free-forme surfaces and comparison between the design and actual shape of the part. After 3D posi-

tional correction, the actual shape of the object to be inspected is first determined and then compared with the „golden template," a 3D image of a good part. Even minor deviations in the dimensions can be recognized by this real time process, allowing rapid qualitative evaluation of the object. This procedure provides a decisive advantage particularly in industrial production processes since the immediate recognition of defective components is mandatory to ensure smooth operation while simultaneously maintaining high quality. Only such an absolutely reliable test ensures proper control of the process while allowing immediate intervention if defects occur repeatedly. Only in this way refinishing work in the production process and the resulting loss of time can be avoided and productivity can be maintained at a high level.

The Right Bite

Another market segment where precision and accuracy are of high significance is the wide field of dental medicine and technology. Here even extremely fine deviations determine whether a dental prosthesis fits correctly and is comfortable for the patient, or whether cost-intensive, manual re-work is required. This means that comparison with the dental imprint taken on the patient (reference model) is particularly important when making a prosthesis or partial prosthesis. „In addition to precision, the processing speed is a key factor for the success of the SAL3D standard software library in this market segment," remarked Palli. Here the speed of the SAL3D ensures quick and precise adaptation with the aid of the 3D scan. This is the major prerequisite for the production of a 3D model, which can be converted into a CAD design for controlling production of the dental prosthesis. If this procedure becomes established in dental laboratories, a few image acquisitions will be all that is required to create an exact image and significantly shorten the production time. Because the three dimensional comparison with the stored reference model not only saves time during production, it also frequently eliminates subsequent touch-up work and repeated fitting work on the patient completely.

In conclusion it can be said: Regardless of whether dental technology, food industry or the automotive industry – with the aid of the SAL3D library from Aqsense, various production processes in different branches of industry can achieve significantly higher quality levels without interfering with the short cycle times. This results mainly from the rapid processing of 3D information at high data rates. Even minor defects on object surfaces or deviations from production specifications are detected, analyzed and documented without contact at production speed.

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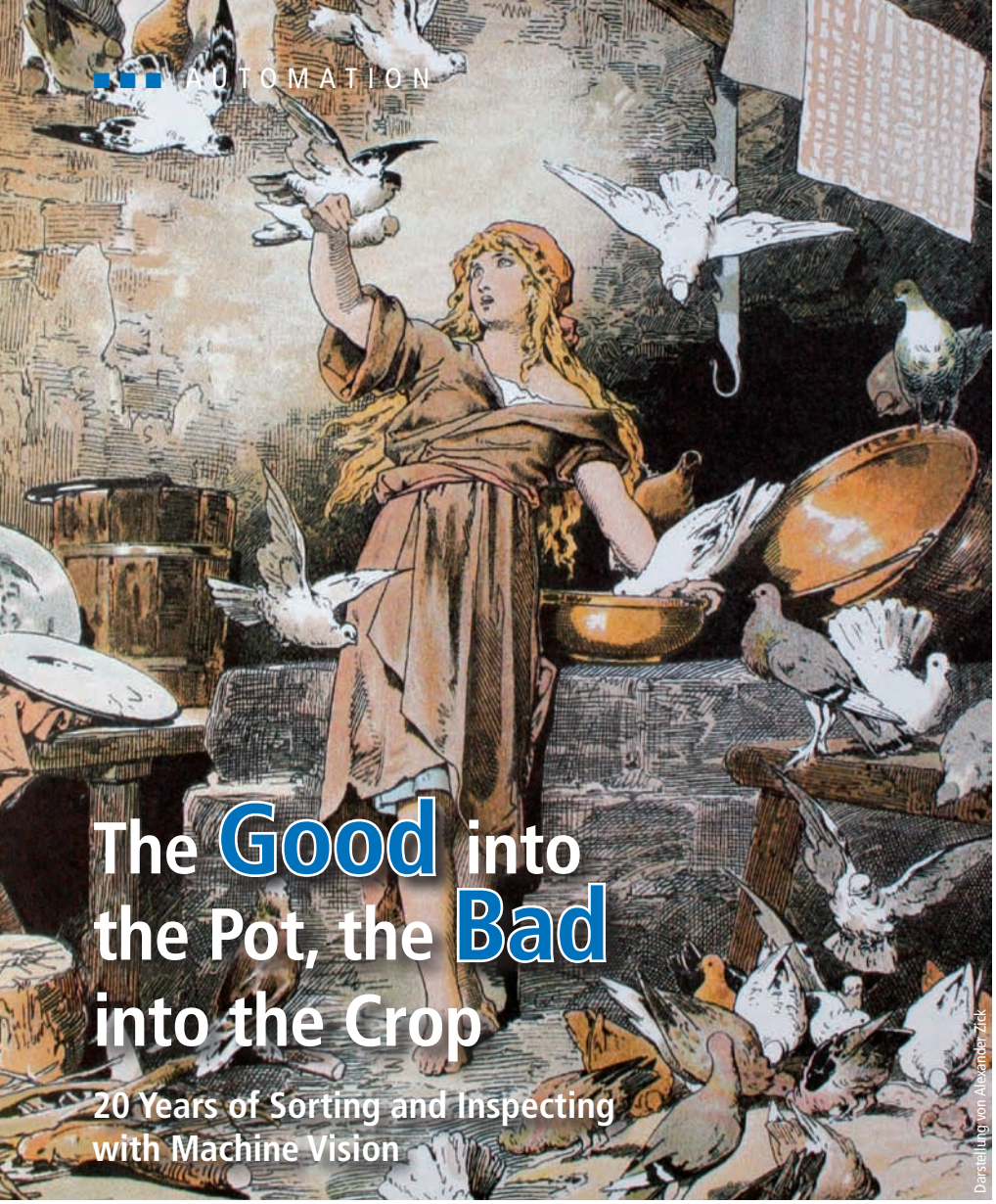


The Good into the Pot, the Bad into the Crop

20 Years of Sorting and Inspecting with Machine Vision

Darstellung von Alexander Zick

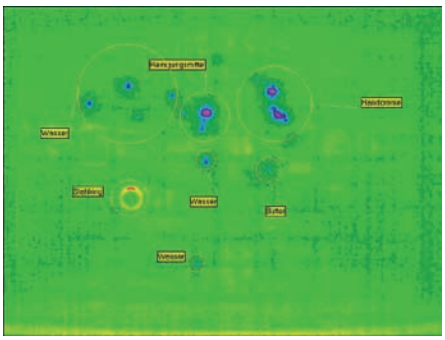
In the fairytale by the Brothers Grimm, Cinderella has to sort lentils, a cumbersome task. But the girl gets help from doves who do the job fast and reliably. As Cinderella also industry does not have to rely anymore on manually sorting and inspecting. This task is done by machine vision systems for 20 years now. During sorting surface inspection is done efficiently at high examination rates.

The company Visicontrol is celebrating its 20th anniversary this year. Over these years, the demands placed on sorting and inspection have increased in many respects. Computing power has grown exponentially, camera resolution has improved and LEDs started appearing in illumination technology. In addition, Visicontrol focused on optics and developed test methods and algorithms. The handling operations for separating and positioning the parts continue to be of central importance for sorting. The entire sorting system must be designed and configured for the task to achieve optimal results.

Verification of Shape Dimensions

For a long time, verification of the dimensions of the shape against drawing tolerances was in the foreground of automatic sorting. This is realized using two-dimensional imaging with 2D machine vision. In the meantime, this has become standard.

These checks of dimensions can also detect local shape deviations and can thus find surface defects such as burrs on metal parts, wrinkles on plastic parts or cracks using transmitted light. In this respect, using specialized lenses also allows the examination of edges that are difficult to access, say, on the periphery, in a single image acquisition operation and that are not detected in the telecentric beam path.



Inspection by using thermal imaging: Locally applied water drops are colder (cold = blue/violet) than the dry plastic material of the transportation crate (warm = green)

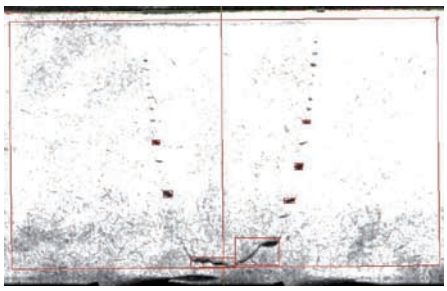
Top Lighting Sees More

Surface inspections usually use some version of top lighting. In this way, the reflective behavior and other physical factors of the surfaces are inspected. At the same time, this approach provides the possibility of making defects visible. One example that appears exotic in this case comes from the packing inspection at a logistics center. Has the crate become wet consequently requiring it to be rejected? A reliable response to this inspection task is provided by the use of a thermal-imaging camera. Drops of water are cooler than the dry base material.

Such sorting tasks may occur dynamically because the defect is visible in one view. The center of gravity of the part being examined is moving during this process and the image acquisition is triggered. The use of flash illumination systems concentrates the necessary light energy within a short time window consequently reducing the blur to an acceptable level. In this way, very high examination rates exceeding 1,000 parts per minute can be achieved, precisely with small parts.

Line Scan Cameras in Use

Frequently, defects occur on the entire lateral area of a component. These parts can be inspected by using line scan cameras and the appropriate illumination systems. During the examination the part rotates about its symmetry axis and the center of gravity is at rest. The line scan camera captures a necessary number of lines per rotation that are then merged into one image of the lateral area. The algorithms for surface inspection are applied to this image. The inspection is performed with a rotary indexing machine or parallel grippers. The examination rate is usually restricted to less than one



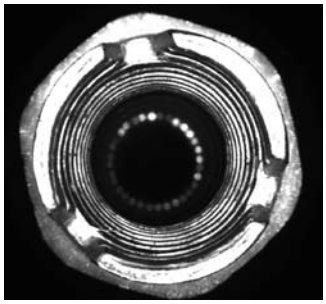
Inspection of a lateral area using line scan cameras: Example of a deep-drawn sleeve and the surface defects occurring there, known as flow defects

part per second and can be increased by parallel processing.

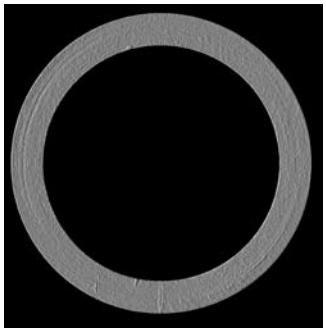
If the diameter to height ratio is not too large, the surfaces on the sheath can be photographed directly using one 2D camera with specialized imaging optics or mirrors. The surface inspection can then again take place dynamically.

Evaluation of Contrasts

When inspecting the sealing faces, for example of cast parts, the pores, voids and scratches are critical types of defects. Image acquisition uses a 2D camera that evaluates the contrasts using special algorithms. The number and density of the individual pores and voids can be put into a relationship and then the parts are evaluated and sorted according to pore classes. Robots are usually used to handle these parts.



Borehole inspection: Detection of surface defects in the thread inside the borehole (bottom left). Use of a special lens that does not need to be inserted into the borehole.



Example for using a 3D method (Shape-from-Shading): The part being inspected is a sealing face in hydraulics. The smallest piercing scratches are critical (bottom center).

Inspection of Boreholes

Inspecting the inside surfaces of boreholes usually requires inserting the illumination system and the imaging optics into the borehole itself. Endoscopes or borescopes are widely used in this application. The examination rate is correspondingly low and the positioning requirement high. In recent years, some specialized optics and optical systems have been developed for inspecting boreholes. Depending on the diameter and depth of the borehole, these systems make insertion no longer necessary.

The Right Color?

Color is one feature primarily for parts that enter the consumer market. However, this aspect is also important for technological parts. Examples are the coloring of instruments or fastening elements in medical technology. Coloring immediately signals the user whether he is picking up the proper object. Another example is the safety-critical fastening elements in aviation. In this case, the surfaces must be appropriately hardened and tempered to possess the required properties. Color deviations or the lack of color represent one criterion for missing or defective coating. Accordingly, dynamic sorting can be performed reliably even at high inspections speeds.

Future in 3D

The three-dimensional acquisition of geometry is a growth field. These methods can, besides determining the dimensions of the shape, also be used to detect surface defects. These methods are used if the defects do not provide sufficient gray-scale contrast in the 2D method, for example, due to the small depth of dents or scratches. With 3D, the next 20 years will remain to be exciting for Visicontrol.

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Reaching the Goal Faster

Machine Vision Solutions for Solar Cell Production

Step by step, the German state aid for photovoltaic systems will be reduced. In order to compensate this and to remain competitive, solar manufacturers have to optimize their production processes. The quality of solar cells and therefore their efficiency, as well as the throughput, have to be increased. In reaching this goal, manufacturers are supported by machine vision specialists offering fast solutions for quality inspection.

Solar technology has received a substantial boost within the last years, since rising energy prices cause an exceptionally high demand for photovoltaic systems which transform solar energy into electric power. In Germany, this trend was supported by a number of different economic stimulus packages, which have recently suffered drastic cuts: until December 12, 2012, funding for solar power will be cut back by up to 50% in four steps. In order to secure a continuously high demand as well as their market shares, German solar manufacturers are now facing the challenge of minimizing production costs for solar cells and other components faster than before while simultaneously increasing product quality and efficiency. Fully automated production facilities, which make the handling of the extremely fragile components easier and improve productivity, will therefore gain increasing importance in the future. Providing high-performance machine vision components, machine vision expert Vision Components enables users in the solar industry to design reliable and cost-efficient quality control solutions.

◀ Wafer positioning with the VC solar solution

Inspection Tasks in Solar Cell Production

Electrically connected solar cells composed of monocrystalline or polycrystalline silicon wafers form the core of photovoltaic modules which directly transform solar energy into electric power. Solar plant operators aim for maximum efficiency, which means that the silicone wafers, which are approximately 0.2 mm thick, are manufactured with high demands on purity and precision. Defective parts must be rejected as early as possible to avoid cost-intensive further processing, and in order to exclude faulty components from impairing the energy balance of finished photovoltaic modules. Inspection tasks in solar cell production include detecting wafer positions and geometric attributes, monitoring wafer thickness and curvature as well as detecting fissures and damaged edges. Therefore, machine vision solutions must span a large field of view and ensure a fast image transfer. Real-time systems that enable the parallel processing of several frames help increase the process speed since they can carry out several inspection tasks simultaneously.

Custom-tailored Software Library

Vision Components has developed the VC Solar Solution software library which can be combined with VC's intelligent cameras, forming a complete solution for

Extremely compact image processing systems with a 5 Megapixel resolution: VC6210 nano and VCSBC6210 nano

camera-guided production monitoring and quality control in solar cell production. No separate PCs are required since the real-time cameras are designed as compact, stand-alone vision systems. The library provides optimized positioning functions for this task, turning cameras into a comprehensive robot guidance solution which transfers all detected positioning data to the assembly robot via a communication line. This allows the robot to carry out all necessary adjustments or to divert defective wafers before the next production step.

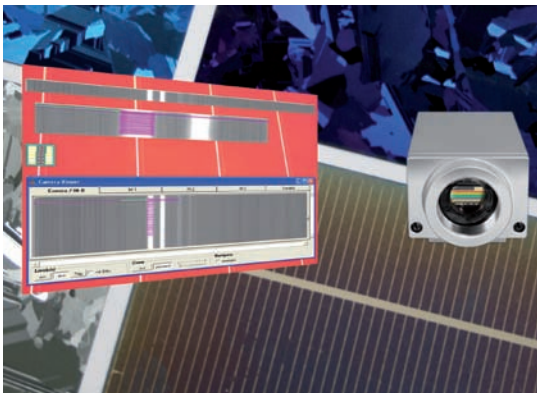
Wide Range of Cameras

Vision Components offers a wide range of performance-graded cameras for the software library. The VC4067/NIR model, for instance, has been especially developed for electroluminescence-based quality control which enables users to look inside solar wafers. Thanks to a unique sensor operation mode, the photosensitive technology provides highly precise images at wavelengths up to 1,200 nm, thus ensuring very precise image recording even in low-light conditions. Featuring an integrated 400 MHz processor from Texas Instruments, the VC4067/NIR has a computing power of 3,200 MIPS. The 2/3“ CCD sensor has a 1,280 x 1,024 pixel resolution and provides a maximum frame rate of 14 fps. A new model, the VC4467/NIR which provides increased computing power thanks to a 1 GHz processor, has been recently introduced.

VC‘s nano cameras with a board that is populated on both sides are another recent development. Available as a single board camera or with a protective housing, both types are extremely compact and provide a performance equaling that of much larger PC systems. Suitable for use as high-performance vision sensors, they can execute many tasks in photovoltaics’ production, such as the measuring, position detection and handling of solar wafers. The VC6210 nano camera measures 80 x 45 x 20 mm, while its sister model, the single board camera VCSBC6210 nano, measures 40 x 65 mm. The units, which are equipped with 32 MB Flash and 128 MB DRAM, have more memory space than all other VC camera models. Featuring a 700 MHz processor and 5,600 MIPS, they provide a high computing power. Images are recorded by means of a global shutter CMOS sensor whose performance equals that of a CCD sensor, providing clear, high-resolution pictures even in extremely fast applications.

◀ The EL-MES module from Buchanan Systems records and analyzes electroluminescence images of solar panels

The high-performance VC4002L line scan camera controls laser scribing in solar cell production ▼



Application: Testing Facility for Solar Modules

VC cameras have already proven themselves in a wide range of solar technology applications. Buchanan Systems, a manufacturer of measuring systems for the solar industry, has for instance developed a tried-and-tested electroluminescence imaging system for the company Bosch Solar Modules. The EL-MES module, which is based on two VC4067/NIR cameras, is suitable for solar panels measuring up to 2,200 x 1,200 mm. Images are recorded by a an overview camera, which is installed in a fixed position above the panel, and a detail camera, which can be moved by means of a manually adjustable linear axis system. Users can adapt the measuring parameters to specific control tasks by means of specially developed software. The system ensures recording times as low as 200 to 500 ms. Image recording is triggered by means of a connected PC; moreover, images can be stored and analyzed.

Real-time Laser Scribing

Another application is the SolarEye system from the company EVT which consists of a VC4002L line scan camera and application-specific software. The camera controls laser scribing of thin-film solar cells, i.e. the separation of conducting paths. The cells‘ substrate material, e.g. glass, is coated with a thin silicon film which is then structured by a laser. The conducting paths run in parallel and as close as possible without touching. The monitoring system controls the laser in real-time with a precision of 1 µm. The laser line position is scanned at a 5 ms rate, providing 200 measurements per second. All data can be read out directly from the camera via an Ethernet or RS232 interface. The camera can transmit the analyzed data and scan results to an optional display terminal and a computer in order to immediately display any error sources. Containing all required analysis electronics, the robust camera autonomously executes all image processing processes. It needs to be connected to a PC only for parameterization. The device supports three integration modes: autonomous operation or external triggering with a constant exposure time or with a triggered exposure.

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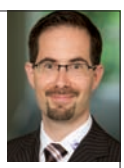

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Intelligently Connected

Quality Control with Intelligent Image Processing on Embedded Controller

In quality control, camera systems are mostly used as autonomous systems with their own intelligence. They are seldom integrated into the plant automation system. PC-based automation now combines image processing and automation in one solution. The consequence: Performance and flexibility increase, because several cameras can simultaneously record an object from various angles.

At the manual assembly stations of Siemens Electronics Works Amberg, Germany, camera systems take care of prod uct quality. To this end the image processing software Simon iBV runs on a Simatic S7 modular embedded controller. The controller is integrated into the automation of the assembly line and is well suited for PLC-oriented applications in the high-performance field. It consists of the EC31 CPU and the optionally available modules EM PC and EM PCI-104 for expanding with plug-in cards. This allows the most diverse automation tasks to be integrated into a total solution on a hardware basis. The peripherals can be connected in a distributed or central manner – by using the SM modules of the S7-300 series. Installation and commissioning are identically to the Simatic S7-300.

No Chance for Errors

The electronics plant produces numerous components for the Simatic family. On the ML200flex assembly line for ET200 distributed I/Os, 79 different modules in 35 different enclosure versions are produced. One special feature of this line is that each part is checked for 100% completeness and correctness. In this way, any possible assembly errors can immediately be corrected. Systematic errors do not stand a chance: The finished products leave the line guaranteed error-free.

Intelligent Image Processing

This quality control is made possible by the innovative machine vision system Simavis P of the Siemens Solution Partner Simon iBV in Bayreuth, Germany. The software runs on the Simatic S7-mEC. High-resolution cameras provide the images for this. Wide-area flash lamps ensure precisely reproducible lighting over a long period of time and rule out the interference of external light. The light from the flash is precisely aligned and is not noticeable from outside of the test area.

The parts to be inspected can be simultaneously recorded from various angles. For this purpose, several cameras can be connected to the Simatic S7-mEC. At the line at Amberg, however, one view per assembly station is sufficient – up to nine different criteria are checked at the same time: The presence of screws, sealing rings, connector plugs, etc. These criteria can then be checked for up to 16 individual characteristics. Thus, the system not only checks whether the correct components were assembled, it also

The automated quality control prevents errors at the assembly of components of the Simatic ET200 distributed I/O

checks for the exact alignment – of a coding lug – for example.

User-friendly Operator Interface

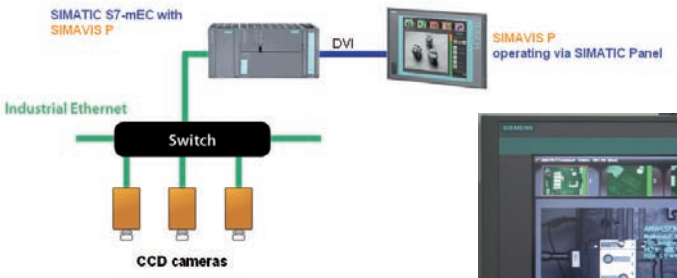
Images and test results are displayed on a Simatic flat panel monitor Pro. This has IP65 protection and is mounted on a support arm in such a way that it can be moved into the given optimal position at the assembly station.

The defect locations are clearly marked by the system. Information on clearing the defects makes it easy for the assembly personnel to quickly correct any assembly errors. Only once a renewed check of the module confirms the correctness of the results is the part conveyed to the next station. The test results are send to a higher-level database. The individual modules are identified and tracked via a Simatic RF340T RFID tag on the workpiece carrier.

The interface from Simavis P is well laid out and intuitive to operate via the touch screen. Thus, the user can change, for example, the tolerance range of a test criterion if corresponding requirements should arise.

Migration of Vision Systems

The new test stations with Simavis P on the embedded controller are gradually replacing existing systems with the Simatic vision sensor system VS710. In comparison to these systems, which had the image processing intelligence integrated in the camera system, the image processing on the Simatic S7-mEC is performed better and more flexible. So, the user program will automatically handle the control tasks for the assembly station on the same controller. The Simatic WinAC RTX software controller makes this possible in real time – and Simavis communicates with WinAC RTX via the system's own S7 communication system.



The Simavis P image processing software on the rugged modular embedded controller Simatic S7-mEC

The user interface of the Simavis P image processing software on the Simatic flat panel monitor Pro specifies whether the test criteria have been fulfilled

Successful Cooperation

Josef Bäumler, the production engineer at the Electronics Works Amberg, is satisfied with the reliability of the new system. In particular, the fact that it was possible to carry out the implementation in a short period of time convinced him that he had made the right decision – both with regard to the hardware and with regard to the cooperation with the partner Simon iBV and its image processing system Simavis P.

The easy connecting of Simavis P to the Simatic programming environment Step7 and thus to automation solutions with the Simatic programmable logic controllers makes the system appealing for many other application areas in a wide variety of industries. A wide range of PC-based controllers supports this flexibility.

S7-mEC: the PC-based controller platform for high-performance applications

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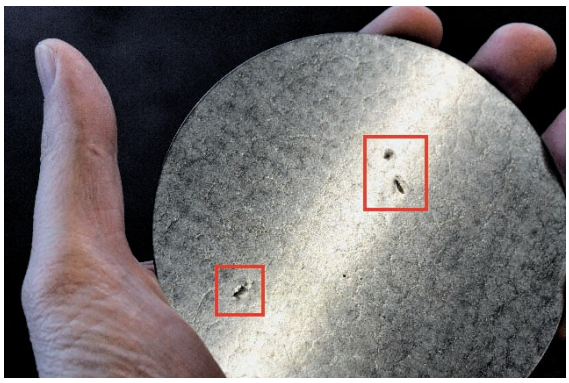
Defect Detected – Defect Averted

100% Inline Surface Inspection Guarantees Long Life of Fuel Pumps

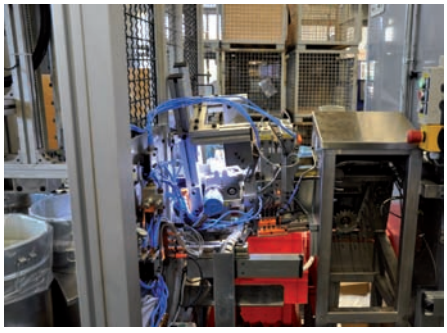


Fuel pumps must operate trouble-free behind the scenes during the whole life of the automobile. A defect-free surface of the pump tube is a prerequisite for perfect corrosion protection and thus a long life of the fuel pump. To guarantee this, Präschu Umformtechnik has chosen an in-line inspection system from Octum for the automatic surface inspection of the pump tubes.

The company Präzisionsteile Franz Schulz GmbH – or just Präschu Umformtechnik for short – has its key competence in the production of high quality sheet metal parts by deep drawing, stamping and bending. This is followed by further processing with or without cutting, assembly by joining or welding and surface finishing and cleaning.

Octum GmbH implements customised image processing solutions for 100% quality inspection and material flow control in series production. The solutions are implemented with compact, intelligent cameras for simple or distributed inspection or identification jobs, or PC-based multi-camera systems, e.g. for surface inspection or 3D inspection. In the field of surface inspection, Octum has specialised in the inspection of single metal parts.

Finished tube with defects



Optical final inspection by the Octum CV-600 system

The tubes of fuel pumps are produced fully automatically in a deep drawing process. Material flaws were already discovered in spot checks prior to deep drawing which are largely due to contamination, blowholes, doubling and scaling of the metal sheets. According to Thomas Hube – Head of Production & Plants at Präschu – the scrap rate is already about 2% on arrival of the material, whilst Präschu promises its customers 100% good parts. This has led to high sorting costs in the past with the risk of flaws slipping through unnoticed, which can never be totally ruled out in manual inspection.

From Manual to Fully Automated Control

Other sources of faults such as Thyssen arches and flaking off of the galvanisation were identified during the conception phase of the automatic inspection system. The latter defect lead to a loss of the corrosion protection and thus to failure of the fuel pump. Although the majority of the flaws would already be detectable before deep drawing, an optical inspection system was chosen which does not inspect the parts until after deep drawing. This also enabled tool faults and tool matching problems to be discovered.

The tubes are washed after deep drawing and then presented to the image processing system decollated and in the correct position over a chute with stoppers. A roller mechanism designed by Präschu turns the parts around their longitudinal axis by 380 degrees underneath the camera. The CV-600 system from Octum takes the camera images in high resolution with a line scan camera and evaluates these automatically. The CV-Inspect system software operates with local adaptive methods to cope with brightness fluctuations to compensate for process-related or material-related fluctuations in the appearance of the tubes after the deep drawing. The sensitivity of the defect segmentation and of course also the response limit can be parameterised by the operator. At this time, defects from a size of 0.2 mm x 0.2 mm upwards lead to

Flawless tubes before packing

rejection of the part. All detected defects are colour marked in the grey image. Inspection regions and excluded areas can be set flexibly. The key routines access library functions of Halcon or VisionPro, respectively, depending on the application. The cycle rate is 1.8 seconds.

Future-orientated Investment

At Präschu, more than 2.1 million parts per year are produced. Good parts are transported directly for packing. The system is designed for simple operation and provides multi-level access depending on the qualification of the employees. The access possibilities range from simply calling the inspection program for the part currently being produced to making parameter changes or even modifications in the inspection process. This future-orientated investment is part of the 0 ppm strategy of Präschu Umformtechnik and guarantees the continuing high level of quality in the production. Because of the positive experience made with the installed inspection system and the quick amortisation time as well as other cost savings, additional surface inspection systems are being planned for other lines and products.

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Postal Organisation with WebCoding Solution

The OCR specialist and systems' integrator, Prime Vision, has just delivered the first phase of its WebCoding solution to TNT Post in Holland. The product will allow video-coding images to be captured at TNT's nationwide sorting centres and collated into a single stream for export to TNT coding facilities abroad. WebCoding is available in various modes and can be introduced in phases to suit the client's needs. The solution can be deployed in-house with the keying undertaken centrally. Alternatively it can be web-enabled with the task distributed nationwide or internationally, via a service such as TNT Shore, to realise additional cost savings. WebCoding is robust and provides redundancy. It ensures that the efficiency of the post's operation can no longer be compromised by insufficient resources at peak times or limitations in system architecture.

Prime Vision B.V.
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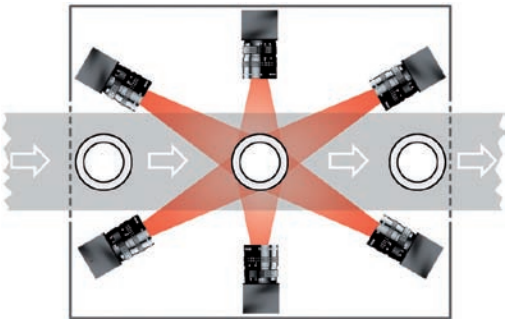
Inspection of Cylindrical Objects

Locate, read and verify the serialized 2D code for cylindrical containers, every time, regardless of bottle orientation – a real challenge for packagers. Therefore, Seidenader Vision, a supplier for inspection technology to the pharmaceutical industry, developed a module to check cylindrical objects around their entire surface: the SV360. With this new solution, bottles can be checked on-the-fly, capturing a 360 degree view of the unoriented bottle on the conveyor. The inspection module can be integrated anywhere on the conveyor for speeds of up to 400 containers/minute. By using a six camera solution, and positioning the cameras 60 degrees apart, the SV360 locates, reads, and verifies the 2D code every time as it passes through the inspection module. The Seidenader SVIM, a high performance vision processor, takes these images which overlap, analyzes each individual image or stitches them together to create one image to be analyzed.



Seidenader Vision GmbH
Tel.: +49 8121 802 0 · info@seidenader.de · www.seidenader.de

App for Camera-based Identification Technology

The second you move away from the desk is the second you can lose track of what is happening: What is the latest system read-rate? How is that torn barcode being read? Vitronic now offers an App which can solve this problem. A quick glance at the compact iPad, wherever you are in the distribution centre, is enough to check the performance characteristics of the identification technology in the entire hub – completely wirelessly. Using the App is simple and, with a couple of swipes of the finger, it can display: The status and read-rate of each individual identification system, and all current and archived read results. Many intralogistics companies already use web-based monitoring software. But up until now, this has only been possible at fixed workstations.

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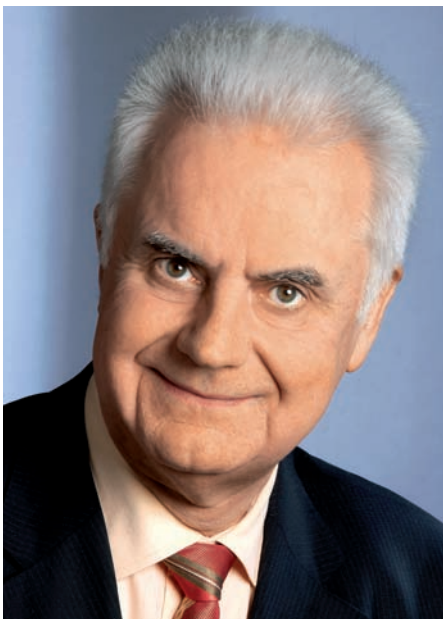
A Better Alternative

Expert Discussion on the Usage of High Resolution Optical Metrology on the Factory Floor

Having been regarded as a "trend" only a few years ago, optical metrology is today already "best practice" in industrial quality assurance. Today non-destructive measurement solutions are used by default for the measurement of complex components in various industries. The technological principle of Focus-Variation included in the recent EN ISO standard 25178 is one of the technologies which are not only used in the lab but also for production integrated surface measurement. In the following, Alicona CEO Stefan Scherer and Prof. Albert Weckenmann, head of the Chair Quality Management and Manufacturing Metrology (QFM) of the University Erlangen-Nuremberg, speak – exclusively for INSPECT – about strengths and weaknesses of optical metrology, demands from the industrial users and necessary measures to even better establish optical metrology on the factory floor.

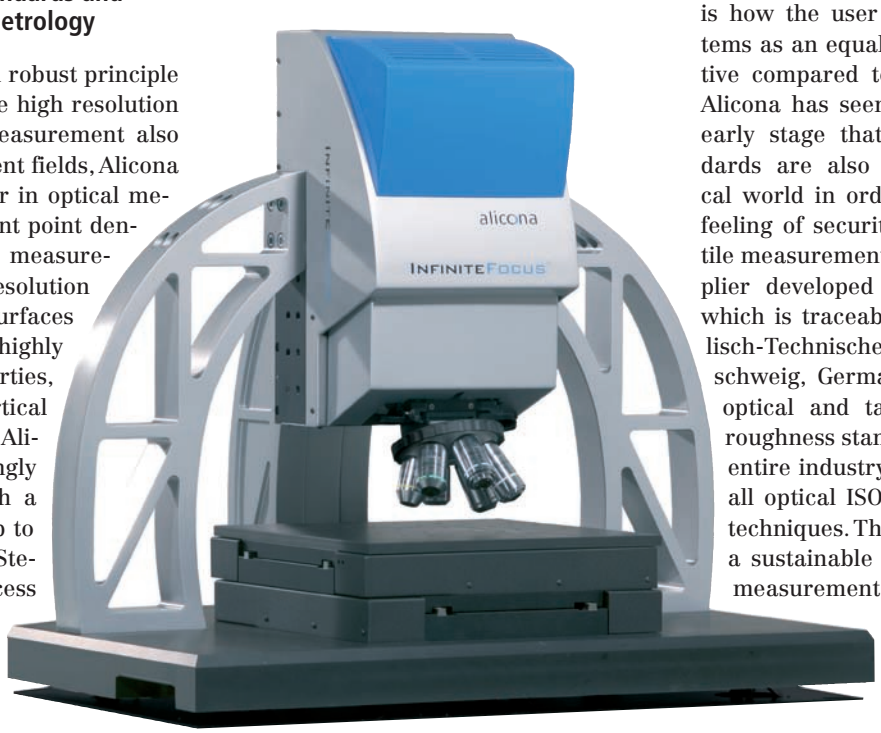
Dr. Stefan Scherer,
Managing Director Alicona Imaging



Prof. Dr. Albert Weckenmann, Full Professor at the Chair for Quality Management and Manufacturing Metrology (QFM) of the University Erlangen-Nuremberg

Focus on Reference Standards and Guidelines in Optical Metrology

With its areal based and robust principle of focus variation for the high resolution form and roughness measurement also across large measurement fields, Alicona is regarded as a pioneer in optical metrology. The measurement point density of several million measurement points, a vertical resolution of up to 10 nm even at surfaces with steep flanks and highly reflective surface properties, as well as the high vertical scanning range lead to Alicona being an increasingly demanded supplier with a yearly growth rate of up to 50%. According to CEO Stefan Scherer, this success can be traced back to two factors. Firstly, the high quality and user oriented products and, secondly, a consistent business policy which also emphasizes on "continuously exploring and watching the market to figure out which other measures, besides accurate results are necessary to advance optical metrology." In terms of reference tools and traceability it is due to Alicona that significant progress has happened. Albert Weckenmann on the importance of traceable standards: "Reference tools, user guidelines and measurement standards are mainly tailored to tactile production measurement technology. However, the user has to be sure that optical measurements can be traced back as reliable as known from the tactile measurement tools and procedures. This happens throughout the use of calibrated reference standards and standardized measurement procedures. This is how the user recognizes optical systems as an equal or even better alternative compared to common techniques." Alicona has seen and understood at an early stage that these reference standards are also necessary in the optical world in order to provide the same feeling of security as known in the tactile measurement. Consequently, the supplier developed a roughness standard which is traceable to the PTB (Physikalisch-Technische-Bundesanstalt, Braunschweig, Germany) and applicable for optical and tactile instruments. This roughness standard can be used by the entire industry as it is appropriate for all optical ISO certified measurement techniques. This is how Alicona has set a sustainable step to advance optical measurement forward.



Robust Results also in Production

Industry faces an increasing need for new solutions in quality assurance as fine detailed functional geometries have become too complex to be measured with tactile techniques. "Our customers agree that in many cases tactile measurements hardly achieve appropriate results," states Scherer. Results are simply not robust enough and vary depending on the measurement position. However, despite the need for robust and high resolution measurements, optical systems have not been widely taken up in integrated production measurement and quality assurance. "For the use in a production near environment, industry requires more than highly accurate and traceable results," Scherer continues. "Additionally, there is a strong demand for robust repeatable measurements, universal fields of application and function-oriented results. The robust technology of focus variation already delivers today repeatable and traceable results with high resolutions." To make optical techniques production-ready, Weckenmann adds another aspect: "Universal applications at high usability including information on the measurement uncertainty – as soon as suppliers meet these requirements, optical measurement will be accepted both in production and integrated quality assurance," Weckenmann states. "The measurement uncertainty is crucial information as it often indicates the conformity of components. This implies that values for measurement uncertainty have to be shown directly in the measurement result. This will become increasingly important," so the chair of QFM. Again, focus variation is a leading technology as it provides information on the repeatability of every single 3D point. The user gets an estimated measurement uncertainty with every measurement value. "This repeatability measure helps to evaluate the quality of individual measurement points. At present, we do not know of any other optical technology that delivers information to verify the quality of a measurement value as it is achieved by focus variation," Stefan Scherer summarizes.

Higher Resolution across Larger Vertical Scanning Ranges

At QFM, focus variation is used to measure complex surfaces and components. "With the high resolution optical 3D measurement device InfiniteFocus we measure e.g. cutting inserts, bearing shells, crankpins as well as the surface of press cylinders. With Focus-Variation, we are also able to measure steep flanks at a vertical scanning range of more than 20 mm. In contrast to other techniques such as white-light interferometry this enables a much larger measurement field," describes Weckenmann the applications and benefits of focus variation. The expert about further benefits that come along with the use of optical measurement solutions: "Measurements are much faster and include more information. Throughout the use of optical principles the user benefits from more measurement points which enable him to achieve areal based results. In contrast to e.g. tactile techniques, which can cause surface defects due to the stylus force, non-contact measurement also means that the surface remains undamaged."

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For an Ideal Interaction

White-Light Interferometry Inspects Pump Components

Heavy duty pumps have to achieve higher and higher performances and are often designed for a pressure of 400 bar and more. If they reach the expected performance depends heavily on the components that are used. Since these components are mainly produced in huge quantities an inspecting system is required that operates precisely and economically. These demands are fulfilled by the white-light interferometer: Within a very short time, it examines the components in regard to form and roughness.

Workpiece surfaces are characterized by several parameters, like flatness, roughness, edges, bearing angle (cone) and roundings. To measure these characteristics with traditional methods, like tactile measurement instruments, is work-intensive and costs a lot of time. The non-contact white-light interferometry is an alternative which is suited best for in-line inspection tasks. A major advantage is that samples can have several features automatically tested with one measurement instrument and in only one fixture. In this way, time-consuming sample transfers and fixing procedures are avoided. By using directly the fixture or the transport fixing device for other production processes, the sample table must have a travel of 15 cm or more.

The NewView Technology

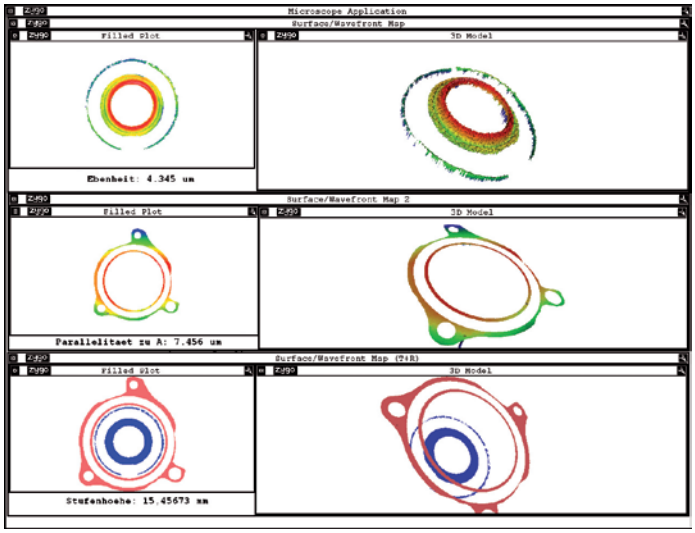
For more than 30 years the test equipment manufacturer Zygolot, Darmstadt, Germany, has been engaged with optical metrology, above all with the applications of the white-light interferometry. The NewView measurement technology developed by Zygolot uses white-light interferometry and has become generally accepted for industrial application since the year 2000. Today, about 3,000 NewView instruments are applied in industry worldwide. Many of them are working 24 hours every day seven days each week. In numerous industries where small precision parts are manufactured or required, such as in mechanical engineering, medical technology and other industry branches, the NewView instruments are considered as reference instruments for surface profiling. The white-light interferometer NewView 7300 can be flexibly applied for universal testing tasks. It can automatically realize, analyze, report and document graphically several different measurements.

Precision Parts for Heavy Duty Pumps

The measurement instrument NewView 7300 can be installed right next to a machine, for example a grinding machine. The operator inspects continuously the quality of the grinded parts – and thus the quality of the manufacturing process. If necessary, he can intervene in the manufacturing process and correct the manufacturing parameters avoiding in this way the production of expensive scrap. Having replaced or adjusted tools, the operator can also examine rapidly whether the machine works in a correct manner or not.

The NewView 7300 white-light interferometer

One example for the application of the measurement instrument NewView 7300 is the examination of parts which are used in heavy duty pumps. Such pumps are used in fluid systems, e.g. for the fuel delivery, or hydraulic systems, where they convert mechanical energy into hydraulic energy and transmit it. These systems can be found in industrially used machines and plants as well as in construction engines, passenger cars and utility vehicles. Heavy duty pumps have to achieve higher and higher performances and are often designed for a pressure of 400 bar and more. The proper function of such a pump and the safety of humans and significant material assets depend on the condition of the pump components – above all the pressurized ones. Certain of these components have areas which are set back; upper and lower areas must be parallel to one other. These parts with a diameter of 60–80 mm are manufactured in large volumes of 100,000 and more each month and must adhere to high precision requirements regarding their form (flatness < 5 µm) and structure (roughness < 1 µm). These characteristics have to be controlled at 100%. In the indus-



Graphical illustration of the pump component's surface characteristics

trial practice these parts are measured in a transport fixing, which can accept 100 parts. Besides performing a 100% inspection, it is also possible to test automatically each n-th part. Besides various engine components and valves, also components for semiconductor technology, optical lenses of all kinds, components for photovoltaics, components of micro-laser systems as well as medical implants and other components for medical technology are typical parts whose surfaces can be tested with the measurement instrument NewView 7300.

Various Measurement Applications

The white-light interferometer NewView 7300 is designed for a wide variety of samples of all materials and shapes with diameters ranging from less than 1 mm up to greater than 130 mm. The system can execute numerous tests, for example the measurement of flatness, roughness, step heights and form deviations. Likewise, areas which are set back, angles, radii, cone angles and cones can be measured. Moreover, grinding structures and wear phenomena can be determined, layer measurements realized and edge effects analyzed. In the case of flatness tolerances a measurement system capability is guaranteed with a part tolerance of 0.5 µm. The NewView 7300 provides also SPC data. The test results are transferred directly into statistics. To make data analysis even easier, the operator can view selectable 3D graphics that enhance the part shape for easy interpretation, documentation and printing. The test results of each inspected piece can be shown three-dimensionally and in color on a monitor or a hard copy resulting in an improved vividness. The measurement instrument NewView 7300 is a modular system. Users can acquire a basic instrument responding to their specific requirements. When further testing tasks are to be added, the system can be extended according to these requirements. The modular system is very versatile. For example there are more than 20 different objectives available. The economic efficiency of the measurement method is still higher because the operator can insert 24 samples into a multi-part pick-up device. Having started the testing procedure, the samples are automatically tested one after the other.

Rapid Repayment

Zygolot is an A-class supplier of companies like Carl Zeiss and Robert Bosch where numerous NewView measurement instruments are already working. Also many small and medium-sized companies already successfully apply the NewView technology and expand their inventory of instruments. The NewView 7300 measurement instrument can be fully integrated into the production process, works with short cycle times and helps to correct production parameters if necessary, avoiding in this way the production of expensive scrap. The operation of the device is simple and safe; the quality of the measurements does not depend on the operator's skill. Due to its various characteristics the measurement instrument NewView 7300 is paid for by a rapid return on investment.

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Making the Invisible Visible

Prism-based Multispectral Camera Technology

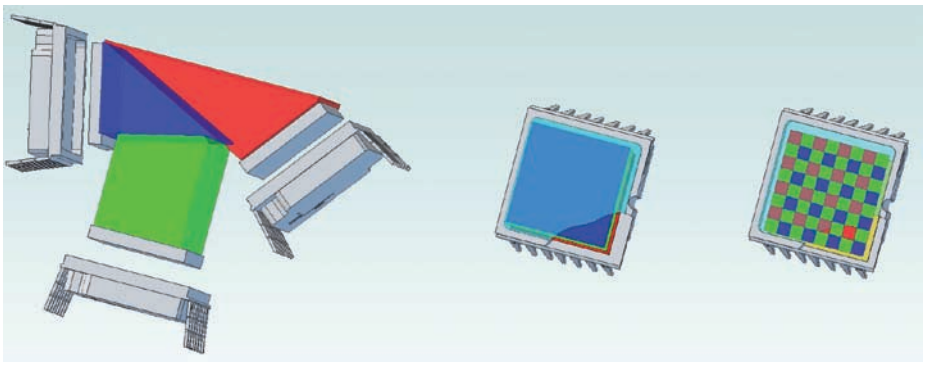
Multispectral cameras are capable of separating light based on its color. In this sense, color is not limited to the human perception of color. In fact, many multispectral cameras capture parts of the optical spectrum that are invisible to us, such as ultraviolet and infrared.

There exist many methods for spectral measurements. At one end you find spectroscopy which is capable of sampling in very narrow bands but is generally slow and doesn't allow area scan sampling. On the other end you find grayscale cameras equipped with changeable filters, but since the filters need to be changed this method is not suitable for real-time measurement. Quest Innovations' prism-based solutions combine the best of both worlds: real-time imaging of multiple spectral bands without motion artifacts, perfect pixel alignment across channels and at full sensor resolution.

Pixel-to-pixel Alignment

A glass prism splits the light beam into individual parts based on its wavelengths and projects each part on a separate sensor. Because all sensors use the same optical system, they can be aligned with great precision. This is of great importance for the quality of the camera. Cameras that have high alignment precision make it possible to compare the images of each spectral band at high resolution.

Commercial prism-based cameras range from two-channel cameras (e.g. RGB + infra red) to five-channel camera that use separate channels for red, green, blue and two infrared channels, with typical frame rates ranging from 15 to 120 fps. All cameras can be customized to the customer's spectral requirements by placing optical filter in the optical path of individual sensors. Just as with grayscale cameras, the sensor type is an important criterion. CMOS and CCD sensors are both responsive from approximately 400 nm to 1,000 nm. Which sensor should be used depends mostly on the requirements of the application: e.g. quantum efficiency, spectral response, sensitivity, resolution, and frame rate.



Three methods of separating colors (left to right): 3CCD, Foveon X3, Bayer mosaic

Color

A RGB color camera can be considered a multispectral camera. The most common method to develop a color camera is to make use of the Bayer mosaic. This is a grid of 2x2 blocks of coatings on the chip that makes each pixel sensitive to either red, green or blue, the other light is filtered out. Software algorithms are used to 'fill in' the missing pixels on each color channel. The Foveon X3 sensor uses a completely different method. Like the Bayer-mosaics it is a single sensor solution, but instead of placing the red, green and blue 'pixels' side-by-side on the sensor area, the color detectors are placed on top of each other on the silicon chip. This way the full sensor resolution is maintained. A third method is known as 3CCD, based on a three-channel prism and three chips for red, green and blue.

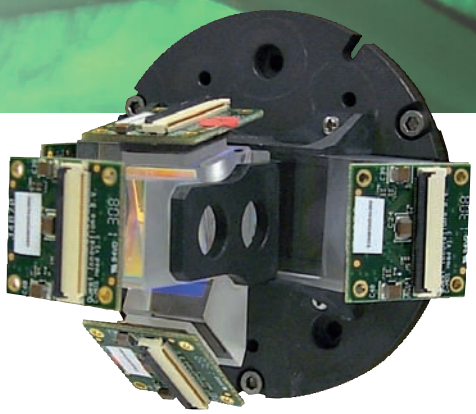
For RGB color imaging, the best solution depends highly on the application. A Bayer mosaic is the cheapest solution but can suffer from low contrast at edges (acutance) due to the interpolation algorithm as well as other artifacts. The Foveon X3 sensor and 3CCD prisms do not suffer this problem: they sample each spectral band at full resolution. The Foveon X3 has the benefit of being a single sensor solution, while 3CCD cameras are configurable (e.g. sensor model and spectral bands).

Customization

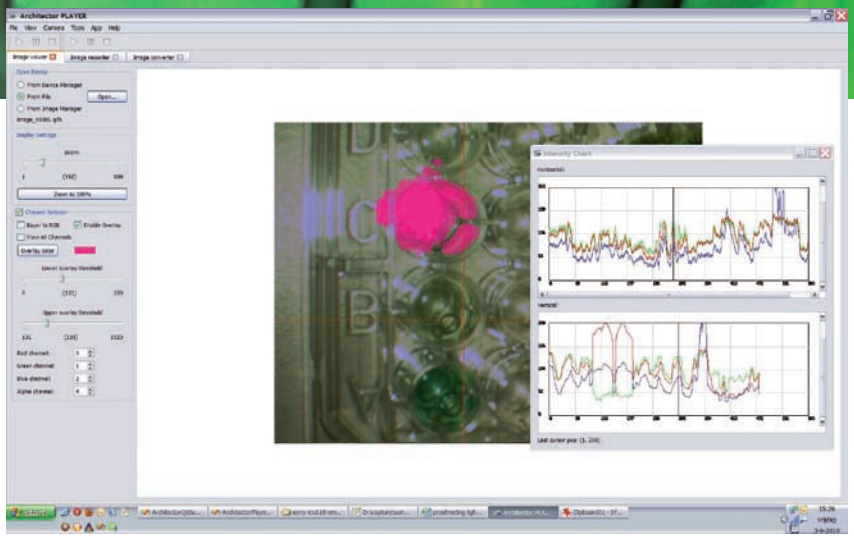
Multispectral cameras often have to be tuned to the characteristic situation of their application. Optical filters can be selected for the individual channels of every multispectral camera from Quest Innovations. But sometimes full system customization is required: customized prism coatings, I/O connectors, frame grabber interfaces, housing, special sensors or even a complete camera (re)design.

Image Analysis

Multispectral image analysis adds a new level to image processing. Algorithms such as the morphological operators, convolution filters and threshold still have their use, but the required information is usually not directly accessible in one single spectral band but only in a composition of more channels. The difference and ratio between channels are



A five-channel prism with sensors attached



Fluorescence image taken with five-channel camera: The fluorescence is shown as false-color (pink)

frequently used. A method that is very useful for human interpretation of multispectral images is to map three channels to RGB and use a forth channel as overlay mask.

Applications

Multispectral technologies find their way into many applications in almost every sector and industry.

Crop Inspection

Pests and crop diseases can be detected by multispectral imaging techniques. Healthy green plants absorb the energy from sunlight in the photo-synthetically active radiation (PAR) spectral region and reflect the sunlight in other spectral regions. Especially the longer wavelengths (>700 nm) contribute little to the process of photosynthesis and only serve to overheat the leaves. Therefore most vegetation appears dark in the PAR spectral region (absorption) but very bright in infrared (reflectance). The Normalized Difference Vegetation Index

$$NDVI = \frac{(NIR - RED)}{(NIR + RED)}$$

is a measure for the photosynthetic capacity. Similar ratios exist for the green and blue channels. These ratios can be used for applications such as segmentation based on crop type or soil, or to find the regions that are under- or over fertilized.

Agricultural Sorting and Inspection

Sorting and inspection of agricultural products such as apples can benefit from multispectral cameras. Measurement of apples is difficult because the algorithm needs to be robust with respect to the colors that apples can have, including the color gradients of many apples. In the infrared images however, all apples appear with an uniform gray surface, making measurement easier and more robust. Bruises beneath the apples skin can also be made visible in the infrared. This is not only true for apples but many other agricultural products such as strawberries, potatoes, bell peppers and many more. For these applications a Bayer-mosaic color channel combined with an infrared channel makes an optimal match between cost and performance.

Cancer Research and Surgery

One of the most promising developments in cancer research is the use of fluorescent molecules that are designed to attach to specific molecules that are only found in cancer cells. When these reagents are excited by incident photons of the appropriate wavelength they start emitting photons at their specific fluorescence wavelength, often in the near infrared spectrum. Multispectral cameras are used to assist in locating the tumors so that they can be surgically removed while causing minimal damage to the surrounding healthy tissue.

Multispectral cameras are applied most in the agricultural and medical sectors, but they promise many exciting new applications for machine vision in other sectors too. The multispectral cameras of Quest Innovations are the logical next step after color imaging: making the invisible visible.

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Insights into Hidden Worlds

Fiber Optical Based Metrology for High-Precision Form Measurement

In order to measure characteristics that are difficult to access, like in boreholes, the commercially available sensors are often not well suited. Either, they are too big or they damage the testing object's surface. That is why fiber optical measurement systems become more and more important. They operate contact-free, with high accuracy and high measuring rates which permit the inspection in production processes.

Measuring tasks in areas with difficult access, like holes, or in delicate component surfaces requires the application of a flexible and non-contact metrology. For this reason the German Fraunhofer Institute for Production Technology IPT developed together with the company Fionec from Aachen, Germany, an optical fiber based measuring system for the high precision form metrology.

System Specification

The system is based on the low coherent interferometry measuring principle, shown in figure 1. It is composed of two main units: the first unit is a fiber based Fizeau interferometer, which is connected to a second unit to analyze the encoded distance, a Michelson interferometer. The generated interferogram is acquired by a CCD line detector and directly evaluated using an embedded microprocessor. The measurement results are available as analog (+/-10 V and 19 bits resolution) or digital signal (USB) with measuring rates of up to 15 kHz. For a measuring range of 120 µm the system achieves measurement uncertainties of 5 nm. Possible operation distances depend on the optic fiber probe design type and can achieve distances up to 3 mm.

The fiber probes are composed of an optical fiber (diameters down to 80 µm) and for the stiffness enhancement also of a ferrule of for example CFP (carbon fiber reinforced plastic) or Aluminum [1].

Form Metrology

The solution concepts for the fiber optical based form metrology comprehend the integration of this technology in commercialized measuring equipments (for example coordinate measuring machines or form measuring stations) as well as the specification, design and construction of fiber probes (fig. 2a). The development and construction of individual high precision measuring equipments for spe-

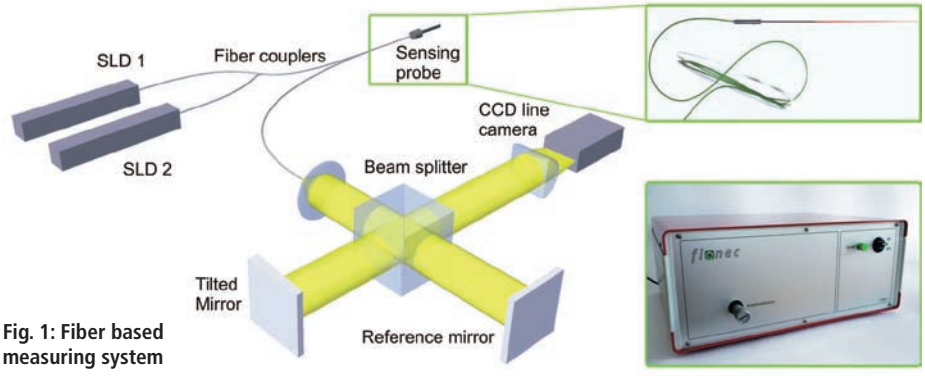

Fig. 1: Fiber based measuring system

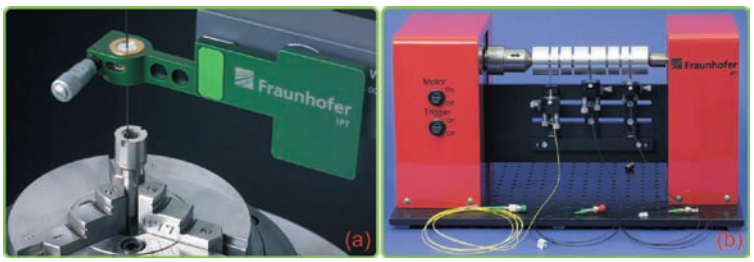

Fig. 2: Sensor integration concepts: (a) Integration in commercial available measurement stations, (b) construction of individual measurement equipments and software

cial measuring tasks is also possible (fig. 2b).

In order to investigate the measuring system's applicability and also the measurability of diverse form characteristics the developed system was integrated in an industrial form measuring station. A complete integration was secured by coupling the analog measuring system output back in the measuring station. The synchronization between position and measurement value is implemented using a TTL trigger signal generated by the measuring station.

By means of this integration all existing measuring station's metrological routines can be used, as well as all the measurement evaluation tools conforming to ISO. Examples of possible form inspection are roundness, cylindricity, straightness, parallelism, run-out, axial run-out and conicity all according to DIN/ISO 1101.

In parallel the Fraunhofer IPT developed individual high precision measuring equipment and software for the micro borehole inspection (roundness and cylindricity) and for the shaft inspection (roundness and run-out) [2].

Applications

Form inspection based on fiber optical sensors can be executed in several high precision components, for example in micro holes in diesel injection nozzles. Those holes exhibit diameters of 125 µm (with falling tendency) and a characteristic conical form (fig. 3a). By using fiber probes with diameters of 80 µm a direct form inspection is made possible. A similar measurement task is the inspection of fuel and hydraulic valves and nozzles, which feature boreholes with diameters in a few millimeters range (fig. 3c). A further measurement task which shows a demand on flexible metrology is the roundness and run-out inspection of gear wheels. Using fiber optical sensors a flexible non-contact inspection of gear wheels with diverse diameters, tooth crest form and quantity is possible in high measuring rates (fig. 3b).

Based on the miniaturized fiber probe size the measurement on form features with difficult access is made practicable. Examples are stepped shafts (fig. 3d) and structured grinding disks (fig. 3e). These structured grinding disks demand in addition to the miniaturized fiber probe size a non-contact measurement because of its abrasive surface.

The possible high measuring rates permit also the form inspection in production processes. The run-out inspection of shafts in the quality test by high rotation velocities (600 rpm) is an example.

By the application of a fiber switch several fiber probes can be scanned using only a single evaluation unit, creating the possibility of a multi sensor inspection. With this concept fiber optical measurement equipments analog to pneumatical multi sensor measurement stations can be developed [2].

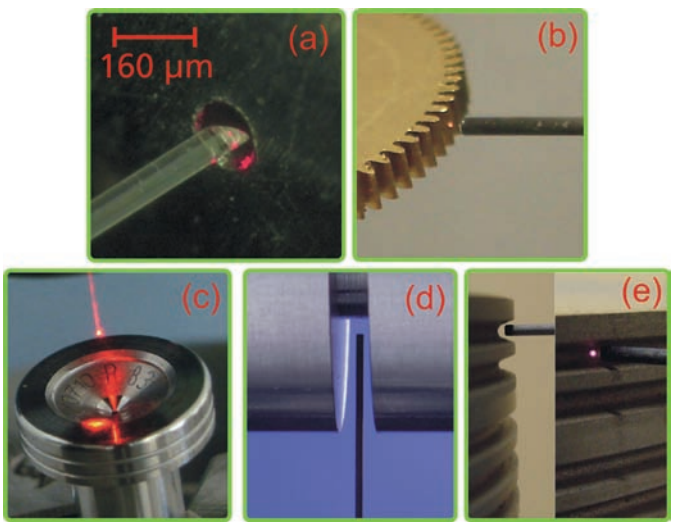

Fig. 3: Applications of the fiber optical form metrology: (a) roundness inspection in micro boreholes (diameter 125 µm), (b) roundness and run-out inspection of gear wheels, (c) quality inspection in valves and nozzle bodies, (d) roundness and run-out inspection of structured shafts and (e) roundness and run-out inspection of structured grinding disks

Future Steps

At Fraunhofer IPT further sensor concepts are planned, like the design of fiber probes for roughness measurement as well as the probe miniaturization under 80 µm. Another focus is the construction of a fiber probe with a built-in rotation unit for measuring boreholes in several surface angles, as well as the measurement of a complete gear tooth.

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High-Resolution Infrared Camera

Flir Advanced Thermal Solutions (ATS) Group has announced the release of its new FLIR SC655, a high-resolution uncooled infrared camera designed specifically for scientific and research and development applications. The new model provides both high frame rates and full 640 × 480 imagery enabling capture of over 300,000 pixels of accurate temperature measurement data in a single image. It offers high-speed windowing modes, digital control of image flow and recording and to be fully compliant with both GenICam and GigE Vision protocols, making it ready to integrate with a variety of third-party analysis software packages. This combination makes the camera the most effective tool available for infrared research, product development and non-destructive testing applications.

FLIR Advanced Thermal Solutions
Tel.: +33 16037 0100 · info@flir.fr · www.flir.com

Update for Microscopy Imaging Software

Olympus has launched an update for the successful Stream materials science microscopy imaging software family. Stream v1.4 provides a number of new and improved features, which not only increase workflow efficiency, but also enhance the overall capabilities of the software. Importantly, Stream v1.4 and the associated Olympus hardware components are now compatible with Microsoft Windows 7, and there is improved interfacing with Microsoft Office 2003 and 2007 programmes. Image processing and measurement within Stream has also been enhanced with a series of additions. A new Differential Contrast Enhancement (DCE) filter selectively enhances areas of weak contrast for better detail and focus. New, simple, 3D measurement functions have been enabled since, in addition to the actual image generated during enhanced focal imaging (EFI), a height map is also produced and saved as a separate layer and this makes measurements in all three dimensions rapid and easy.

Olympus Europa Holding GmbH · Tel.: +49 40 237 735 913
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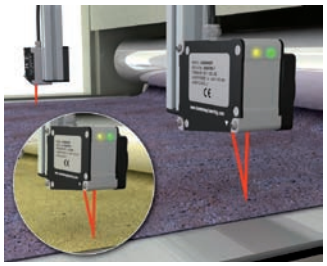
Laser Displacement Sensors

Turck extends its portfolio with a series of triangulation laser displacement sensors for non-contact height or thickness measurement of a wide variety of materials, made by Turck's partner Banner Engineering. The new LH Series sensors provide precise measurement of distance, web thickness and alignment. There are three models in the series, with measurement ranges of 25–35, 60–100 and 100–200 mm. Thickness is measured by two sensors mounted at either side the target that automatically synchronize with one another. Up to 32 sensors can be easily combined in a mixed measurement network of multi-track displacement or thickness sensors. A wide selection of mounting brackets and industrial cordsets allows efficient creation of sensor networks. The software accommodates data logging and monitoring for statistical process control.



Hans Turck GmbH & Co. KG
Tel.: +49 208 4952 0 · more@turck.com · www.turck.com

Line Laser for Machine Vision

The new line laser ZM18-DM from Z-Laser is an all-purpose laser suited to structured lighting for 3D measurement, surface inspection, medical and alignment applications. According to its 5–30 VDC, the laser can be modulated digitally up to 100 kHz frequency. This allows the laser to be switched on and off in synch with a camera offering true imaging capability as well as extended laser lifetime. The ZM18-DM is available in wavelengths of red, blue and IR with output powers up to 200 mW. Furthermore, the sophisticated electronics feature a built-in micro controller and serial interface facilitating the logging of temperature, operating hours etc. OEMs will appreciate the simple, external hand focusing mechanism the lasers provide as well as the thread-mounted barrel for easy and versatile mounting.

Z-Laser Optoelektronik GmbH
Tel.: +49 761 29644 44 · info@z-laser.de · www.z-laser.com

Improved Visualization

Hexagon Metrology releases the latest version of its CAD-based metrology software: PC-DMIS 2010. It is developed by Wilcox Associates, a Hexagon Metrology company. The PC-DMIS 2010 offers new measurement capabilities which ensure total integration with the supported non-contact 3D laser line sensors. New capabilities for non contact sensors include improved visualization of all parameters for programming laser-based 3D geometric features, as well as easy re-execution of laser based measurement routines. PC-DMIS 2010 has been enhanced to handle the large point clouds that are commonly gathered with these types of sensors. The software release is retro-fittable as a software upgrade for most other CMM models. Existing customers with current software maintenance agreements are eligible for a free upgrade to PC-DMIS 2010.

Hexagon Metrology
Tel.: +44 20 860 072 40 · www.hexagonmetrology.com

New USB Microscope Cameras

The Digital Imaging business unit of the Jenoptik Optical Systems Division has now added two USB camera types to its ProgRes CCD microscope camera range: ProgRes SpeedXT core 3 (17 fps, resolution 2,080 x 1,542 pixels) and ProgRes SpeedXT core 5 (13 fps, resolution 2,580 x 1,944 pixels). These products feature the company's innovative SpeedXT core technology. Thanks to the 2-3 fold enhancement of the live image speed in combination with the high resolution, specimens can be focused and positioned more easily and quickly – an advantage in the analysis of moving objects and routine work in laboratories. Exposure times up to 180 s ensure optimum captured images, also under low-light conditions. The maximum possible color depth is 36 bit. In combination with C-Mount connection, the new cameras can be rapidly connected to any microscope, computer or notebook via the USB 2.0 interface.

Jenoptik, Optical Systems
Tel.: +49 3641 65 0 · progres.os@jenoptik.com · www.jenoptik.com/progres

Portable Measuring Arm for Scanning Applications

The Romer Absolute Arm, the latest Hexagon Metrology portable measuring arm, is now available as fully certified laser scanning system covering all types of scanning applications. This system is a universal scanning solution for all types of parts and applications. The scanner's semi-automatic laser power control allows working with different surface types without special adjustment. With the integrated laser scanner and the absolute encoders, operators can simply switch on the Romer Absolute Arm, launch the software and start measuring. Also third party laser scanners can now be connected to the Absolute Arm using the Romer Feature Pack technology. These extensions are thermally and mechanically stable, easy to exchange for the user and open for new technologies and additional accessories.

Romer
Tel.: +33 254 864 040 · www.romer.com

New Control and Measurement Solution

3Shape, provider of 3D scanners and CAD/CAM software solutions, announces the launch of its Convince 2010 Quality Control system, a comprehensive solution for 3D quality control, measurement and inspection. This new generation Convince system combines 3Shape's Q700 scanner series with advanced metrology software. A wide range of new and enhanced features include a full set of built-in 2D/3D and GD&T measurements, difference maps, and Scan-CAD alignment. Furthermore, Convince 2010 supports scan history and statistical process control tools that enable evaluation of trends affecting specific parts. 3Shape provides a choice of 2 scanners – the Q700 with 1.3 MP camera resolution and the Q740 with 5.0 MP resolution. Both scanners are designed for productive quality control of small complex objects through excellent detail level, high scan speed and accuracy.

3Shape A/S · Tel.: +45 70272620 · info@3shape.com · www.3shape.com

New Generation of Laser Spot Tracker

The Model 742DP is a new generation of laser spot tracker with wide flexibility for missile and platform tracker applications. The detector is temperature controlled and optimized for 1.06 µm. Independent five channel noise detectors set the lowest thresholds to achieve long acquisition ranges for different background light and spot positions and special circuits resist sunlight blinding in any one or all quadrants. A range of N-type custom-designed detectors gives a high performance at 1.06 µm. A separate substrate allows the detector size or type to be optimized for the customer's application. Model 742DP comprises a hermetically-sealed temperature-controlled detector with built-in front-end electronics, mounted on a SMT board. A second printed board contains analog and digital processing circuits. The individual channels are digitized with a high-speed A-D converter and output as a serial digital interface for steering. An adaptive threshold control allows optimum signal-to-noise operation and power management is used to reduce power consumption.

Laser 2000 GmbH · Tel.: +49 8153 405 0 · info@laser2000.de · www.laser2000.de

Visionary

Interview with Vlad Tucakov, Director of Sales and Marketing, Point Grey Research

INSPECT: This summer Point Grey celebrated the hiring of its 100th employee. How did Point Grey get started and how did you achieve this level of growth?

V. Tucakov: Point Grey started in 1997 as a spin-off from the University of British Columbia (UBC), developing three-camera stereo vision systems and later single-lens FireWire cameras. Our first location was a tiny office in the West Point Grey neighborhood of Vancouver. Since then we've relocated and expanded several times, and now own a 41,000 sq ft (3,809 m^2) facility just outside of Vancouver, and have offices and customers located around the world.

From the very beginning we have grown organically, through product sales alone. We have focused on reinvesting profits back into the company, hiring good people, increasing production capacity, and diligently working on bringing innovative and ground-breaking products to the market. For example, Point Grey was the first to ship IEEE 1394b cameras back in 2004 and the first to show a USB 3.0 camera in 2009.

How much more do you expect Point Grey to grow?

V. Tucakov: One of the most interesting things we have seen over the years is how new markets and applications can suddenly open up new opportunities for growth. Ten years ago, for example, applications outside of mainstream computer and machine vision, such as traffic or geographical information systems, either didn't exist or didn't require cameras. Now they not only require cameras, but in volumes we never thought possible. We continue to increase our product offering, and have expanded our manufacturing capacity to the point where producing more than 100,000 cameras per year is now within our reach.

Industry experts expect a phase of consolidation arriving for machine vision. Does Point Grey have any plans of speeding up the company growth through acquisitions?

V. Tucakov: While we have seen some consolidation, the vision industry is actually fragmented more than ever. Point Grey believes in organic growth, and we do not feel the need to increase our technology expertise or market share by acquiring other companies. For example, Point Grey is the only camera vendor that offers FireWire, GigE, USB 2.0 and Camera Link products. We will also be adding USB 3.0 and S1600 FireWire to our product line.

You mention how Point Grey is the only vendor to support all the interfaces. What opportunities and challenges does supporting so many interfaces present?

V. Tucakov: By supporting the key digital interfaces, if customers like the size or functionality of a particular camera but want a different digital interface, we can easily meet their needs. The technology behind the interface is not really the challenge. However, you need to educate customers on which interface is best for their application, and then support them in their integration efforts. So, it is critical to ensure your sales and support teams receive proper training and have a good understanding of each interface.

The number of camera offerings continues to increase. How does Point Grey differentiate itself in such a competitive environment?

V. Tucakov: When you're a relative newcomer to a market and your competition is already well-entrenched, it's important to differentiate your product. For example, we knew that we would have to differentiate our GigE products in some way, so we made sure our cameras are either faster, smaller, or less expensive than the competition. Our upcoming Flea3, for instance, will be the world's smallest GigE camera. We also distinguish ourselves from our competitors by being vertically integrated. All our cameras are designed and manufactured in our own facility, we develop all the supporting software and low-level drivers ourselves, and we sell direct in North America and Europe. This gives us tight control over product quality, sales, and support.

According to current market studies one of the most promising application areas for vision is 3D. Point Grey was actually one of

the very early providers of stereo vision technology. Do you plan to expand your product range in 3D?

V. Tucakov: We see a lot of interest in 3D imaging, and our single-lens as well as stereo cameras are both widely used for 3D. Our Bumblebee stereo cameras have been very successful and are used in a wide range of applications, including mobile navigation, medical imaging, bin picking, and people tracking. We believe that we are only at the beginning of the adoption of 3D technology in main stream applications. Cost of 3D cameras will be the key factor. If the incremental cost of getting the 3D information is not significant, then why not have the 3D data as well?

The Vision show in Stuttgart is coming up, and most likely we will see new players on the market offering cameras. The market demand seems to be endless. Based on your experience as an entrepreneur, what would be your advice to newcomers wanting to make their mark in the camera business today?

V. Tucakov: Today applications of machine vision and imaging are virtually endless and present great business opportunities. You can come out with the most exotic camera you can think of and there will likely be somebody out there who will want to buy it. My recommendation to a newcomer would be to come out with a very unique and innovative product that nobody else has, learn about the market and then go for the main stream.

Mr. Tucakov, thank you very much for this interesting discussion.

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Preview

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- Machine Vision Basics: Triangulation
- 3D Vision: Where will the journey lead?
- 3D applications based on time-of-flight
- 3D applications with smart camera technology
- Analysis of clouds of points
- Stereoscopic vision with a single lens
- Self-learning software for 3D robot vision
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- 3D robot programming aided by IR sensor system
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Basler baut das Spektrum der hochkompakten Kameraserie ace weiter aus. Zwei neue Modelle mit 1.628 x 1.236 Pixel und 2.592 x 1.944 Pixel Auflösung in monochrom und Farbe ergänzen diese Low-Cost Kamera Serie.

Matrox zeigt mit der GatorEye eine IP67 GigE Vision Kamera für raue Umgebungsbedingungen.
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