The Changing Face of Web Inspection

Materials produced in continuous rolls (web) or sheet, such as paper, textiles, film, foil, plastics, metals, glass, or coatings are generally inspected using line scan technology to detect and identify defects in order to avoid defective material being sent to customers or added-value downstream processes. Like so many areas of machine vision camera technology, line scan imaging has seen some significant developments in recent years, which not only benefits web inspection but other line scan imaging applications as well.

Line scan basics

Line scan technology involves building up an image, one line at a time, using a linear sensor. For web inspection and many other machine vision applications the object passes under the sensor, typically on a conveyor belt. Applications involving rotating cylindrical objects or where the camera moves relative to the object are also possible. Although linear sensors have similar pixel sizes to the sensors used in area scan cameras, the line lengths can be much greater. Instead of the 1-2K width typical in most megapixel area scan sensors, a line scan sensor can have up to 16K pixels. This means that for a given field of view, a line scan camera will provide a far higher resolution, and line scan technology makes it possible to capture images of wide objects at a single pass. High scan speeds for linear arrays mean that the amount of light falling on individual pixels is often lower than in area scan applications so consideration must be given to overcoming this.

New developments in line scan technology

Both CCD and CMOS linear sensors have been used in line scan cameras for many years, but developments in CMOS technology driven by the mobile phone market have also led to significant benefits in industrial imaging sensors. Recent developments have included the introduction of 16K pixel sensors, simultaneous RGB and NIR imaging, higher line speeds, larger pixel variants for enhanced sensitivity, lower cost systems, enhanced software and the use of the newer data transmission standards such as CameraLink HS and CoaXPress. Another interesting development has been the emergence of contact image sensors (previously found in photocopiers and scanners) as a viable alternative to line scan cameras for industrial applications. Also, some area scan cameras offer a line trigger mode for use in some line scan applications. Our centre page spread will take a more in-depth look at line scan technologies and their applications. Thanks to UKIVA members Alrad Imaging, Matrox Imaging, Multipix Imaging, Olmec-UK and Stemmer Imaging for their contributions to these features.
Easy to use, simple to integrate and straightforward to maintain; SICK 2D and 3D vision systems will help to save you money, increase your quality levels and improve your production processes. All of the range include the tools for high speed object location and feature detection as well as measurement and positional functionality. In-built illumination, and accessory options make them a tough and flexible solution. For 25 years, SICK have been at the forefront of 2D and 3D imaging technology. We think that’s intelligent. www.sick.co.uk
In my first contribution to Vision in Action since being elected as Chairman of UKIVA in January, I am delighted to report that this is the largest ever issue at 32 pages. In just one year it has grown from 24 pages to its present size, reflecting not only on the growing membership of the Association (now totaling over 30), but also on the wealth of expertise and experience that they have to offer, and the enthusiasm that the Association continues to have to promote the use of vision. Take a look through this issue and you will see a varied range of applications where vision has been able to solve customers’ real world needs.

We have continued the theme of giving a special focus to one particular aspect of vision technology in each issue of Vision in Action. This time we are looking at line scan technology and how recent developments have not only impacted on traditional web inspection applications, but also on a wide range of other applications. I hope you find these articles both interesting and informative.

I am delighted to have been elected as Chairman of UKIVA. Altrad Imaging has been a member of this prestigious organisation for some 20 years and it is the second time a member of the company has been appointed chairman, Geoff Smith holding the office from 1997 - 1999. I would like to take this opportunity to thank my predecessor, Mark Williamson for his outstanding contribution in the role over the last 13 years, which included helping to steer the Association through its transition from an independent organisation to becoming a Special Interest Group of the PPMA Group of Associations. Mark has done a great job and his experience and stature in the industry has ensured continuity through the many changes, including the passing of founder member, Don Braggins. I am delighted that he will remain an active member of the committee and that he continues to be a director of the main PPMA board.

As you will see elsewhere in this issue, we have also restructured the UKIVA committee, increasing its size and bringing in some of the newer members and with the resources from the PPMA that we have at our disposal, I look forward to the next phase of the Association’s development.

Ian Alderton, UKIVA Chairman
New Chairman for UKIVA
At the recent UKIVA Members’ meeting held at the Manufacturing Technology Centre, Coventry, Ian Alderton from Alrad Imaging was elected Chairman, with Mark Williamson from Stemmer Imaging standing down after 13 years in the role and Paul Wilson from Scorpion Vision became Vice Chairman. This new structure establishes a succession plan for the committee, as the Chair and Vice-Chair are now both elected for a two-year tenure, with a view to the Vice-Chair succeeding the Chair, leading to a 4-year cycle. Ian has also been a longstanding member of the UKIVA and we wish both him and Paul every success in their new roles.

UKIVA welcomes new members
UKIVA is delighted to welcome ifm electronic ltd and The Config Team Ltd as the latest companies to join the Association.

Editorial material in this section is provided by UKIVA Members.
Content accuracy is the responsibility of individual UKIVA Members.

New cameras and illumination systems for linescan applications
The new UNiQA+ Power over CameraLink camera family from e2v offers affordable, flexible and simple high speed line scan solutions. Thanks to e2v’s exclusive CMOS image sensor technology, the UNiQA+ is available across the full resolution range from 0.5k to 16k pixels and in speeds of up to 100kHz in both colour and monochrome. The UNiQA+ also challenges existing line scan camera standards by bringing versatile multi-resolution models to machine vision OEMs. For example the 4K 5 micron pixel version can be binned using the extra lines to 2K 10 micron pixels and then also reduced to 1K or 512 pixels on FPGA.

In addition, the new range of PRL LED projectors from DCM Systemes produces a high-intensity line light, ideally suited for use with line scan cameras. A customisable version is available with up to 15 segments, each with a line length of 201mm.

Easy, precise web-edge measurement
The compact Baumer PosCon 3D laser line edge sensor is an efficient alternative to more complex laser measuring systems for a wide range of edge measurement applications where other solutions would fail. PosCon 3D is a versatile solution to reliably detect edge positions and object or gap width. Edge positions are reliably detected even when installed in any non-vertical position within a lateral angle up to 30°. The object width is identified within fractions of a second and with an accuracy of 0.2mm, irrespective of the object position within the measuring field. The sensor reliably measures objects with different colours and surfaces, even when these are changing. It is easy to install, quick to configure, and low-maintenance in operation.

Bytronic achieve Cognex Platinum Partner System Integrator status
Midlands-based Bytronic Automation Ltd are celebrating being named as the UK’s only Cognex Platinum Partner System Integrator. The award was achieved in October 2014 and Bytronic are one of handful of companies worldwide to attain this status.

The award for partner involvement and performance is based on the commercial actions taken by Bytronic to reach their goals and turnover target and recognises the company’s advanced knowledge of Cognex hardware and software offerings. Bytronic’s innovative vision system project planning and singular approach, together with great results and high standards, has enabled them to expand and contribute to Cognex’s global success. To date, Bytronic have sold hundreds of Cognex systems.

Cognex is a leading machine vision systems manufacturer, offering complete turnkey solutions from feasibility studies, design and implementation of vision systems through to documentation, training and support. The Cognex Platinum Partner System Integrator (PSI) Programme aims to provide customers with superior service standards, as both Cognex and Bytronic are 100% committed to responding efficiently to queries, with both teams dedicated to satisfying customer needs throughout the life of a project.
Clearview Imaging

New Chameleon3 USB3 vision board-level camera

The Chameleon3’s unique combination of form factors, ultra-compact size, low cost, and CCD and CMOS sensor selection, make it the ideal camera for a wide range of machine vision and scientific applications. This low cost camera combines USB3 Vision’s ease-of-use with multiple form factor options, making it ideal for space-constrained applications. The Chameleon3 is available in a 44 x 35 x 19.5mm enclosed metal case as well as in a 40 x 31mm board-level version with either C/CS-mount or M12 micro lenses.

There are currently 1.3MP colour and monochrome models available, featuring the Sony ICX445 CCD sensor. Set for release soon are a 2.8MP Sony ICX818 global shutter CCD model and a 1.3MP On Semi Python 1300 global shutter CMOS model.

Cognex

Cognex revs up 2D barcode reading

Cognex has announced its PowerGrid™ technology, a texture-based location algorithm that takes a unique, inside-out approach to reading 2-D matrix and Direct Part Mark (DPM) codes. While conventional feature-based algorithms start by locating the finder pattern, PowerGrid technology looks for a pattern of alternating light and dark modules within the code.

This approach dramatically increases read rates in 2-D barcode-reading applications where a part’s geometry, poor lighting, occlusion, or print-registration errors make it difficult to capture an image of the entire code. Unlike previous solutions, the new technology can locate and read codes even when they exhibit significant damage to or complete elimination of the finder pattern, clocking pattern, or quiet zone. PowerGrid technology is now available on the X models of the Cognex DataMan® 300 series of fixed-mount barcode readers.

PPMA Group Awards

Congratulations go to UKIVA members Olmec-UK who won the ‘Most Innovative Machine Vision Award’ and Stemmer Imaging who won the ‘Partnership of the Year Award’ announced at last year’s PPMA Group Awards dinner.

The independent panel of judges gave the Vision Award to Olmec for the development and installation of a multifunctional 8-camera, two-stage inspection system for woundcare ‘island’ dressings in their heat-sealed paper packaging pouches. This provided novel automated vision control of product position within the packaging to minimise ‘trapped in seal faults’, together with fully automated rejection of any defective product.

Stemmer Imaging received their award for their partnership with vision systems integrator, Siga Vision over the last 5 years to solve complex vision inspection applications. The judges commented: “Stemmer Imaging, through its size, has enabled SIGA to develop projects that could not be self-funded. In turn, Siga has provided feedback and challenges that have allowed Stemmer Imaging to continuously improve its products, giving great results for all of its customers.”

Jaguar Land Rover to speak on Vision at 2015 PPMA Show

With the dramatic uptake in robotics in competing nations such as Germany, China and newly emerging economies, automation is one of the most important issues facing UK manufacturing today. Grant Collier from the PPMA Group commented “we are also pleased to announce that Jaguar Land Rover will be speaking at one of the seminars which will demonstrate how industrial vision systems integrate to form the perfect partnership with robot applications in the assembly of quality vehicles.”

Collier continued ‘Industrial Vision is becoming an increasingly important part of automation and robot development. In 2014 we had nine vision companies exhibiting at the PPMA show, in 2015 we already have sixteen companies booked and more interested’.

The PPMA show demonstrates all the latest processing and packaging, robotic and machine vision technology and has a total of over 320 exhibitors and over 8000 visitors. More info on www.ppmashow.co.uk
End of Line Packaging Validation Systems

Within the Food, Drink and Pharmaceutical industries, retailers are becoming more and more stringent about their suppliers meeting correct packaging specification criteria. The result of incorrect labelling can result in poor customer satisfaction at best – at worst, hefty fines or Emergency Product Withdrawals (EPW).

A cost-effective range of products to suit your end of line quality control needs.

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- Easy to Operate

As well as monitoring and reporting the inspections of the labels / packaging we can also provide:

- Modular Conveying Systems
- Stainless Steel Enclosures
- Audit and Performance Logs
- Simultaneous Control of Line Printers
- Visual and Audible Indicators
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Or contact us for a demo or more information @ info@acrovision.co.uk
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DIMACO

Veri-PACK label inspection system

Dimaco’s Veri-PACK system helps with food safety as well as product traceability. It checks that the correct labels have been applied to the packs and that all essential pre-printed and over-printed data such as barcodes, dates, price and weight are correct and legible. This avoids label mix-ups, reduces the risk of EPW/product recall, prevents poor quality barcodes reaching the checkout and electronically archives inspection results. VeriPACK verifies label presence, identification and placement; over printed data, over printed barcode and promotional labels.

IDS IMAGING DEVELOPMENT SYSTEMS GMBH

USB 3 uEye CP camera with Sony IMX174 sensor

The completely re-designed second generation of the USB 3 uEye CP camera series now incorporates the new 2.3 MP Sony IMX174 CMOS sensor. This sets a new standard in terms of light sensitivity, dynamic range and colour reproduction. It provides excellent image quality with extraordinarily low-noise performance. The sensor is perfect for applications demanding excellent image quality even in low-light conditions. A special feature for this sensor only available in IDS cameras is an exposure time of up to 30 seconds, giving image quality comparable to CCD sensors. The camera also offers frame rates of over 160 fps at the full 1936 x 1216 resolution and more than 180 fps at HD resolution.

Other special IDS features include multi-AOI operation, adjustable black level, line scan mode, operation in USB 2.0 mode and shift between 8/10 and 12 bit during image acquisition. With its industrial standard dimensions of only 29 x 29 mm, as well as its extremely light and robust magnesium housing, the USB 3 uEye CP is suitable for use in a wide range of industrial and non-industrial environments.

IMPERX

New Cheetah CMOS cameras

The Cheetah is a new family of high performance CMOS image sensor cameras providing unprecedented versatility and functionality. The first Cheetah products are the C4080 (12MP) and C2880 (6MP) built around the ON Semiconductor KAC-12040 and KAC-06040 image sensors. The C4080 has a resolution of 4000 x 3000 pixels and a maximum frame rate of 70 fps and the C2880 offers 2832 x 2128 pixels with maximum frame rate of 135 fps.

Both cameras support global and rolling shutter operation, offer several levels of digitisation with excellent near-infrared sensitivity, dual video capability, extended dynamic range, several ROIs, multiple decimation schemes and a variety of triggering options with either CameraLink® Full or CoaXPress output.
IVS provides vision systems to global aerospace manufacturer

Industrial Vision Systems have provided a global aerospace bearings manufacturer with an integrated quality control machine vision solution for circlip inspection. The automated inspection vision system provides micron level measurement of the circlip position and size. The system is one of a series of vision machines installed by IVS for various quality control tasks for bearing inspection.

Unleash the potential of your vision system with the e2v UNiiQA+ family of line scan cameras

e2v’s new UNiiQA+ family of line scan cameras has been specifically designed to bring affordable, flexible and simple high speed solutions to your current raw material inspection system.

Powered by a state-of-the-art e2v CMOS image sensor, the UNiiQA+ comes in three product ranges to suit your specific requirements; high speed, industry-leading affordability even in colour and high resolution.

Simple – Affordable – High Quality

Applications include –

Online Quality Control: raw materials inspection (plastic, film, glass etc) – print and paper inspection.

Sorting: food sorting (belt, lane or free fall sorting) – parcel and post sorting – barcode reading.
JPEG compression recording from 10 cameras

A StreamPix-based recording solution records from 10 GigE Vision cameras simultaneously at 50 frames per second at a resolution of 1280 x 1024 per image. Each image is real time JPEG compressed using the StreamPix CUDA compression module. The compression is performed directly to JPEG, using a 75% lossy compression quality. The main advantage from this type of compression is image quality and added recording time varying by a factor of 10 to 15 compared to uncompressed recording. Using the NorPix real time compression, optimised with the Nvidia CUDA graphics processor, recording times of over 175 hours per camera can be reached on a 4 terabyte disk drive.

Smart cameras read 2D codes at winery

LSIS 462i smart cameras from Leuze electronic have been chosen by Voigt Technology e.K. for detecting and checking printed 2D Data Matrix codes on wine boxes at the Herres sparkling wine winery in Trier, Germany. A motor-driven focus adjustment permits automatic re-focusing during program changeover. Special optics developed by Leuze electronic create a rectangular intense illuminated field of view that is particularly homogeneous at a distance of 50 to 250mm to the test object. This produces a higher level of detail in the image than would be achieved using LEDs.

The code read station inspects the 2D Data Matrix codes printed on the cartons for presence and readability at speeds of up to 6000 cartons per hour. A special ‘reading gate control’ is used for code detection since codes are printed at different locations on the cartons depending on the product. An added benefit is that these camera models are also used in cap inspection applications in the winery allowing the spare-parts inventory to be limited to one fully equipped device model that can be deployed anywhere if necessary.

Major update to Matrox Imaging Library vision software

Matrox Imaging has announced a major update to its core vision software product, Matrox Imaging Library (MIL). MIL 10 Processing Pack 1 will give users even more ready-made tools to solve 2D and 3D vision challenges from within the familiar and proven MIL API along with numerous productivity enhancements that will reduce the development time and effort required to bring solutions to market.

Enhancements for 3D vision include calibration of multiple sheet-of-light and camera systems to work as one, a new, more robust peak detection algorithm and a new 3D surface registration tool. Enhancements for 2D vision include additional image pre-processing, additions to the 2D mark reading and verification tools, new colour-relative calibration, a new dedicated circle matcher and additional speed optimisations including the use of Intel® AVX2 technology. Productivity enhancements include intelligent code completion and context-sensitive help in Visual Studio®, C#/Python/Visual Basic® scripting and execution and an overhauled Example Launcher utility.
A revolution in Vision Inspection

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Industry’s fastest compact vision system

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MEMBERS NEWS

MULTIPIX www.multipix.com

Basler racer all purpose line scan camera

The Basler racer family combines special CMOS line-scan sensors with Gigabit Ethernet and CameraLink interfaces to achieve a flexible, state-of-the-art technological package for the line scan market. Offering an outstanding price/performance ratio, this series is ideal for price-sensitive applications such as web inspection (wood, paper, film, etc.), controlling of printed images, surface inspection (silicon chips, panels and displays, semi-conductors, etc.) and sorting as well as scanning of documents. Available with resolutions of 2k, 4k, 6k, 8k and 12k, the cameras are supplied in a robust, compact housing measuring just 62 x 56mm for easy integration into industrial applications. The low costs of the camera and accessories mean that even multi-camera systems can be created at competitive prices.

OLMEC-UK www.olmec-uk.com

It’s all done by mirrors!

A vision system designed by vision systems integrator, Olmec-UK, uses precisely angled mirrors to allow both sides and the top of injection-moulded components for automotive radiators to be imaged simultaneously using a single camera, avoiding the need for a complex 3 camera set-up. The components leave the factory with an identifying label attached and with many component parts with only minor differences being manufactured, the vision system was designed to eliminate the possibility of mis-labelled parts reaching the radiator manufacturer. Attaching the wrong label led to major problems at the radiator assembly stage.

The inspection station features a 1.2 MPixel colour camera with overhead LED illumination and measurement software with at least 12 measurement tools. An operator presents a part where it is interactively inspected against a number of pre-defined specifications including checking for missing product and any defects such as faulty or missing brass inserts. If the inspection fails the part is manually rejected and no label is issued.

Matrox Design Assistant 4 lets you deploy your inspection project to the platform of your choice. Whether it’s any computer with GigE Vision® or USB3 Vision™ cameras, a Matrox smart camera, or a Matrox vision system, you’ll get the processing power you need.

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Point Grey is a world-leading designer and manufacturer of innovative, high performance digital cameras for industrial, life science, and traffic applications, and ClearView Imaging is their sole distributor for the UK and Ireland. Point Grey have a comprehensive portfolio of USB3 Vision, GigE Vision, FireWire, and USB2 products known for their outstanding quality, ease of use and unbeatable price-performance.

Learn more at www.clearviewimaging.co.uk or contact info@clearviewimaging.co.uk
Multi-configurable 3D Stinger cameras

The Scorpion 3D Stinger Camera is an extra-ordinarily versatile industrial stereo vision camera for use in 3D robot vision, 3D laser triangulation, 3D gauging, 3D assembly verification and other advanced machine vision solutions. It is available in a variety of configurations, supporting passive and active stereo vision, recognising that each application needs to be assessed before the right technology is selected. The 3D Stinger cameras are available in two versions with different baselines of 30mm and 200mm. Each version can be supplied in a number of dual camera and single camera configurations.

Dual camera configurations are: stereo vision only, stereo vision with multiline laser and stereo vision with random pattern projection. Single camera versions are available with laser line for 3D triangulation applications. Supplied in an IP-64 enclosure, the cameras are available with monochrome or colour CMOS or CCD sensors with resolution from VGA to 5MPixels. The unique one-push 3D calibration technology provided by Scorpion secures optimal performance and easy maintenance.

High speed contact image sensors

The Mitsubishi Electric KD range of contact image sensors has been further extended with the addition of high-speed monochrome versions and versions without any built-in illumination. The monochrome versions operate at scan speeds of 1.8m/s at 600dpi, twice the speed of the colour models and, like their colour counterparts, are available in three different lengths, offering scan widths of 309, 617 and 926mm.

Image formation in these contact image sensors is achieved via a double-row lens array, using gradient index rod-lenses, matched to the CMOS sensor to produce an image with virtually no distortion since the long sensor line maps the object on a one-to-one scale. With integral white LED illumination, this arrangement produces a quasi-telecentric image at each pixel, giving remarkable image uniformity. These new versions are ideally suited to a multitude of applications, including dimensional measurements, inspection of parts stamped out on metal ribbon, identification of dirt and debris in web inspection etc. For applications that require back lighting rather than incident lighting, a version of the contact image sensors with no integral lighting is also available.
MEMBERS DIRECTORY

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Upal Imaging is a prime UK distributor of vision products. Products include cameras and sensors, frame grabbers, illumination, imaging software and sub-system solutions for OEMs and system integrators.

Baumer is one of the leading global manufacturers of innovative image processing components and offers an extensive product range of high quality industrial cameras and vision sensors.

ClearView Imaging is a supplier of vision components, including a wide range of cameras, frame grabbers, software, embedded systems, smart cameras, vision processors, lighting and optics.

Cognex is the world’s leading vision company, with over 150,000 systems delivered. We offer a complete range of vision solutions, from smart cameras to powerful framegrabbers.

Framos is a specialist distributor of digital and electronic imaging devices and complete cameras. Both area and linear CCD and CMOS devices are offered with full technical support for design and integration.

IDS Imaging Development Systems is a global leader in medical vision and machine vision technology, offering industrial cameras with USB 2.0, 3.0 and GigE interface and OEM plus customised solutions.

Ifm electronic develops, produces and sells sensors, controllers and systems for industrial automation worldwide and is a leading supplier of vision systems including 2D and 3D sensors and cameras.

Impex designs and manufactures high performance cameras, frame grabbers and industrial imaging systems for a variety of markets. Our multi-service brand is recognised for superior performance, reliability, and cutting-edge design.

Lambda distributes a broad range of MV products for industrial, research and logistic applications. Providing digital cameras, frame grabbers, software, lenses and lighting teamed together a wealth of technical experience.

Leuze electronic “the sensor people” are the experts for sensors. They also specialise in smart cameras and identification products.

Matrox Imaging is a leading developer of hardware & software for machine vision and imaging technology.

The wide range of products offered includes frame grabbers, cameras, lenses and imaging software together with a highly experienced support service.

National Instruments manufactures hundreds of integrated software and hardware products, which are used to replace and/or communicate with traditional instrumentation.

Omron Electronics manufactures a wide range of vision-based industrial solutions, ranging from cost effective vision sensor products to high-end vision controller and camera products.

We sell and support Scorpion Vision 2D and 3D Compact Vision Systems for integrators and machine builders. We represent The Imaging Source in the UK and sell machine vision products through our ecommerce website.

SICK manufacture and supply a complete range of Vision Systems & Solutions, including vision sensors, smart cameras, full 3D bio-scan imaging, multi-scan imaging and systems. Part of the SICK automation portfolio.

Europe’s premier Machine Vision technology provider. Offering the widest range of 2D and 3D vision systems and components along with independent technology training and extended technical services delivered with passion.

 Activation is a leading Systems Integrator of Vision Inspection and Barcode Reading systems. Our ‘Validator’ series has been designed to carry out any required End of Line Packaging validation and inspection.

Bytronic is the only Cognex Platinum Partner System Integrator in the UK. Bytronic are experts in machine vision, packaging verification, factory automation, MES solutions, manufacturing data management and more.

Fisher Smith LLP is a UK specialist in machine vision. Our product range covers, Vision and Control machine vision components, and GenVis and RoboVis PC-based vision systems and vision training.

Easy to use vision systems, special purpose vision machines & smart cameras. Improve yield and remove defects with our automated quality control machine vision solutions. Practical and simple to maintain.

Loop Technology specialises in offering 2D and 3D vision solutions for advanced assembly and inspection processes including robot guidance, quality checking and surface profiling.

Specialists in product handling, controls automation and validation. Olmec deliver complete inline and stand-alone vision inspection into existing, new and OEM machinery processes.

Panther Vision provides independent consultancy and bespoke product development and is interested in joint development opportunities.

RNA are specialists in the supply of special purpose machinery including automated vision inspection systems and pick & place handling units.

Scandinavian Machine Vision Ltd is an independent machine vision integrator providing complete solutions and tailored services for a wide range of manufacturing and process industries.

Specialist SAP consultancy and producer of CodingControl™, a SAP-Certified software platform that connects vision systems, coders and labellers to your SAP ERP system to eliminate coding errors.

Quality conveying solutions for the packaging industries including slat, modular, cable, roller and endless belt, in a range of material handling applications. implanted iconic solutions, graduised upgrades, line modifications.

Dimaco is the UK’s leading provider of vision inspection systems in the food industry. Our VenIPACK series is widely used to meet the packaging validation requirements of the major supermarkets.

Metller-Toledo Ltd is one of the world’s leading suppliers of industrial weighing and inspection solutions, including checkweighing, metal detection, x-ray and vision inspection systems.

Multivac UK is a wholly-owned subsidiary of Multivac Sepp Haggenmüller GmbH & Co, the world’s leading supplier of packaging machines.

Stein Solutions provide inspection and optical sorters.

UPM Conveyors provide complete automated conveyor and vision systems.
CORE TECHNOLOGY FOR VISION DEVELOPERS.

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**LINE SCAN TECHNOLOGY**

**Camera Developments**

**Resolution and speed**

CMOS sensor developments have allowed increases in pixel resolution to 16K and line speeds up to 140kHz. More pixels and higher line speeds generate more data – a 16K sensor operating at 1.2MHz line rate produces 2 GBytes/s of data which necessitates camera/frame grabber combinations utilising the new generation of camera interfaces such as CameraLink HS and CoaXPress. Pixel size and number determine the length of the sensor. By making use of binning techniques and FPGA, resolution and effective pixel size can be adjusted in a single camera to optimise between resolution and sensitivity. For wide web inspection applications multiple line scan cameras may be needed to cover the entire width.

**Improved sensitivity**

Line scan cameras generally have short pixel exposure times and require more illumination than area scan cameras. Since higher line rates bring even shorter pixel exposure times, sensors frequently use dual line technology with two rows of pixels scanning each line on the sample, improving the S/N. Time Delay Integration sensors offer multiple integration stages, giving substantial S/N enhancement. Typically, line scan pixel sizes range from 3.5 to 14µm square, but a new range of single line scan cameras features 20µm square pixels, with a 2K CMOS sensor capable of operating up to 80kHz. The larger pixel size gives better signal to noise ratio for a given exposure level, and higher line speeds than smaller pixel systems at the same exposure level.

**Colour and multispectral imaging**

Three sensor colour imaging in line scan cameras allows collection of independent RGB information. Prism systems collect light from a single line and split it spectrally onto 3 sensors. Trilinear sensors collect the RGB components from 3 separate lines. These lines need to be physically separated to accommodate the necessary electronic structure.

A cost-effective alternative is a bilinear detector with no line gap that uses colour filters similar to the Bayer arrangement used in area scan cameras. In another recent development quadrilinear and prism-based 4 sensor cameras are now available to provide NIR outputs as well as RGB for multispectral imaging. This enhances imaging possibilities for a wide range of applications, including print, bank note inspection, electronics manufacturing, food and material sorting.

**Illumination, Optics and Processing**

**Illumination**

The shorter pixel exposure times for line scan cameras compared to area scan cameras generally means that line scan applications require a greater level of illumination. Since line scan applications only require imaging of one line on the sample, line light illumination systems are usually used. High intensity LED line lights provide long lifetimes, and consistent, stable, light output along the entire length of the light. Line lights are available for both front and back lighting, with bright field and dark field illumination being the most popular choices for front illumination depending on the material being imaged. LEDs also offer a choice of wavelengths. The light unit can effectively be made of any length and any intensity. However the higher the intensity the more expensive this option becomes because of the heat generated and the heat sinking needed to dissipate this. The use of enhanced sensitivity sensors helps reduce the intensity of lighting required.

**Exposure control**

A line scan image is produced from the relative movement of the sample and the camera. Synchronisation of the movement between the object and camera is required to ensure that there is no distortion in the image. This is usually achieved by setting up a line trigger signal from an encoder signal from the sample movement method (typically a conveyor belt), to ensure that the scanned lines are synchronous with the movement of the object. The camera will collect light between these trigger signals, so if the movement speed varies the image brightness will also vary. In order to ensure constant image brightness exposure control is needed. This can either be set up on the camera itself or by controlling the illumination intensity.

**Lenses**

The sensor length is a function of the number and size of the pixels it contains, the more pixels there are and the larger they are, the longer the sensor will be and this has a direct influence on the size of the camera lens. For sensors with a line length of more than 20mm, the use of traditional C-mount lenses becomes problematic, since there is a significantly different viewing angle at the ends of the sensor and the phenomenon known as vignetting comes into play with resulting intensity variations towards the outside of the lens. The solution is to use F-mount lenses with a larger image circle diameter, but this adds to the cost of the optics. Alternatively, a sensor with smaller pixels, and hence a shorter line length could be used, but this may require increased illumination. A uniform viewing angle can be obtained using telecentric lenses, but these again add size and cost to the installation. Thus careful thought must be given to the imaging and resolution requirements to get the optimum choice of sensor and lens.

**Image processing**

The major image processing toolkits provide all of the tools necessary for inspecting continuous webs. These offer the facilities to find and classify defects such as cracks, tears, knots, holes, find colour variations or perform critical dimensional measurements at the high speeds needed. Other capabilities include code reading, robot guidance for cutting, trimming, or shaping and communication with other 3rd party equipment such as PLCs, HMIs, and remote storage. For other line scan applications where effectively an area scan image is produced, many of the off-the shelf software packages can be used, as well as specially developed software for print inspection.
Line Scan Inspection

Web materials

Line scan imaging is used in continuous web inspection systems to perform 100% inspection to detect defects such as dirt, debris, pinholes, roll-marks, holes cracks, tears and scratches on materials such as paper, foils, films, nonwovens, metals etc. Web inspection is possible for web materials with a uniform or textured, glossy or matte surface or transparent materials. It is generally carried out on wide rolls of material (for example some 8 m wide) and at high speeds so it is frequently necessary to use multiple line scan cameras to cover the entire width. Depending on the particular material, incident or transmitted illumination can be used. Defect classification is based on size range and contrast type – for example a contaminant may show up dark and a hole bright in transmission. Typically defects down to around 50μm can be detected. Because the material is on a continuous roll, it is not possible to carry out instant rejection system when a defect is detected. Instead, a roll map is produced which shows the defect type and location on the roll so that it can be identified and removed when the material is actually used.

Print

It is possible for numerous defects to occur during printing processes such as ink spot marks, embossing defects, mis-registered colours and colour variations. 100% print inspection on materials as varied as banknotes, and pharmaceutical and food packaging is a challenging application which frequently makes use of line scan cameras and software utilising the ‘golden template’ or an ‘intelligent template’ model to compare the item under test with a standard image and measure the differences. Other applications include continuous verification and/or quality inspection of numbered print and inspection of symbols and labels on web, sheet or single documents, as well as inspection of security features by checking the presence, position and integrity of applied features such as such as foil and hologram devices and base paper inserts like security threads.

Curved surfaces

Line scan is an excellent way of imaging cylindrical components. A line scan camera records the same position across the whole cylinder and as the cylinder rotates an ‘unwrapped’ image of the entire surface is generated without the distortion that would result from imaging a curved surface with an area scan camera. This technique allows labels to be unwrapped, allowing the reading of codes and human readable characters. It also allows the inspection of surface for defects such as pits, scratches, holes etc.

Sorting

Inspection systems equipped with line scan cameras can be used for sorting of a large variety of objects, such as food, waste, mining products, mail, parcels, etc. Typically these objects are moving past a camera system on a conveyor. Line scan systems can also be used for sorting free falling products such as rice, vegetables, postal, molten glass, steel, pharmaceutical products, rocks etc which cascade past one or more cameras like a curtain.

High resolution imaging

Since the ‘length’ of the image produced by a line scan camera is determined by the number of lines recorded for each image, very high resolution images can be produced. This is particularly useful for inspection of a host of products including flat panel displays, solar panels, pcbs, silicon wafers etc.

Contact image sensors

Contact image sensors are an interesting alternative to line scan cameras for the inspection of flat products such as textiles, foils glass, wood and other web-like materials for defects. Other applications include PCB, solder paste and packaging inspections, as well as print inspection and high end document scanning. They offer high data rates as well as high sensitivity and simple set-up. Contact image sensors use the same concept as used in fax machines and desktop scanners. They include a sensor and lens with pixels being mapped 1:1 to the object, with a working distance from a few mm up to around 12mm. This means the sensor has to be as big as the item being imaged, but has the advantage that distortion found in traditional lens/line scan camera combinations is removed. They are available with and without integral LED light sources.

The sensor head generally features a lens array using gradient index rod-lenses. Because these lenses are graded, they do not suffer from any variation in their refractive index. Each individual lens captures an image of a very small region of the target, and thanks to the small overlap in the captured images, a clear, sharp quasi-telescopic image is produced along the narrow line of the sensor head, with remarkable image uniformity. This is particularly important in applications such as high value print inspections such as on banknotes, passports etc, which may contain holograms. These are particularly susceptible to the angle of light entering them, so the virtually telecentric structure of the contact image sensor is well suited to these applications.

Compact image sensors can be combined to offer extended lengths and provide similar features to line scan cameras in terms of dark current, peak response non uniformity and dynamic range, but without the trade-offs concerning spatial resolution and light efficiency. Contact image sensor heads can use CMOS or CCD sensors as detectors. There is a choice of pixel layouts from monochrome sensors to colour versions using alternating coloured pixels or tri-linear sensors. Resolutions up to 600dpi are available with scan speeds up to 1.8m/s for monochrome sensors. Image data output is generally provided via standard industrial CameraLink interfaces.
Alrad’s range of ISG smart cameras are used extensively in automated optical inspection (AOI) systems for the semiconductor process and printed circuit board markets. With a choice of CCD and CMOS sensors and the popular USB 3 Vision and GigE Vision interfaces the cameras have been used in systems for wafer surface profiling, wafer surface inspection, solder inspection and more. For example, the ISG LightWise™ Allegro USB3 family supports the CMOSIS 2, 4 & 12Mp sensors and also the OnSemi Truesense Imaging CCD family. This offers customers a wide variety of sensors in an inexpensive intelligent programmable camera platform. The ISG LightWise™ cameras contain CPUs, FPGAs and plenty of on-board memory to accelerate these algorithms.

ISG cameras have been very successful in identifying short circuits, voids, misalignment, missing or incorrect components, and other defects such as scratches and stains. Online inspections during soldering are also vital as issues with solder paste integrity and profiles affect successful outcomes. Systems can also be used for evaluation of component placement prior to reflow and for post-reflow component conditions. Problems in the solder and assembly area of a PCB can be seen early in the production process.

A major flat-panel display manufacturer has implement an automated optical inspection system using an 8-head version of ISG’s Octopus OEM camera platform. Faster inspection times increase flat-panel inspection throughput and cost efficiency. The system uses eight 5-Mpixel image heads to achieve a total unified image size of 40 Mpxels in a 2x4 matrix. This aspect ratio is suitable for widescreen TV LCDs. The eight heads produce a single unified image and can operate at up to 12 fps at full 40-Mpixel resolution for high-speed automated optical inspection. Inspection algorithms embedded inside the camera system are processed with a high-performance Linux-based CPU and a large FPGA. External triggering and strobe functions are integrated, along with external I/O for inspection outputs.
Barcode readers ensure accurate product labelling

A global consumer product manufacturer produces and packages boxes of powder products ready for distribution at its manufacturing plant and distribution centre. As part of the vital pre-shipment labelling process, approximately 150 boxes are stacked on each pallet which is then stretch wrapped before a label is printed and affixed. This ensures complete product traceability and accurate delivery of goods to their destination.

Previously, information on the pallets' contents was stored on a PLC. However, this was not 100% accurate and occasionally led to mislabelling. To overcome this and ensure products were shipped accurately, a new system was required to identify all the products within one pallet.

Bytronic, experts in test and measurement, automation and process control solutions, developed a system that could cope with these challenges. Responsible for the complete design and installation, Bytronic undertook extensive testing using a Cognex DataMan barcode reader with enhanced Field of View (FOV) capabilities. This high performance camera delivered significantly improved results at a lower cost option than a laser scanner system.

The system uses a DataMan 303 camera permanently installed on the line. Only one camera is required per line due to the expanded field of view technology. The pallets leave the stretch wrapper on a conveyor and move past the camera, which reads the barcode on each box contained within the pallet. The barcodes can appear anywhere within a 500mm tall x 1m wide FOV with the 1-D barcode code being only 60x30mm. The camera is integrated to the pallet labeller via Ethernet to send the scanned codes and set up the appropriate pallet label, which is then affixed automatically to the pallet ready for shipment. With line speeds of approx. 0.5m/s processing around three pallets per minute, the system has provided a 100% read rate.

Portable 3D body scanner for human metrics applications

The world’s first portable 3D body scanner from Space Vision, Japan, utilises nine board-level UI-1221LE USB cameras from IDS Imaging Development Solutions. Designed to be easily set up in a space of 198 x 230 x 222cm, the body scanner is used in the human metrics business, where precise measurements are critical for various applications. The scanner is robust and versatile, capable of measuring the dimensions, position, and orientation of different objects in a variety of scenarios.

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measurements of the human body are used in various applications, such as measurements for made-to-order clothes and in dress pattern making software or monitoring body shape as part of dieting and exercise regimes.

The system consists of 3 lightweight portable towers, each containing 3 of the board level cameras. The person to be measured stands in the middle of the space and a safe, low-intensity red laser light pattern is projected onto the body. Changes in the pattern due to the shape of the body are captured and the images analysed to generate around 1 million 3D data points within 2 seconds. All control and analysis software runs on a separate PC.

The compact UI-1221LE board level camera is an ideal choice for this application, with dimensions of 36.0 x 36.0 x 20.2mm and weighing just 16 g. It is equipped with a 752 x 480 pixel CMOS sensor with global shutter. IDS implemented some slight modifications to the connector for Space Vision together with some additional features in the uEye API. The IDS Cockpit application, part of the IDS Software Suite supplied with all uEye cameras, is used by Space Vision to adjust individual camera parameters and to check images after the set-up procedure is completed.

**INDUSTRIAL VISION SYSTEMS**  
www.industrialvision.co.uk

**15 camera vision quality control machine at automotive component manufacturer**

IVS have installed a 15 camera vision machine at a prestigious automotive customer for the inspection of a key part of the main drive chain. The front corner braking assembly quality control system is integrated as a final inspection of the complete unit prior to release to the main production line. The fully integrated machine vision system provides 100% inspection of the full sub-assembly. Designed, built and manufactured by IVS the complete machine utilises digital gigabit ethernet cameras combined with various LED lighting arrays to inspect the corner assembly as part of the Just-In-Time manufacturing. Inspection tasks include confirmation of correct build sequencing and presence verification of many key components in the build, for examples drive shaft type, retaining rings, brake caliper variant, wear pad sensor type and various measurement checks.

The machine includes Siemens PLC Profinbus control with the main line PLC and database including full historic archiving of failed images, plus all measurement data for statistical process control. The machine was tested at IVS prior to integration on the main automated production line at the automotive manufacturer.

The vision system removes the need for any manual inspection by operators and guarantees the quality of the sub-assembly parts arriving at the customer.

**LAMBDA PHOTOMETRICS**  
www.lambdaphoto.co.uk

**Miniature camera helps recording of dental procedures**

Lambda Photometrics’ imaging partner Ximea has been involved in the development of a novel dental imaging system. Futudent, manufactured by Novocam Ltd features a tiny USB 2.0 HD camera mounted on a dentist’s loupes, together with advanced yet easy-to-use image capturing software, to provide a completely new way to share dental information, document procedures, and ultimately improve patient care. Futudent is a hands-free bookmarking system that the dentist can activate with a floor-mounted pedal without taking his or her eyes off what they are doing, thus not interrupting the particular dental procedure. In addition, the system can be equipped with a function for a simultaneous commentary via the microphone connected to a laptop or desktop PC. Explaining procedures during operation is an efficient way of streamlining communication. Users can upload their material to a secure, cloud-based server for storage and sharing with colleagues, while complying with the strict patient data protection requirements expected of everyone in healthcare. This new approach means that dentists can share material created day-to-day with their colleagues or their dental technicians, in addition, it is a powerful tool for teaching as students can see a live or recorded procedure, and lecturers can monitor a student carrying out a procedure.

The XIMEA camera was chosen because the sensor has a number of advantages including a miniature and rugged form. The compact aluminium body is just 18 x 22.5 x 25mm and weighs 16g, making it small and light enough for the dentist’s comfort. The camera attaches to existing current loupes or glasses with a universal clip, or to selected loupes with special clamp. Other possibilities are headband and
DID YOU KNOW...

Bytronic are proud co-creators of LineView™ – “the most powerful manufacturing tool”* and system of choice for Coca-Cola Enterprises for real-time data visualisation. Whether it is a total MES solution, machine inspection & measurement, industrial networks, manufacturing data management, or automated test equipment, Bytronic can help.

*Richard Davies, VP Operations, Coca-Cola Enterprises
gooseneck attachments. The optics have been designed for dental purposes with the lenses offering an extended depth of field, allowing in focus image of 15cm (in distance of 35-50cm) with standard and the 2x magnifying lens. The camera can be used for extended periods of time without excessive heat generation. The USB2 connection allows compatibility with most Windows based computers, with HD video capture at 25fps. High resolution still images can also be captured by just pressing the foot pedal. The camera also offers a user friendly development environment. XIMEA provides APIs for most commercial image processing libraries which allowed the imaging system to quickly and easily developed.

LEUZE ELECTRONIC www.leuze.co.uk

3D inspection for automotive bumper safety

Machine vision specialist, attentra GmbH in Tübingen is using LPS 3D triangulation cameras from Leuze electronic on inspection systems for bumper production lines at plastics specialist, REHAU AG + Co, headquartered in Rehau in Germany. Since Rehau delivers bumpers in more than 500,000 variants for a number of major manufacturers in the automotive industry, a highly flexible inspection system is required. Robot-controlled camera positioning allows the number of required cameras and sensors to be greatly reduced. The system also remains flexible, even if something changes on either the component or at the inspection positions.

Robot Vision Center software from attentra is a control software that connects optical detection systems, robot controls and production systems.

In the bumper inspection system, a robot from Universal Robots ensures maximum adaptability for the positioning of the cameras. It controls two 2D-cameras with different optics to provide different levels of magnification. The robot is also equipped with a high resolution LPS 36 light section sensor for inspection of a pressure hose sensor for the ‘active engine hood’ with depth information. The active engine hood is a modern safety measure designed to help protect pedestrians. By raising the motor hood, it ensures more deformation space, thereby reducing the risk of injury to a pedestrian. The pressure hose sensor is laid in the bumper over the entire width of the vehicle. It is positioned in a block of plastic foam (the ‘impact absorber’) and must be fitted in a guide with extremely high precision. The LPS 36 performs the precise measurement of the depth of the hose in the plastic foam since it must not protrude above the top. The sensor is moved by the robot over the component and an additional encoder in the LPS 36 sensor supports the capture of three-dimensional images with an accuracy of within a few tenths of a millimetre. 3D image data is captured using HALCON image processing software from MVTec.

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Identifying defects in uniform web materials

The Matrox Imaging Library (MIL) software development kit makes the development of web inspection applications easier by providing the image processing, blob analysis and calibration modules needed for the processing of continuous image feeds. Image processing operations are used to correct, enhance and segment an image for subsequent analysis while calibration allows the analysis to be done in real-world units. Web analysis is basically carried out through blob analysis at the application level. Blob analysis is performed in monochrome, and then colour analysis can be added on top of blob analysis. Special measurements, plus colour measurements can thus be made.

For continuous, roll-to-roll processes, it is vital to identify where the defects occur. To do this, a virtual frame is created for a part of the web and inspection occurs within one virtual frame before moving to the next. There is a certain amount of difficulty in identifying defects that straddle two such frames. Analysis tools within MIL can be used to build a solution for this situation.

Identifying defects in uniform web materials like paper and metals relies upon finding areas that differ from the homogenous background. Identifying defects in textured surfaces presents a higher challenge as these defects are harder to define and characterise. Image processing helps in extracting the feature from the background first. Then the defect is measured. The application then classifies the defect based on the measurement and tolerance. The variance may need to be adjusted or fine-tuned to come up with a right tolerance for the defect. Based on the classification, if there is a defect, many manufacturers will mark/flag the roll with a printer. When the material is sold, web manufacturers unwrap the marked section and discard it. Systems can also be designed to support alarms, flagging, machine control and waste removal. When a serious class of defect occurs, a designated action sequence can be activated, such as driving a downstream device to reject.
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London Container Terminal access gate solution

London Container Terminal (LCT) at Tilbury Docks, is a busy terminal where deep sea, short sea and feeder trades come together in a unique way. Security is increasingly important – particularly since the introduction of the ISPS code post 9/11. To improve security on their premises, LCT has been using an access control solution for many years. Almost as critical as the system’s reliability is its ability to work fully automatically, without manual intervention. Traditional access control solutions cannot properly utilise complex traffic guidance, OCR (optical character recognition), RFID (radio-frequency identification), or interfaces to 3rd-party management systems. But logistics and container terminals do require fully-featured products to achieve the service levels they must offer. Vsys supplied such a solution to LCT overcoming this in the form of a driver kiosk system that combines several different identification and software technologies to create benefits for both logistics and security with Basler IP cameras delivering the pictures.

Access control systems at LCT

The Access Gate solution uses cameras and a sophisticated proprietary OCR algorithm to read the license plates of every vehicle entering and exiting the area. The cameras needed to deliver crystal clear images of any license plate for OCR, and also be equipped with a CCD sensor with a global shutter to prevent the images from the moving vehicles from becoming distorted and therefore unsuitable for OCR. In addition, the cameras needed to provide colour images during the day and the night. Being already impressed with the image quality provided by Basler IP Cameras elsewhere in the port, they chose a Basler BIP2-1600c IP Camera with a 2Mpixel CCD sensor. The cameras in the Access Gate system are installed at the entrance to the harbour area, capturing images of every vehicle approaching the gate barriers. The images are then transmitted to the access control operating environment, where OCR detection takes place. If the system associates the detected license plate number with an authorised vehicle, the barrier will open and let the vehicle pass. When the system can’t read a license plate, the driver is able to feed the license plate in manually. In this ‘harbour’ installation, the access control system is differentiated from traditional access control since it interfaces with other LCT systems.

Vision System ‘unwraps’ bottle labels for 100% inspection

Olmec-UK has designed and manufactured a line scan-based vision system for 100% inspection of labels on OTC healthcare product bottles. By rotating the bottle in front of the camera, the label is effectively ‘unwrapped’ to produce an image equivalent to imaging before it was stuck to the bottle. The vision system checks that the information on the label is correct as well as identifying missing or partial print.
The system handles a variety of bottles at a variety of speeds. The bottles are randomly fed into a servo-controlled starwheel which rotates each bottle in turn to the camera position. The ‘unwrap’ process is achieved by using rollers to rotate the bottle within the pocket of the starwheel in front of a line scan camera which builds up the image of the label line by line. A distortion-free image is produced so there are no false rejects and no possibility of any rogue products getting through. Since the bottles do not need to be oriented before entering the system, speeds up to 120 per minute can be achieved.

The entire inspection cycle from moving the bottle into position, rotating it through 360°, acquiring an image and making decisions takes just 500 milliseconds. The rotation of the bottle is synchronised with the scanning speed of the camera to eliminate deformations in the image. If the bottle rotates too fast the image is compressed and the pharmacode cannot be read and optical character recognition is also difficult. Similarly, if the bottle rotates too slowly, the image is stretched. In addition, if the bottle is leaning or moving up and down in the starwheel, the image can be skewed or show a ‘corkscrew’ effect. By precisely matching the mechanics of the starwheel with the image acquisition, the system offers a stability that minimises both false rejects and further software processing steps.

Using line scan technology greatly simplifies the inspection process. The label unwrap system design ensures the product is held captive and cannot be released unless it is acceptable, this eliminates the possibility of a product reaching a customer incorrectly coded or without any code at all.

SCORPION VISIoN www.scorpionvision.co.uk

3D bin picking of automotive components

Raufoss Neumann from Norway, a global supplier of lightweight aluminium suspension parts to the automotive industry chose a Scorpion 3D Stinger Camera – 3D Stereo Vision based solution to solve a challenging 3D bin picking application. The requirement was to reliably pick 720 parts direct from a 1200 x 800 x 600mm shipping package box. The parts are arranged in 6 layers separated by cardboard inserts with 120 parts on each layer. The system is configured to be able to pick two different products.

Before the 3D solution was implemented, the parts were manually picked from the box and stacked on custom plate to enable robot picking with the aid of an old fashioned 2D robot vision system. The 3D system for robot vision added uptime and contributed to a significant cost-saving. The system utilised a Scorpion 3D Stinger camera system, an industrial PC with Intel Quad-Core 2.4 GHz running Scorpion 3D Stinger for Robot Vision software and an ABB robot. The camera system is equipped with two monochrome GigE cameras with 1024×768 pixel resolution and a stereo vision baseline of 300mm. The system captures two stereoscopic images and produces a picking resolution of 1.0mm in X & Y and 2.0mm in Z. The part is located reliably and accurately in just 500ms. The system can handle dirt and contamination on the brown cardboard and can automatically detect when a layer is empty. This allows the cardboard to be automatically removed to access the next layer.

The system generates real-time picking profiles and statistics for secure and reliable operation. In practice, the height curves demonstrate that the system delivers 100% picking reliability for a complete box. The picking profile shows the height variation for each layer and defines the height span.

STEMMER IMAGING www.stemmer-imaging.co.uk

Eight camera system for sheet metal parts metrology

International machine builder Sturm Gruppe has a machine vision division based in Munich, Germany which develops customised inspection solutions for both internal and external clients. One recent project carried out in conjunction with Stemmer Imaging has been the development and manufacture of an eight-camera vision inspection system for another Sturm division which carries out contract manufacture of precision sheet metal parts using precision laser cutting and edging. The end customer is a manufacturer of filling and packaging systems in the food and beverage industry, who orders around 170 different parts in batches of up to 50 pieces through a B2B server directly into Sturm's production system. This saves a significant amount of administration and order management. After laser cutting, slide grinding and abrasive blasting, all finished parts are inspected and compared to the CAD-drawings in a final quality control step.

An OCR reader at the beginning of the line reads the laser engraved OCR code on the sheet metal part and initiates the download of the factory order from the database along with the specifications. The vision system utilises monochrome Spyder3 4k, 18kHz GigE Vision line scan cameras from Teledyne DALSA which image the sheet metal part as well...
as the conveyor belt at a throughput of 25 seconds per part. Thresholds define which pixels belong to the conveyor and which to the part. Only the middle 2k pixels of each camera are used to produce a line of 16k in order to create a telecentric view and an optical resolution of 110 µm/pixel. This minimises angular variations and avoids the need for expensive telecentric lenses. The cameras can be height adjusted according to the thickness of the metal. The specially cooled LED lighting system was developed in-house. A major challenge was to develop software which could accurately convert the 3D CAD data at high speed into a machine vision compatible TIF-format that can be compared to the images produced. The positioning of the parts on the conveyor belt is not critical.

After the scan, dimensional measurements are made and deviations are calculated, colour coded and displayed at the end of the line and depending on the level of match sent to rework or manually labelled. Once all parts of a production order have passed the inspection they are immediately prepared for distribution to complete the production order.

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Some useful technical tips from UKIVA members

**Using the Line Scan Mode in an Area Scan Camera (IDS Imaging Development Systems GmbH)**

en.ids-imaging.com/techtipp.html

**Vision Inspection, Now Vital For Food Safety (Mettler Toledo)**

uk.mt.com/gb/en/home/supportive_content/White_Papers/CIV_LabelMixfood.html

**Optimising Illumination in Line Scan Vision Systems (Multipix Imaging)**


**How does HDR (High Dynamic Range) Imaging Work? (Stemmer Imaging)**

www.stemmer-imaging.co.uk/en/videos

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**EVENTS & TRAINING**

**EVENTS**

**The PPMA Show**

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Many UKIVA members will be exhibiting at this complete production line event. Jaguar Land Rover will deliver a seminar on the use of industrial vision systems and robot applications in the assembly of quality vehicles.

www.ppmashow.co.uk

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UKIVA will have a booth at Vision UK@Photonex.

www.photonex.org

**TRAINING**

Training courses offered by UKIVA members:

**Matrox Imaging**

‘Introduction to the MIL/MIL-Lite Environment’, April 13-14, 2015

‘Matrox Imaging Library (MIL) Processing, April 15-17, 2015

‘Matrox Design Assistant’ April 20-22, 2015

All courses in Montreal, Canada.

www.matrox.com/imaging/en/support/training

**Stemmer Imaging**

(in association with the European Imaging Academy)

‘Optics and illumination for imaging’, April 22, 2015

‘Machine Vision Solutions from Teledyne DALSA’, May 27-28 and July 8-9, 2015

‘3D Image Processing with the LMI Gocator’, June 24-25, 2015

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