UKIVA

VISION IN ACTION

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Autumn 2018

Industry update from the UK Industrial Vision Association

Deep learning for machine vision

Image courtesy Framos

The use and availability of deep learning techniques for machine vision is generating a huge amount of interest in the industry as a whole. With standing room only for deep learning at this year's UKIVA Machine Vision Conference, our centre pages are devoted to this popular topic.

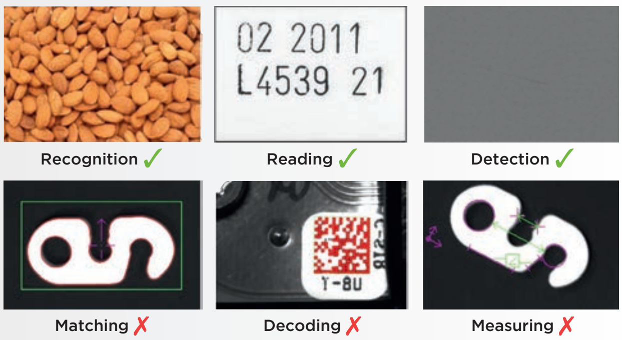
The evolution of deep learning

Deep learning is a subset of machine learning, which in turn is part of the overall umbrella of artificial intelligence (AI). AI was first formulated as far back as 1956. In the 1980s, machine learning emerged in the form of algorithms that can learn patterns in training data sets using some form of statistical analysis, then look for those same patterns in 'unknown' data. Deep learning, however, utilises artificial neural networks to imitate the way the human brain works for recognition and decision making.

Deep learning really began to make an impact around 2012 thanks to a number of key breakthroughs. These included the development of deep neural networks with many hidden layers, the possibility of massive parallel processing at affordable costs through GPUs, large data storage capabilities and the availability of huge data sets for training. Now deep learning capabilities for machine vision are available through commercial image processing software.

Extraordinarily powerful,
but not a magic bullet in solving all imaging problems.

What's good and what's not -
more information on deep learning in the centre pages.



Deep learning capabilities (Courtesy Matrox Imaging)

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FOREWORD by Paul Wilson

UKIVA's Machine Vision Conference and Exhibition, held in May at MK Arena, has again been a major activity for the Association during the early part of the year. I am really pleased that we were able to build on the success of last year's inaugural event and attract even more visitors than before. This year we included presentations on deep learning at the Conference. These proved extremely popular, so to further satisfy the high level of interest in this topic, we have made it the subject of the main feature and centre page spread of this issue of Vision in Action. We hope you find it interesting! The rest of the Conference was also very well attended, and I was delighted at the number of companies from around the world that supported the exhibition, reflecting the importance of the machine vision market in the UK. There was a great vibrancy and 'feel' to the day. More visitors, a high quality, engaged audience, happy exhibitors and new business relationships being established mean that the UKIVA Machine Conference and Exhibition is cementing itself as a well-respected event.

I continue to be passionate about training in the vision industry. I am therefore delighted that another UKIVA member, ClearView Imaging, has recently participated in a STEM (Science, Technology, Engineering & Maths) day at school local to them, Lord William School in Thame, Oxfordshire. The day was part of a series of events organised by PPMA BEST, an independent charity, set up by the PPMA Group of Trade Associations to address the on-going skills shortage within the industries served by the Associations and to tackle short and longer term recruitment needs. These STEM days give students still at school a taste of what vision is and what it can achieve in the real world. The aim is to raise interest levels in the subject for students going forward, but there is still much work to do to establish a clear pathway that could lead our engineers and technicians of tomorrow into a commercial career in industrial vision.

Paul Wilson, UKIVA Chairman

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Want to learn more about Machine Vision?

Machine (m*uh*-**sheen**) Vision (**Vizh**-*uh* n): The gift of sight

Download our Guide to Understanding Machine Vision

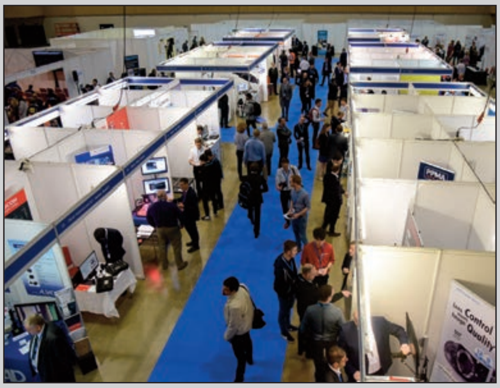
https://www.clearviewimaging.co.uk/machine-vision-guide

ClearView Imaging

ASSOCIATION NEWS

UKIVA EVENT GOES FROM STRENGTH TO STRENGTH

The UKIVA Machine Vision Conference and Exhibition held in Milton Keynes in May 2018 enjoyed an attendance up 17% compared to 2017. It featured 54 technical seminars and 2 keynote presentations, supported by an exhibition from 56 of the world's leading suppliers of industrial vision components systems and services. The event attracted visitors from many different industries, including automotive, food and pharmaceutical, with many actively seeking vision solutions for real applications. By providing visitors with the chance to see a host of manufacturers, distributors and systems integrators under one roof, it proved to be a real platform for business.



The conference provided something for everyone, ranging from some basic understanding of vision technology to the complexities of deep learning and machine learning. With the current high levels of interest in the use of deep learning and machine learning methods these topics attracted the largest audiences of the day. The two popular keynote presentations covered different applications of autonomous vehicles.

Exhibitors came from all over the world, including Canada., France, Germany, People's Republic of China and the USA to put on an impressive display of the latest vision technologies and services currently available. There was a very positive response from speakers, visitors and exhibitors alike. They came together to create an environment where knowledge could be shared, real world needs could be properly discussed, solution ideas proposed and business relationships begun and reinforced.

UKIVA AT VISION, STUTTGART

The Vision Show (6 - 8 November, 2018 Messe Stuttgart, Germany) will once again be taking place this year. Since it attracts many visitors from the UK, UKIVA will have its own stand at the show (Hall G Stand 1Z105). If you would like to meet up with any of the many UKIVA members who attend the show but are not exhibiting, call by the UKIVA stand and we can set up a meeting for you!

APPLICATION ARTICLES

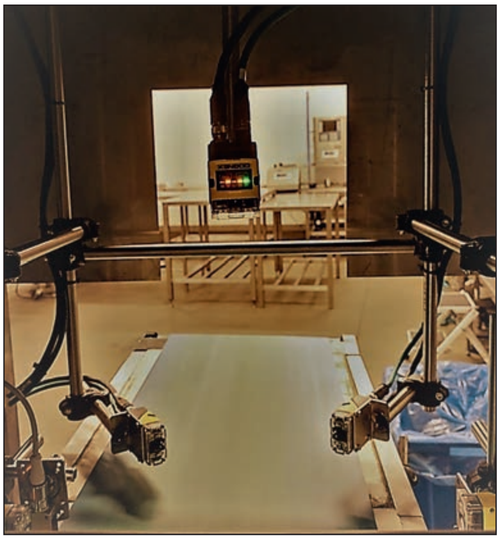
Editorial material in this section is provided by UKIVA Members. Content accuracy is the responsibility of individual UKIVA Members.

ACROVISION www.acrovision.co.uk

Helping a cream manufacturer check packaging

A leading cream manufacturer is using Validator OMNI from Acrovision to validate codes on both the circular pots for the cream and the foil lids. On the side of the pot, OMNI validates the EAN barcode (which can be in numerous positions around the pot) to match against a pre-set matchcode. It also reads a 2D 'foil code' on the lid of the product to confirm a correct lid and cross-check against the EAN code. Validator OMNI is the latest addition to Acrovision's suite of in-line package and label inspection systems and has been designed to read and check 1D and 2D barcodes in any possible direction/orientation on circular food packaging items.

The system uses Cognex DataMan camera vision systems, consisting of up to six cameras positioned around the conveyor belt to cover the diameter of the pot and an optional camera on top, if foil inspection is required. The field of view of each camera is overlapped, meaning there are no blank areas, so the system doesn't miss a code. The system is supplied complete with Validator software and generally, a front-end monitor to display real-time data and provide the interface to select new batch runs.



Validator OMNI

A key packaging contractor is also using OMNI to read codes on all kinds of cylindrical packaging items, containers for yoghurt, soup, noodles, for example. The excellent depth of field means that the smallest to largest size pots and all possible barcode positions can be validated without any physical change required. The line system receives information about what product is running and sets the correct barcode in each camera. Products that don't match are rejected and a reject signal is triggered. Batch statistics and reports can also be sent back for archiving and ongoing analysis of results.

ALLIED VISION www.alliedvision.com

Visual analysis of high-speed processes at Heineken

Beer bottles pass through the bottling machine at Heineken in Marseille (southern France) at a speed of 22 bottles per second (80,000 bottles per hour), Any problems at any point in the process occur too quickly to be visible to the human eye. They only become evident when the production system stops automatically. Usually, broken bottles are then found in the machines. Preventing such outages and avoiding the time lost to find the cause of the problem ensures greater productivity.

Bottles without (left) and with (right) Speedview

APPLICATION ARTICLES

The SpeedView mobile analysis system from R&D-Vision, a French company specialising in test and measurement systems with integrated imaging, remedies this situation. Equipped with the high-speed Mako G-030 camera from Allied Vision, SpeedView delivers slow-motion recordings of production processes. This GigE camera makes use of a high-performance CMOSIS/ams CMV300 CMOS-sensor. At full resolution (644 × 484 pixels), the camera operates at 309 images per second. By using a narrower region of interest, the speed can be increased even more. Since there are precise points in the filling and sealing process at Heineken that really matter, the image detail could be reduced to a size of 300 × 200 pixels. This makes an image acquisition speed of 1000 images per second possible, meaning the SpeedView system can record images for up to an hour. By further reducing the region of interest, the speed can be increased to up to 6000 images per second.

Depending on process speed, individual recordings can be triggered either manually or by a PLC signal (Programmable Logic Controller) in the camera. Using these recordings, the maintenance team can quickly and efficiently identify and remedy the cause of failure without unduly interrupting production or incurring downtime costs which can be of the order of thousands of Euros per minute. SpeedView can also be used for predictive maintenance, where it serves to monitor the production facility's condition and determine the ideal time for repair work or maintenance intervals that will not hinder the production process.

The mobile SpeedView system fits into a transport case, can be set up within a few minutes, and can be used at different locations in the production system as needed. Along with the Mako G-030 camera, the system consists of a set with three different lenses, high-intensity illumination, an integrated monitor and control panel and a mounting bracket. For recording, playback, frame by frame analysis, and trigger programming, the system uses HIRIS software, a modular image acquisition solution developed by R&D Vision.

ALRAD IMAGING www.alrad.co.uk

Smart camera inspects ketchup packets

Individual sachets of tomato ketchup can be found in an enormous number of fast food outlets around the world. Vision inspection can be used for checking the quality of these packets. An EyeCheck smart camera combined with EyeVision software from EVT – Eye Vision Technology has been used for this application. These systems are available in the UK from Alrad Imaging.

Ketchup sachet inspection

The smart camera is used for a number of visual inspections of each packet from the front and from the bottom. The integrity of the sealed seams of the sachet is checked for loose and leaky seams as well as other defects such as deformations and entrapped air. The system also checks for the presence of the small cut in one seam that is used to open the packet. Errors in printing of the expiry date are also detected as well as any unreadable bar codes.

The system is easy to set up using EyeVision's drag and drop graphical user interface to create a customised inspection program without programming skills. The software provides extensive functionality, including surface inspection to identify holes, folds, spots etc. The OCR/OCV reading tool has high recognition rates with pre-trained classifications. The code reading tool can read a variety of codes such as DMC, QR and var codes such as EAN 13, EAN 8, Code 39 and Interleaved 2 of 5.

ASSOCIATION NEWS

WELCOME TO MATRIX VISION

Matrix Vision is the most recent new member of UKIVA. For over 30 years, Matrix Vision has been developing industrial image processing components and customised solutions. Special emphasis is devoted to the commercialisation of high-quality digital and smart industrial cameras for various industrial sectors.

NEW MACHINE VISION STANDARDS

The introduction of internationally recognised machine vision standards has been an important factor in establishing consistency for users and manufacturers alike. Cooperation on vision standards is critical to the expanded use of vision and imaging technologies throughout industry. The European Machine Vision Association (EMVA) has recently announced that it is to establish standard working groups for two new important machine vision standards pending official approval by the G3 Standardisation Initiative.

The first one is an Open Lens Communication Standard that aims to create a standard electrical connection between the camera and the lens providing a standard connector, standard voltage, standard communication protocol and standard naming of the parameters; as well as providing feedback from the lens to the camera. This will be important both for lenses equipped with motors for focus, zoom and aperture control and the more recently introduced liquid lenses. It will open up new possibilities for the control of focus and depth of field and their integration with image acquisition.

The second standard is an Embedded Vision Interface Standard. It aims to build on and coordinate between the existing SLVS EC standard, which is hosted by the Japan Industrial Imaging Association, and the MIPI CSI-2 standard for mobile devices. The new Embedded Vision Interface Standard will add functions that are currently missing in these standards, e.g. define a high-level protocol, drivers and standard connectors to plug a sensor module onto a processor module.

VISION TRAINING FOR STUDENTS

Lord William School in Thame, Oxfordshire was the latest school to enjoy an activity-based vision-related STEM (Science, Technology, Engineering & Maths) day under the direction of UKIVA member, ClearView Imaging, and PPMA BEST (www.ppmabest.org.uk). PPMA BEST aims to address the on-going skills shortage within the industries served by the PPMA Group of Associations. 58 students from the school participated in the event, finding out about the vision industry, with hands-on opportunities to use vision to solve a practical problem.

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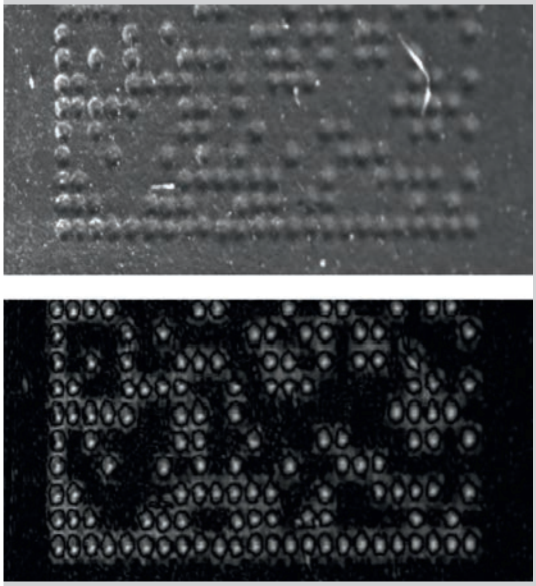
FISHER SMITH www.fishersmith.co.uk

Embedded 3D techniques aid barcode reading in aerospace industry

A European aerospace manufacturer contacted Fisher Smith for help in order to read difficult 2D dot peened barcodes that standard technology could not reliably read. Using Halcon software from MVTec, Fisher Smith was able to use photometric stereo techniques to compose a pseudo-3D image which allowed the codes to be read more reliably. However, the customer did not want a PC based system traditionally used for Halcon applications.

The solution was to deploy Halcon Embedded running on a Vision Components Nano Z Arm/Linux smart camera. Vision Components smart cameras are well suited to embedded vision applications, and the addition of Halcon Embedded makes such implementations much more powerful and easier to realise. The Nano Z series of housed and board level smart cameras are based on the dual-cored Arm ZYNQ module from Xilinx which provides a very powerful platform for embedded machine vision applications. Available in mono and stereo head formats with a wide range of resolutions, the 2-megapixel VCpro Z housed camera was chosen for this application.

To create the correct image four Vision & Control FDL04 area lights were used. Each light was powered by Vision & Control DLC3005 strobe controllers to enable the camera to flash the lights in sequence using its digital IO. Halcon composes the photometric stereo image from these images, then its barcode reading tools are used to decode the data. The VCpro Z camera has an RS232 interface to enable the read codes to be transmitted to downstream devices and numerous I/O for communication with other equipment. To create a user interface Fisher Smith built a web server to run on the camera enabling it to serve web pages for the user to configure the device and observe the acquired pseudo-3D images via the camera's ethernet interface, these web pages can then be viewed on any network connected device with an internet browser such as PCs, tablets, phones and HMIs.



Raw image code segment (top) Photometric image code segment (bottom)

FT SYSTEM www.ftsystem.com

Helping a major dairy stay green

Traditional milk delivery in glass milk bottles is making a comeback in central London and a major UK dairy in London is investing in new vision inspection equipment from FT System to keep up with the trend. Reusable glass bottles are seen as being a 'green' option as compared to plastic bottles. Glass bottles are returned to the milkman and taken back to the dairy where they are thoroughly washed and then inspected with a high quality vision system to ensure the utmost safety and high quality before moving to the filling lines. Bottles are expected to make on average 7 trips before becoming too damaged or worn for further re-use. However since glass can be endlessly reprocessed with no loss of quality, unusable bottles can be sent away for recycling.

FT System provided a complete empty bottle inspection machine to inspect all areas of the bottle for dirt and debris, glass fragments and damaged bottles, together with the rejection system to remove any failed bottles from the flow of bottles before they reached the milk filling machine. The inspection system features 4 cameras to check the quality of the bottle itself and also for possible contaminants. These contaminants include dirt or debris not completely removed during the washing process, foreign bodies entering the bottles after the washer and glass fragments. The neck finish, side walls and base of the bottles are also inspected as well as the 2 concentric wear rings that arise from the bottles pushing against each other in production. A special handling system carries the bottle over the base inspection camera.

The control system provides a full set of production data including history for number of bottles processed, the number of rejects, and the reasons for rejection. Remote assistance is available for support direct from head office. The dairy has 4 filling lines each operating at 24,000 bottles per hour and the first inspection system has already been installed on one of the lines, with the other 3 to follow. FT System can produce vision inspection systems for a range of applications based on cameras that run up to 72,000 bph.

Empty bottle inspection system

Neocortex-G2R-Cell

IDS IMAGING DEVELOPMENT SYSTEMS GMBH

www.ids-imaging.com

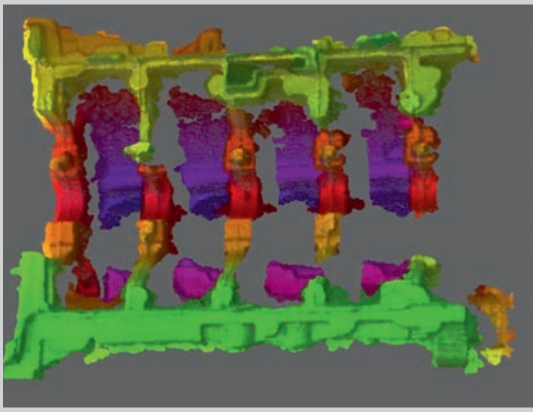
Artificial intelligence-based robot cell 'sees in 3D'

IDS Imaging Development Systems GmbH has worked closely with US software company and integrator, Universal Logic, for the incorporation of Ensenso 3D stereo cameras into the Neocortex® Goods to Robot (G2R) Robot Cells. These systems utilise a modular artificial intelligence software platform (Neocortex®) to automate any high-mix picking application. They can accommodate highly variable and dynamic supply chain needs including high object counts, deformable objects, complex part handling, constantly changing containers or frequent production changeovers. The system is fast, flexible and self-learning. It can acquire an image, recognise an object, and provide smart vision guidance to the robot as fast as 500 milliseconds.

Designed as a drop-in robotic workcell solution, the cell features a six-axis robot with multifunctional gripper, software, 3D cameras, safety barricades, and operating panel. Neocortex AI extends perception, directs gripping, and guides the robot. It gives the cells a human-like flexibility at speeds far faster and more consistent than is possible with manual labour. Programming or CAD data in advance are not necessary, since the robot learns its tasks and is therefore ready for use without major adaptations. Overall throughput is a function of item weight, retrieval difficulty, distance to move the item, and placement details.

The cells can be equipped with high-speed, high-resolution Ensenso N-Series stereo 3D cameras from IDS. These provide both the accuracy and speed needed for the different requirements of the cells. Ensenso 3D cameras utilise the "projected texture stereo vision" principle. Each model has two integrated CMOS sensors and a projector that casts high-contrast textures onto the object to be captured by using a pattern mask, ensuring that high quality images can be acquired even from smooth objects. The cameras are available with USB or GigE interface and are designed for working distances of up to 3,000 mm as well as variable picture fields, meaning that they can be used with a wide range of object and container sizes. They can capture images from both stationary and moving objects.

Depending on customer's requests most of the models meet the IP65/67 protection code requirements and are therefore protected against dirt, dust, water splashes or cleaning agents.



3D image of engine block

SCORPION VISION www.scorpionviosion.co.uk

3D robot picking of engine blocks

China's foundries are currently responsible for the production of 60 percent of the world's engine blocks. Scorpion Vision has signed a major contract with a Chinese robot integrator partner to deliver 3D engine block robot picking systems. The end customer runs a foundry, manufacturing steel and aluminium engine blocks. The blocks are removed from the cast and allowed to cool before they are deburred. Deburring is required because the block will contain rough edges and ridges, meaning that it will not sit flat on its base and may rock around. It had not previously been possible to pick it with a robot before it is deburred. After deburring has taken place, however, it is possible to automate the subsequent processes using machine vision guided robots.

The challenge was to develop a 3D robot picking system that could automate the transfer of the engine block to the deburring machine. This required 3D identification of the engine block, location of the engine block on the conveyor in 3D, finding the 3D pose (xyz and rxryrz) and sending the coordinates to the robot. The robot then picks up the engine block and moves it to the deburring machine.

This system was implemented using the Scorpion 3D Stinger for Robot Vision system. The system uses 2D area scan images from a stereo camera, augmented with a random pattern projection laser to give texture on the object's surface. Scorpion 3D Stinger software creates a 4D model of xyz plus intensity. A height map is also generated from the xyz data contained in the point cloud. Once this is achieved, the picking coordinates are extracted from the accurate 4D space. Processing time is around two seconds so the application effectively works in real time. A key advantage of this system is that the camera or product does not have to move in order to create 3D images. Many systems

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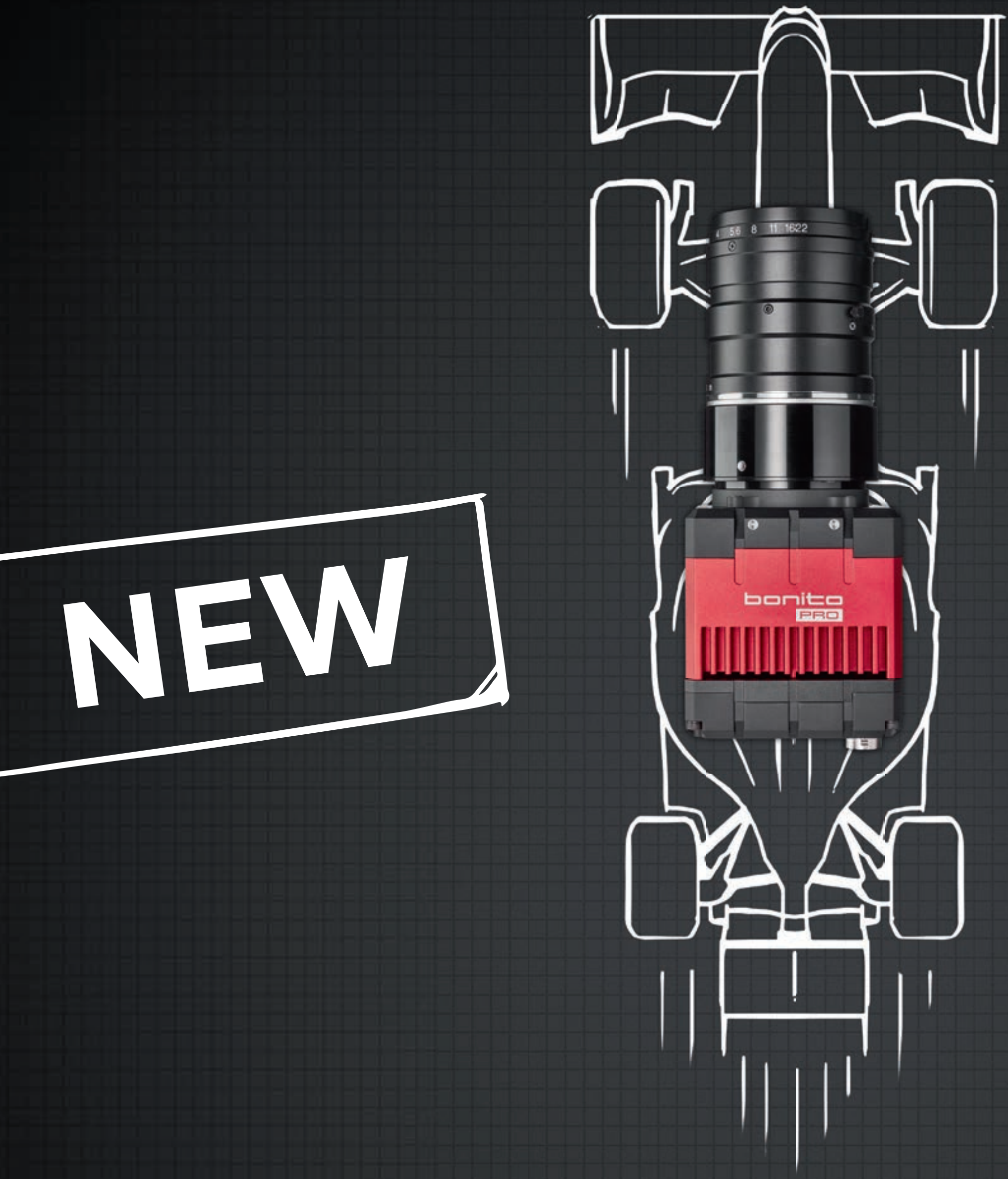
Allied Vision



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have to scan and this can be problematic if the item being scanned moves, or a fast image processing time is required. The vision system has been trained to work with five different engine block products.

The end customer can now completely automate the engine block production line, having dealt with the difficult task of locating the freshly cast engine block. Benefits to the business include a better working environment with fewer accidents, lower labour costs and increased throughput. Finally, an added benefit is automatic verification that the correct part is going to be picked.

SICK (UK) LTD **www.sick.co.uk**

Blown away by vision – HDPE container inspection

Every week the RPC Promens' Northumberland packaging production facility produces thousands of blow moulded HDPE containers and bottles of different shapes and sizes. Many of the containers must meet stringent food hygiene or UN chemical verification standards and the plant is subject to regular customer audits from a number of official bodies. Sick Inspector PIM60 vision sensors have been used to identify a variety of defects in containers that have the potential to stop end user filling lines and incur possible additional downtime costs.

One particular bottle type has a very narrow neck. The blow-moulding process has the potential for difficulties in achieving a consistently round neck and of flashing or additional material remaining in the neck. Previously every bottle was inspected off-line by operatives in the print department. This is hugely labour intensive, as up to 2 million of these bottles can be produced every year.

A Sick Inspector PIM60 2D vision sensor was positioned to check for six different defects in the neck of the bottle from above. The sensor is set up with a digital output delay, timed to trigger an air jet when the rejected bottle is in the right position to be blown off the line into a scrap container for recycling. To achieve successful inspection by the sensor, RPC's engineering team built a new conveyor so each bottle would be stable enough to be centred for accurate imaging. The Inspector PIM60 was mounted in a light box enclosure to eliminate problems caused for the sensor's high shutter-speed by the low-frequency fluorescent ambient lighting in the factory. This has also provided the flexibility to set up the line on different machines, at different locations in the factory without causing issues with changes in ambient lighting. A counting system was also integrated onto the line to provide a real-time operator check of reject rates. The complete system can be set up easily on a number of different blow moulding machines, when a new production batch is needed.

A second Inspector PIM60 vision sensor was installed to inspect the neck of 5-litre containers. Even a slight infill in the neck of the container could lead to problems for the filling machine probe on the customer's line. Some 12 million of these containers are produced annually at a rate of 8 every 15 seconds. A similar system to the narrow-necked bottle inspection was set up with the addition of a visual display on the machine to display real-time results as the system inspects for roundness and any contaminants around the neck. Regular batch changeovers between natural and white colour are easily accommodated by the vision sensor.

Inspection for defects in bottle neck

STEMMER IMAGING **www.stemmer-imaging.co.uk**

Reliable packaging of medicinally active ingredients

Harro Höfliger in Germany develops and builds the PMK 150/300 production and packaging systems for Mucoadhesive Buccal Film (MBF). These films are placed on the inside of a person's cheek for delivery of medication. The MBF active ingredient, which is applied to a carrier film, is initially wrapped up in the form of a roll and the protective film on the upper side is removed. The web is subsequently printed with data for the active ingredient dosage. The medication dosage can be controlled by the size of the film. Products with sizes between 10 x 10mm and 17 x 17mm are sealed in 50 x 50mm aluminium bags between an upper and lower aluminium composite foil. Three machine vision systems ensure reliable quality inspections at several points.

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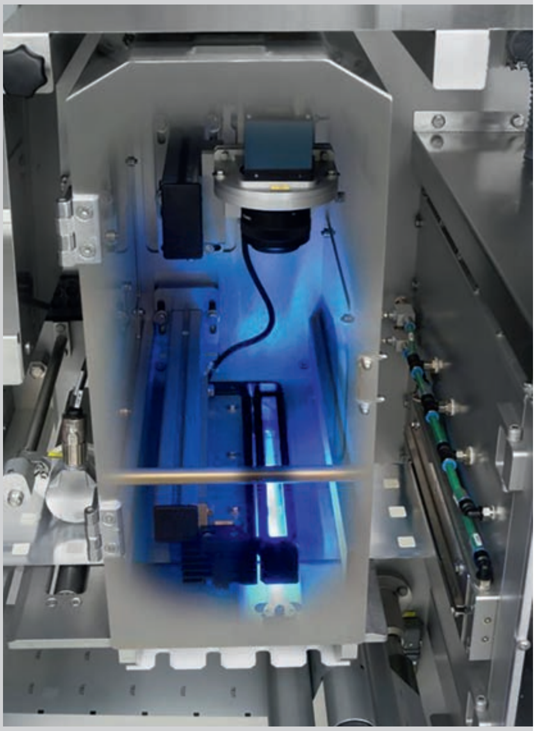

Checking the position of the MBF products before sealing

Stemmer Imaging has worked closely with Harro Höfliger both in the recommendation and supply of machine vision components and in FPGA programming for the framegrabber used as well as continually developing the image processing system. All three imaging inspection stations utilise a Spyder3 4k line scan camera from Teledyne Dalsa and an APO-Componon lens from Schneider Kreuznach. The complete images from all three stations are assembled and evaluated on a microEnable IV frame grabber using the Visual Applets software environment, both from Silicon Software, in a special industrial computer. A computationally intensive part of the image processing is done by an FPGA on the frame grabber. Since all image captures are triggered, the positions of all faulty products in the process can be tracked precisely in order to be able to eject them as bad parts at the end of the machine.

The first imaging module checks that the printing is correct on the front side of all three active ingredient strips with a maximum speed of 1050 parts per minute on each of three webs. Red LNSP line lighting from CCS provides the appropriate illumination. Faulty parts are marked in the machine's internal shift register as "bad" and discharged into a separate ejector at the end of the machine. The final products are cut out of the three webs and transferred to the lower packaging film in three rows at the correct spacing for sealing. The second image processing station checks the position of these products. It also checks the product size and for contamination by foreign bodies down to a size of about 1 mm². Blue LNSP line lighting with coaxial attachment from CCS is used to give optimal contrast between the blue lettering and the background at this point. The third image processing station checks the printing on the upper packaging material web, including the production data, shelf life, batch number and packaging material number in the form of a 2D matrix code.

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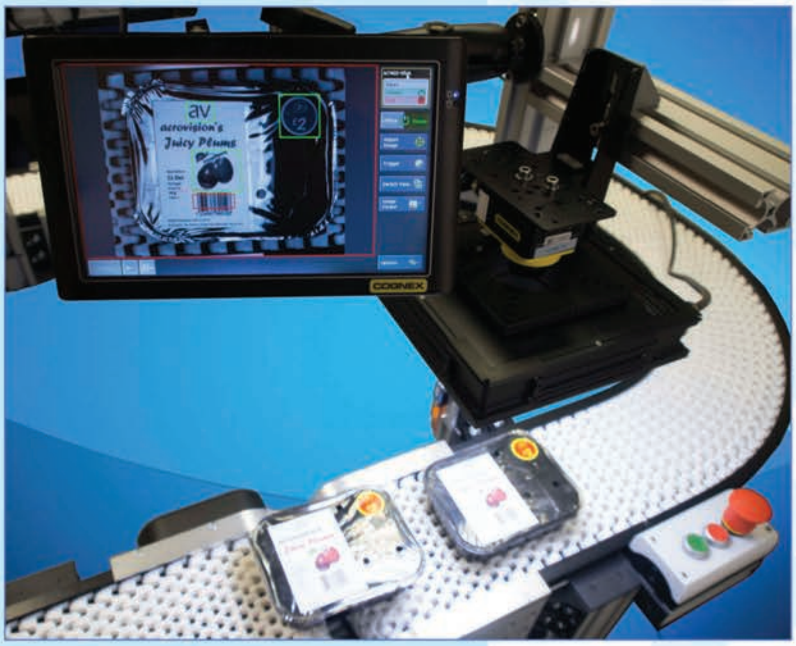

Validator can monitor and control packaging and production lines to ensure 100% correct product in the correct packaging with the correct data.

Validator 100
Stand-alone, 100% checks your barcode is correct & readable

Validator 200
Stand-alone, 100% validation of barcodes, characters & patterns

Validator 300
Integrated 100% checks of barcodes, font, patterns & packaging quality

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- ✓ Check your Sell-By-Date
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- ✓ Check your Label Position
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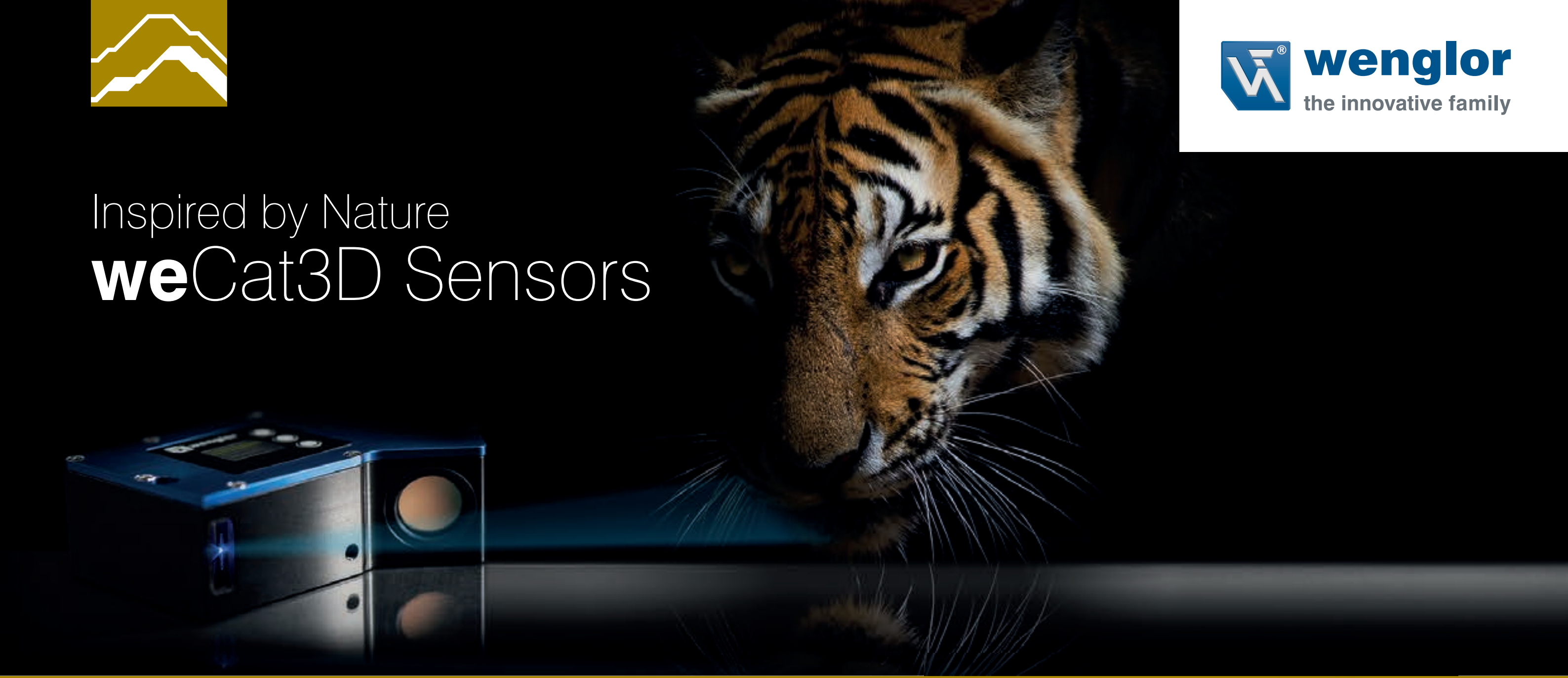

Dominance in 70 Models.

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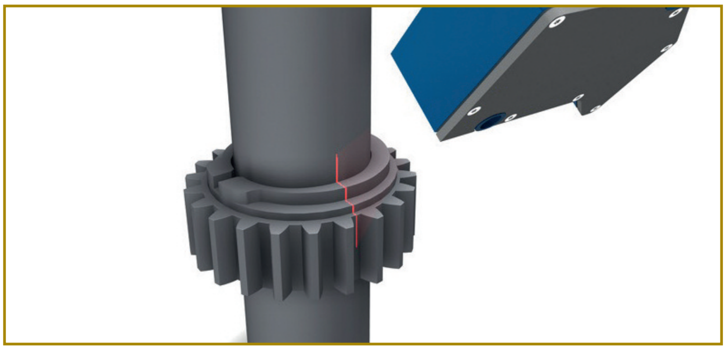
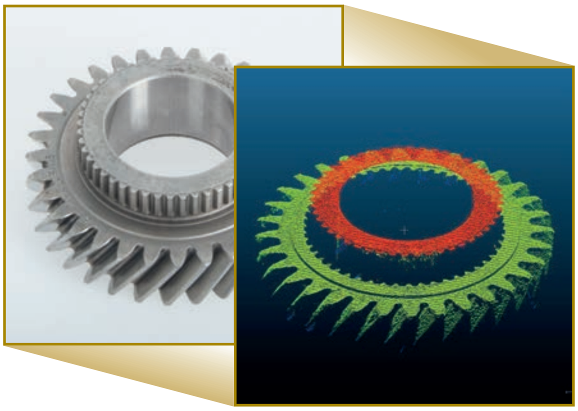
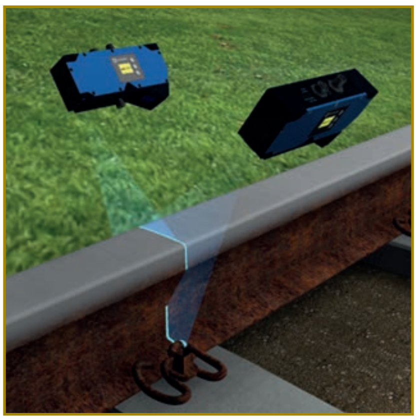
Contour Inspection

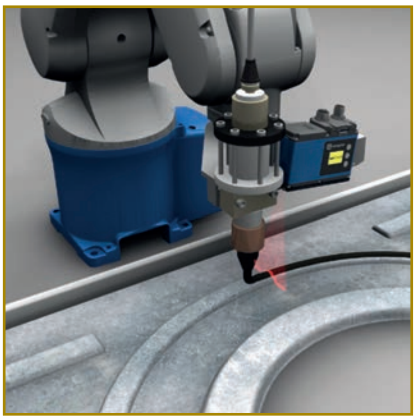




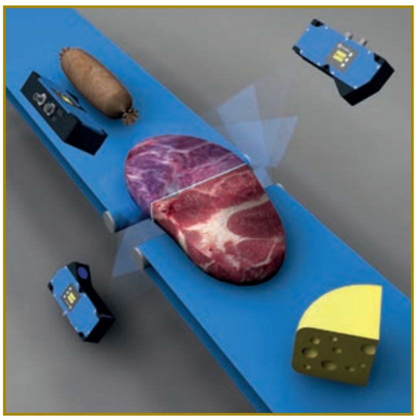
Profile Measurement



Sealant Bead Inspection



Volumetric Measurement



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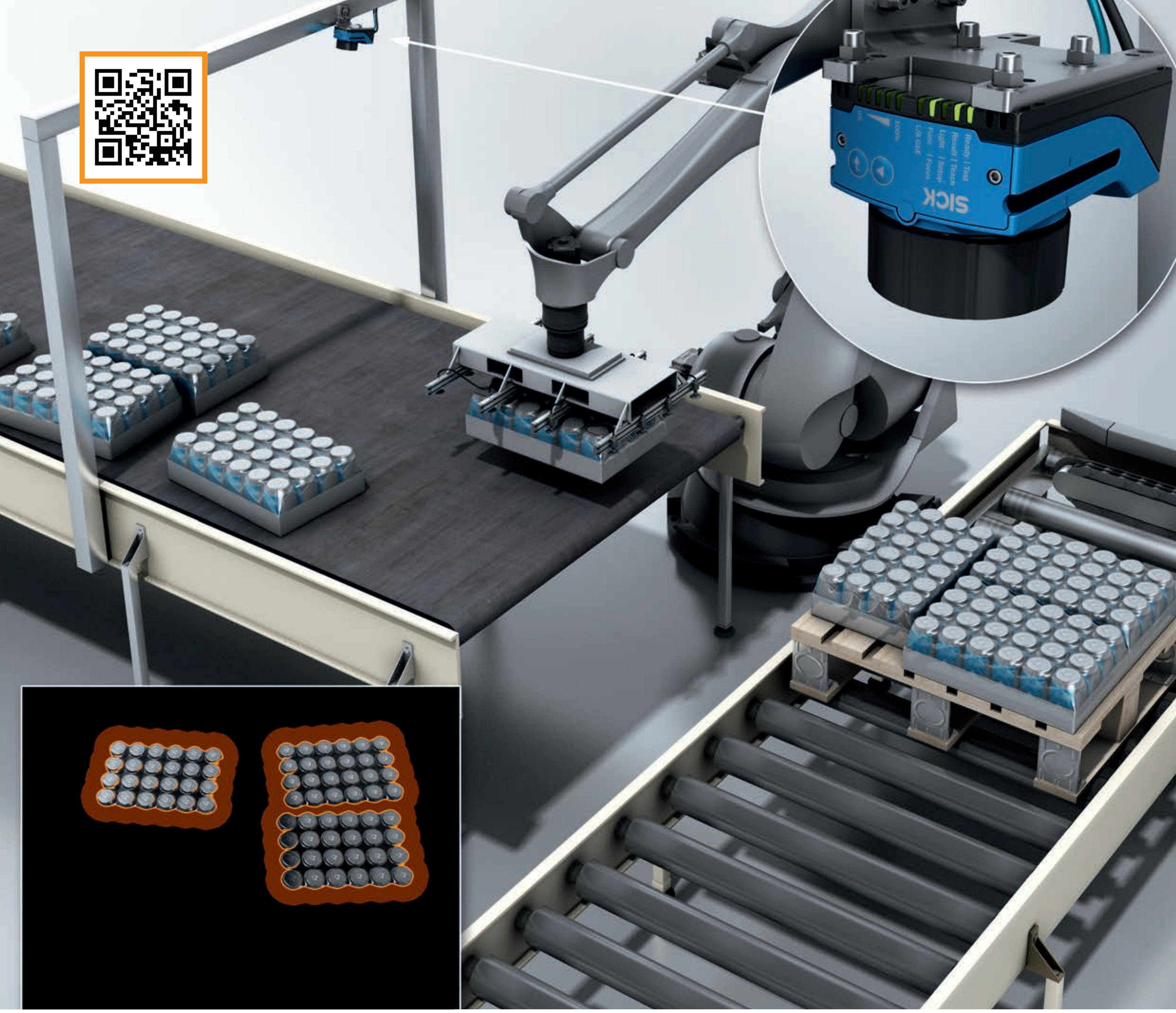

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Deep Learning & Machine Learning

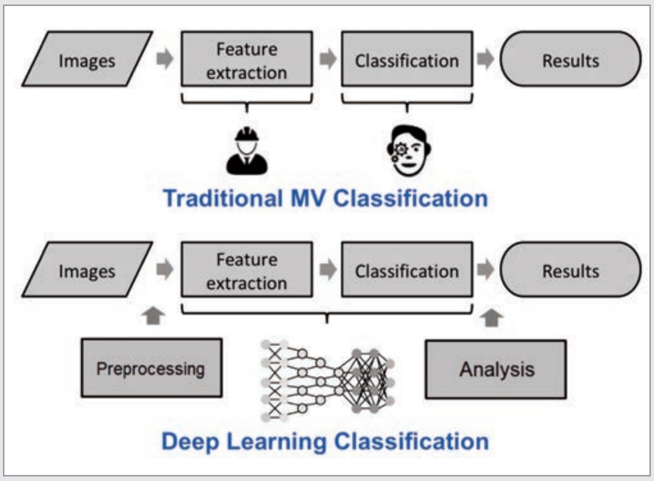
In this in-depth feature, we take a look at deep learning and machine learning classification methods for industrial vision. With the incorporation of these tools into commercial vision software products, the use of these powerful methods is becoming more and more mainstream. We'll take a good look at some of the applications that will benefit from their use as compared to traditional classification methods and find out just how easy it is to implement them. Thanks are due both to UKIVA members and to presenters at UKIVA's Machine Vision Conference & Exhibition (Acrovision, Cognex, Framos, IDS Imaging Developments Systems, Matrox Imaging, Multipix Imaging, MVTec Software and Stemmer Imaging) for their extensive contributions to this special feature.

DEEP LEARNING

Deep learning uses the latest advances related to artificial neural networks to imitate the way the human brain works for recognition and decision-making. It is especially well-suited for machine vision applications with challenging classification requirements. The most commonly used neural networks in machine vision applications are Convolutional Neural Networks (CNN)s. The actual processing and computation that takes place within a CNN is highly complex. Essentially, however, it works as an algorithm, which can extract and model data based on large training sets. In industrial vision, this will mean identifying features such as objects or defects within images and then classifying them into groups. In the simplest of cases it might be to differentiate between an apple or a pear, or between 'good' or 'bad' apples, or between apples that are bruised or have a surface discolouration etc. In general, it is most suitable for imaging applications where there is not a simple relationship between input and output.

Classification methods

For traditional classification methods, features such as shape, texture, and intensity are extracted from the input image. These features are then used as input for the classifier. The biggest effort is in the extraction of the right features. Additional work is also required to devise a suitable algorithm to classification. Deep learning, however, removes the need to "handcraft" these features. It automatically extracts the features that can be used for identifying the required classes and then uses these features to iteratively train a highly optimized classifier for the application in question.



Traditional machine vision classification vs deep learning (Courtesy Matrox Imaging)

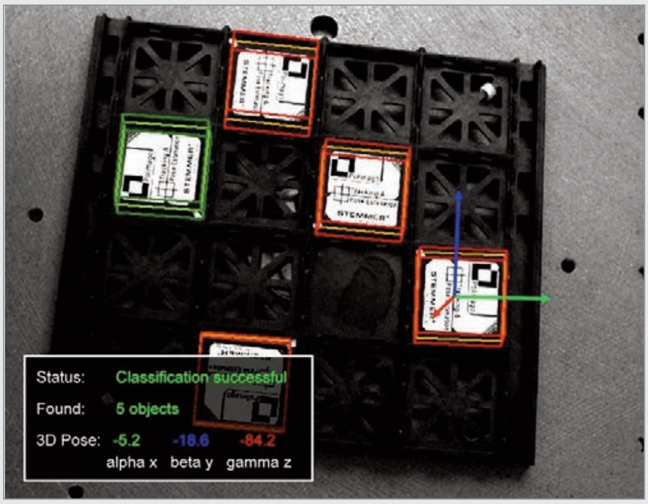
Once the system has been trained, it can be used to classify new images the system has never seen before. The deep learning network uses features learnt during training to analyse the new image data then assigns these images to the classes that it has learned on the basis of the probability that the input data (i.e., an image in this case) belongs to a given category.

MACHINE LEARNING

Machine learning covers the wider range of artificial intelligence solutions to problems, of which neural networks and deep learning are just one approach. However, there are other machine learning algorithms commercially available for image classification. These keep the advantage of learning, while reducing the processing and image requirements compared to deep learning by making assumptions about classes. Neural networks work well in 'unsupervised' learning situations, where there are many combinations of settings to try in order to find an optimal solution. Other machine learning methods, however, are used in 'supervised' tasks, where labelled input images are used and the algorithms then generate a function to deliver the desired classification output.

Supervised machine learning methods

There are a number of supervised machine learning methods available, including support vector machines, ridge regression, decision trees, K-nearest neighbours, and Gaussian mixture models. Some care needs to be taken in choosing the correct inputs or variables to use in designing the algorithm for supervised machine learning, so a staged learning approach is often adopted. The first stage provides an indication of the level of success of the outcome before a full 'learn' takes place. Supervised machine learning methods provide powerful pattern recognition tools, unlike deep learning which is not good for high-accuracy, high-precision matching. Ridge regression methods can be especially useful for tasks such as pose evaluation and object tracking as deep learning does not naturally handle rotation and scale.

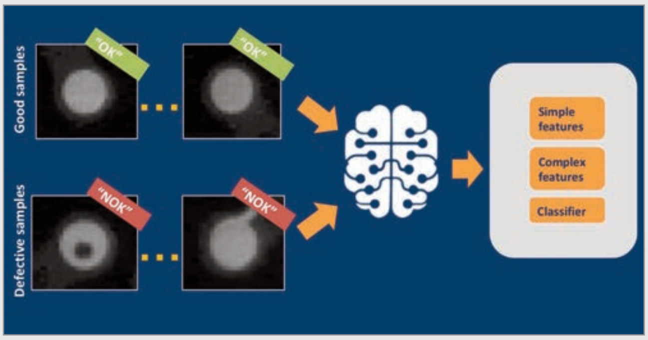


Ridge Regression classification showing the orientation and the scale (Courtesy Stemmer Imaging)

In general, supervised learning methods require far fewer training images compared to deep leaning. The biggest challenge lies in conceiving the possible solutions so that features can be extracted and combined, the solutions can be designed and the complexity of the solution can be decided. The type of algorithm alone is not a solution – it is the implementation of the algorithm that is critical.

TRAINING THE SYSTEM

All machine learning methods require a training phase. Neural networks are typically used to cope with complex problems that show some variability. Humans learn to identify parts of an image based on 'experience' gained by exposure to a large number of similar sets of data and feedback about whether the decision was correct. An untrained neural network 'knows' nothing at first and gives random or chaotic results until the neurons and the network have been 'trained' to give the desired output. A trained system can then be used to analyse new images and assign them to the classes it has previously learned. In order to train a deep learning network, labelled data are needed, which correspond to a certain class of an object such as 'good samples' and 'defective samples'.



Training a neural network (Courtesy MVTec Software)

For deep learning, adding more and more training images continually improves the classification accuracy. There is a variety of training approaches for neural networks.

Bespoke neural networks

Training a network to be effective requires a great deal of labelled data that is evenly distributed. That could mean thousands of images for every desired category. The approach of some software providers is to design a CNN from the ground up which is optimised for the specific application. This requires a detailed understanding of the problem to be solved in order to determine the best classification strategy and pre-processing steps. Once the classification capability has reached an acceptable level, the system can be deployed.

Pre-trained networks

An alternative approach offered by some companies is to provide pre-trained networks which customers can use to develop an application with a relatively low number of training samples.

Here, the deep learning classifier is pre-trained on a large and diverse dataset containing hundreds of thousands of training images to learn general features. This pre-trained network can then be further trained on a much smaller dataset (typically only hundreds of images) relative to the specific problem. This allows the parameters and possible outcome classes to be adjusted to the specific task.

Non-neural network systems

The supervised learning methods described earlier require much smaller training image sets compared to neural networks, but more detailed involvement in identifying features and classifiers. They can also be useful in applications where the objects to be classified have a variety of orientations. Here, some of the algorithms can use a comparatively small set of real training images to automatically create thousands of simulated training images containing randomly generated views of the object. This provides the ability to reliably detect the test image from a number of different angles.

GETTING UP TO SPEED

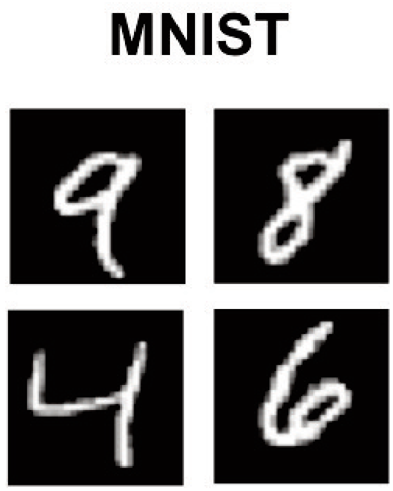
For machine learning and deep learning systems, the time required to analyse new images once the system has been trained will depend on the application and on the algorithm and processing platform used.

Practical usage

Most machine vision tasks require the use of a number of different tools, and deep learning is just one such tool which will generally be used in conjunction with others. Commercial software suites that offer deep learning capabilities are primarily designed for use on PC-based systems although some are available for embedded processors. Some software makes use of the parallelisation offered by GPUs, especially for training CNNs (Convolutional Neural Networks) in reasonable timeframes. Other software utilises CPUs. Execution times to classify unknown images after training are generally measured in milliseconds to seconds on a mid-range modern CPU.

Performance examples

There is no hard and fast rule as to which deep learning or machine learning technique will work best for any given application. This can be illustrated by an example of the classification of handwritten numbers using the MNIST (Modified National Institute of Standards and Technology) database of handwritten digits for training. This contains 60,000 binary images of handwritten digits sized at 28x28 pixels.



Some of the MNIST training images (Courtesy Stemmer Imaging)

The time for training the 60K training set into 10 different classes was 62 minutes using a CNN and 14 hours 7 minutes for a ridge regression algorithm. Classification time after training, however, was 1.791 msec for the CNN and 0.007 msec for the ridge regression method. This does not mean that one method is better than the other, because there are also other factors to consider, but serves to illustrate potential variations between different methods for the same application.

Hidden extras

With many deep learning and machine learning options available, choosing the best classification strategy depends on a good understanding of the problem. Although the actual training of a system may be fairly straightforward, a lot of time can be spent acquiring and labelling a suitable set of training images, even if it doesn't need to be particularly big. The quality of results after training must be assessed to determine how successful the process has been and the outcome may require further training steps.

THE ROLE OF DEEP LEARNING

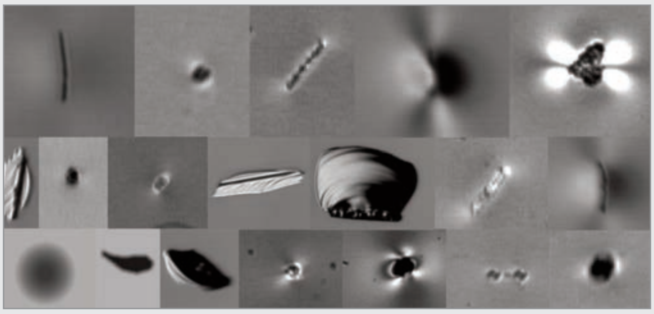
Deep learning has many strengths, but it is a complementary technology, not a solution to all problems. It is a highly effective tool for complex classification applications with high variability. Here, the use of traditional machine vision step-by-step filtering and rule-based algorithms becomes too time consuming, expensive, and may not even be capable of delivering the required results. Deep learning models can distinguish unacceptable defects while tolerating natural variations in complex patterns. These are the sort of problems where a human would find it easier to show a solution rather than describe it.

Recognition

Deep learning is good at recognising or identifying objects or features, allowing it to classify different product types, for example. It is particularly good for applications featuring organic materials such as faces, food, plants, etc. where there are lots of natural variations. It is also very good for outdoor applications - where the ambient illumination can change the appearance of objects.

Detection

Deep learning works well for the detection of defects such as scratches, dents, and marks which are unknown in advance or difficult to describe. It is also useful for detecting things that are missing, such as the absence of a subtle component in an assembly. The example shown illustrates some of the extremely high number of defect classes possible in glass products which highlights the potential complexities of defect detection. For defect classification based on classic machine learning, it would be necessary to first segment the defect and then 'hand-engineer' features that are meaningful enough to distinguish the defect classes.



Defects in glass (Courtesy MVTec Software)

Reading

Optical character recognition (OCR) is also a good application area for deep learning and was one of the early applications. It is particularly good for difficult OCR, such as handwriting, deformed text, and stamped characters that may vary significantly. Of course, the text needs to first be located and segmented for good performance.

Non-suitable applications

As mentioned above, deep learning is not suitable for all applications. For example, although it is good for OCR, deep learning is not suitable for decoding 1D or 2D codes. Dedicated algorithms are needed for that. Deep learning is also not practical for measuring or matching applications. Traditional rule-based programming technologies are better at gauging and measuring, as well as performing precision alignment.

3D IMAGING, ROBOTICS AND DEEP LEARNING

The combination of 3D technology, robotics and artificial intelligence is turning machines into smart partners, leading to innovative applications both in industry and in everyday life. 3D technology provides a new level of perception in real time. With image-based artificial intelligence, vision systems provide accurate analyses of environments and objects. 3D sensing provides robots with the mechanical skills to grab like humans and avoid collisions with the environment during movement. In industrial automation, the combination of 3D imaging and artificial intelligence allows machines and robots to make valid decisions themselves. The 3D technology makes robots fast, enabling them to recognise once unknown objects in real time. The position and distance measurements are no longer based on old data, CAD models, or vaguely made assumptions - the robots now recognise and act immediately with high precision. For example, "random picking" applications can be implemented, and in quality assurance, 3D cameras are also much faster and more accurate. Self-learning algorithms allow networking between various devices and machines, so they can independently coordinate with each other. This option is particularly relevant in the logistics sector with many unexpected and unpredictable events, but it also allows production in batch size 1 (economically efficient manufacture of highly customised products).

Pick and place

Pick and place applications are another area to benefit from deep learning methods in the form of a drop-in robot workcell which can automate any high-mix picking application.

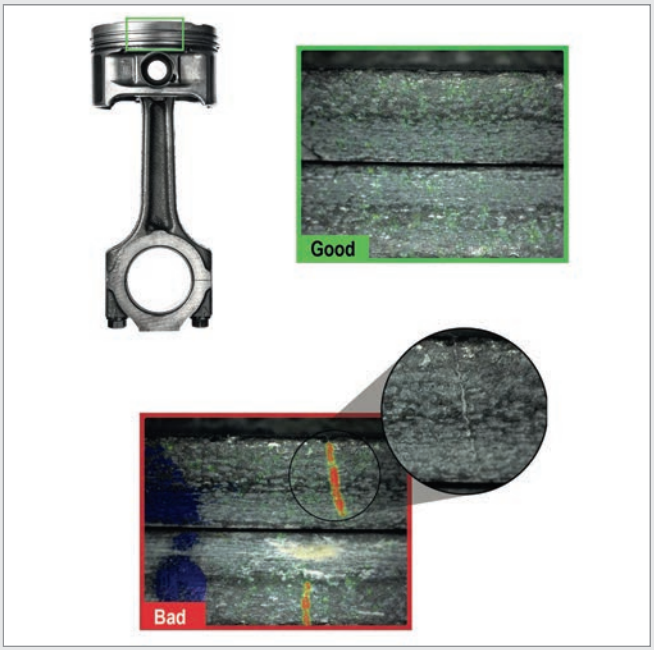
Goods to robot work cell
(Courtesy IDS Imaging Development Systems)

The system can be used in applications from random bin picking to order fulfilment, machine tending, or line loading. These are challenging applications. Traditional bin picking requires picking many parts in homogeneous bins, however, order fulfilment could require picking thousands of different product types. Parts for picking are located using 3D imaging. The system is self-learning and the more objects it encounters, the "smarter" and more reliable it becomes. It can recognize never-before-seen objects that are similar to other objects it has learned. The robot can pick up a wide variety of items from containers, transport boxes, conveyor belts, or pallets, and place them in cartons, bags, or mechanical devices. These cells can be used both for finished products and within production processes. The system can also be set up to use other machine vision tools to read barcodes, identify labels, or take measurements.

MARKETS AND APPLICATIONS

Automotive

Deep learning has a number of applications in the automotive industry. It excels at addressing complex surface and cosmetic defects, such as scratches and dents on parts that are turned, brushed, or shiny. It can also perform demanding OCR applications (even where the printing is distorted). Application examples include the automatic detection and classification of defects including pores on textured metal surfaces, as in the inspection of piston rings. Piston weld seams can be inspected for anomalies, such as missing, overpowered or underpowered seams, and overlapping seams.



Piston ring inspection (Courtesy Cognex)

Deep learning can help with the inspection of flaws in safety-critical textiles such as airbags. Automotive manufacturers must also be able to locate and decode chassis or vehicle identification numbers (VIN) for successful traceability. Paint colours, specular effects, and glare make it difficult for traditional machine vision systems to locate and recognize characters. Deep learning can be used to reliably identify all deformed characters during the VIN inspection.

Food and agriculture

Deep learning is particularly good for recognising and classifying varying features on organic items such as fruits, vegetables, and plants. For example, a user in the agricultural industry was classifying plants using traditional machine vision. New plant types had to be manually programmed and separate MLP classifiers (feature extraction) were required for each country because different countries have different plants. This was an extremely time-consuming process. Using deep learning, the same tasks were solved in just two weeks and the error rate was halved. Machine learning is also being used as part of automated harvesting methods for vegetables such as broccoli. In another application, a producer of a seafood product is using deep learning to inspect the meat for any remaining fragments after the shell is removed prior to packaging.

Logistics

Deep learning has been used to identify empty shelves in warehouse applications. The original solution was to use an elaborate and expensive hardware setup with 3D imaging. This had an error rate of 2.56%. By using a deep learning solution, imaging costs were reduced by being able to use cheaper 2D imaging, and classification was faster. In addition, error rates were reduced to 0.29%.

Pharmaceutical

In the pharmaceutical industry it can be difficult to identify defects on pills in the presence of acceptable textures using traditional machine vision techniques. Each time a new pill type is added to the manufacturing process, a specialist vision engineer has to travel to the manufacturing site to add the new defect classes into the system, which is both expensive and time consuming. Utilising deep learning significantly speeds up the process, as additional training images are used for new defect classes.

Semiconductor

Inspection of defects in contact surfaces is an important requirement in semiconductor manufacture. If any defects are flagged up, they need to be further inspected manually which is time consuming. Traditional inspection methods can have high error rates (in excess of 10%) but these can be reduced significantly by using deep learning methods. This, in turn, reduces the time and costs for manual inspection.

Traffic

Machine learning and deep learning can be used in a variety of vehicle identification applications. Vehicles can be classified by brand, model, colour, etc. The ability of deep learning to handle difficult OCR applications also makes it suitable for number plate reading, especially in difficult imaging conditions.

Domestic applications

Deep learning is also being used for a number of domestic appliances. 3D navigation and intelligent mapping of the environment can be utilised in home appliances such as vacuum cleaners and lawn mowers. Structures can be recognised and avoided. So, for example, training a vacuum cleaner to identify jewellery would allow the appliance to manoeuvre around something like a ring that had been dropped on the carpet rather than sucking it up. An intelligent lawn mower can detect where the lawn edge ends and stop there. Similarly it could be trained to identify, for example, a hedgehog, so that it would avoid it.

Robot lawnmower (Courtesy Framos)

Deep learning has also been applied to domestic ovens. Using an HD camera in conjunction with a deep learning neural network running in real time on an embedded GPU, it is possible to recognize many different food types foods and recommend the best cooking program for them.

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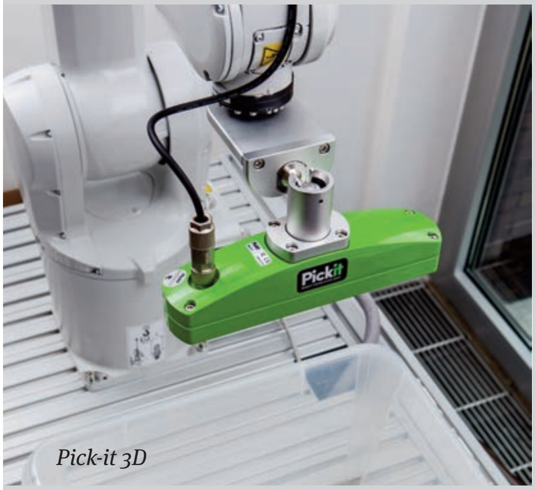
ACROVISION www.acrovision.co.uk

Acrovision offers Pick-it 3D robot vision

Pick-it 3D, now available from Acrovision, is a plug and play robot automation solution with flexible capabilities and easy set up and calibration through a user-friendly graphical interface. It integrates with all major robot brands including the AUBO-i5 collaborative robot, also available from Acrovision. At an affordable price, it provides a fast return on investment.

Pick-it supports robotic applications such as automatic machine loading, bin picking, de-palletising, kitting and assembly from multiple bins and conveyor handling. It can find products of varying shapes and sizes, all colours, both matte and gloss, all materials including metal, plastic, wood and food, It works in changing and poor light conditions with no need for extra lights.

The Pick-it product features a Pick-it 3D camera and software installed on an industrial processor, which can be connected to the robot of choice.



Pick-it 3D

ALLIED VISION www.alliedvision.com

New high-speed, high bandwidth camera announced

The new Bonito Pro camera family from Allied achieves 25 Gigabits per second with quad CXP-6 CoaXPress for high-speed, high bandwidth applications. These include automated optical Inspection, Flat Panel Display inspection, printing inspection, 2D/3D surface inspection, and aerial surveillance.

The 12.6 Megapixel Bonito PRO X-1250 camera operates at up to 142.6 frames per second (fps) at full resolution. The 26.2 Megapixel Bonito PRO X-2620 camera has maximum frame rate of 79.7 fps at full resolution. Both cameras offer a comprehensive feature set including Sequencer Control and Multiple Region of Interest. They deliver outstanding image quality at these frame rates and are available as monochrome, colour, and NIR models with extended near infrared sensitivity.

The robust thermal housing allows operation at extended temperature ranges and enables to select between multiple lens mount options. These include F-mount (default), M42, M58, and EF-mount including focus and iris control.

Bonito PRO

ALRAD IMAGING www.alrad.co.uk

New ISVI high speed, high-resolution cameras

ISVI Corp. has launched the IC-C18N-CXP and IC-C18R-CXP, 18MP colour CMOS cameras with a single CoaXPress CXP6, DIN-1 interface. These can deliver 24fps at a resolution of 4912 x 3684 pixels in 8-bit raw Bayer GR format. By combining the outstanding dynamic range characteristics (65.8dB) of the On-Semiconductor AR1820HS colour sensor with a single CoaXPress interface, these cameras provide an extremely cost effective high-resolution solution for many single and multi-camera application areas. These include 2D/3D metrology, AOI and SPI, 3D digitising systems, wire bond inspection, LED/OLED inspection, robot vision, digital gel imaging systems and digital pathology.

The IC-C18N-CXP is a standard housed version with C-mount and additional power and I/O connectors, while the IC-C18R-CXP is a remote-head version with CS-mount consisting of the imager head, base unit and a single DIN CXP connector. Multiple high-resolution cameras can be easily and accurately synchronised using a single CoaXPress 2, 4 or 8-link framegrabber for high-accuracy applications. Alternatively, single-link CoaXPress framegrabbers can be used for one camera high-end imaging systems.

ISVI IC-C18N-CXP and IC-C18R-CXP cameras

FLIR Blackfly-D Polarised camera

CLEARVIEW IMAGING www.clearviewimaging.co.uk

New camera with Sony polarising sensor

The new FLIR BFS-U3-51S5P-C USB3 Vision polarising camera opens up new applications and reduces the complexity of polarised light imaging hardware. The new camera combines Sony's new 5.0 MP IMX250MZR Pregius global shutter CMOS sensor with the already powerful feature set of the FLIR Blackfly S. The new IMX250MZR sensor features a polarising filter on each individual pixel. These filters are oriented to 0°, 45°, 90° and 135° and arranged in repeating two-pixel blocks. This allows the detection of both the amount and angle of polarized light across a scene and overcomes the effects of reflections and glare on reflective surfaces like glass, plastic and metal.

Conventional polarising systems that rely on multiple cameras and filters behind a beam splitting prism, or a single camera with a rotating filter or filter wheel are large, complicated and slow. The compact BFS-U3-51S5P-C delivers increased speed, and greatly reduced size, mass, power consumption, compared to existing solutions.

Dataman 470

COGNEX www.cognex.com

New fixed-mount barcode reader

The new DataMan 470 series of fixed-mount barcode readers from Cognex is designed to solve complex, high-throughput manufacturing applications such as tyre identification and electronics and automotive component traceability. Multi-core processing power, new HDR+ imaging technology, high-resolution sensor, advanced algorithms, and simple setup combine to deliver excellent coverage, speed, and ease-of-use. It also offers greater field-of-view and depth-of-field coverage than conventional readers.

The seven powerful processing cores enable it to run multiple algorithms and processes in parallel at astonishing speeds. Using patented technologies and advanced algorithms, it can read challenging 1D and 2D codes in varied locations, as well as multiple mixed symbologies simultaneously while maintaining the highest decode rates. It is also capable of reading low contrast and ultra-small 1-D and 2-D codes not visible to other readers.

MOD225I

FRAMOS www.framos.co.uk

New sensor module for embedded video applications

The first sensor module for embedded video applications from Sunex Optics is available from Framos. The MOD255I is based on Sunex Optics' 4K Miniature DSL255 SuperFishEye Lens. The high-resolution module provides up to 12 Megapixel resolution images at 60 frames per second, or 4K2K video at the same frame rate. It incorporates Sony's IMX477 1/2.3 type CMOS consumer with an active pixel array of 4072H x 3062V. The fully integrated and dynamically aligned lens provides a wide 190° field of view at a design image circle of 4.3mm. In addition, it achieves excellent performance in low light with an F/2.0 aperture.

The compact design can easily be integrated into any embedded vision application. With its thermal stability and low power source requirements and consumption, it is ideal for security and industrial action cams delivering high-resolution video in real-time for both indoor and outdoor applications. These include drones, bank machines, smart home surveillance, board-room video, or sports cameras.

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IDS IMAGING DEVELOPMENT SYSTEMS GMBH

www.ids-imaging.com

NXT vegas app-based camera with colour sensor

The IDS NXT vegas app-based industrial camera is now available with a 1.3 megapixel CMOS colour sensor from e2v. With an integrated liquid lens, LED illumination and a Time of Flight sensor for distance measurement, it is fully equipped for many different image processing tasks. A newly integrated 'high-power mode' is automatically pre-set for trigger operation and ensures that the LEDs are briefly operated at higher than normal current. This results in brighter images.

New features such as Auto White Balance and Colour Gain configuration have been added to the IDS NXT Cockpit, which serves as a PC application for configuring the cameras. These allow users to adjust the image to the particular imaging conditions

As a complete embedded vision component, IDS NXT simplifies integrated design into custom device hardware and software. IDS NXT vision apps run as application programs on the IDS NXT vegas itself and extend the device's functionality. Users can create their own vision apps with the IDS NXT Software Development Kit .

NXT Vegas with colour sensor

MATRIX VISION

www.matrix-vision.de

mvBlueGEMINI – toolbox technology smart camera

The mvBlueGEMINI smart camera from Matrix Vision enables beginners, professional users, and system integrators alike to realise applications in a highly efficient way. The camera is pre-installed with mvIMPACT Configuration Studio. Its user-friendly menu navigation allows applications to be developed in a very intuitive way. Teaching functionality makes it possible to solve applications without programming.

An application consists of individual tools such as 'Acquire image', 'Find object'", etc. which are based on the Halcon image processing library. All available tools are grouped in the user-accessible toolbox. Tools are available for sorting and counting (colour, size, form), measuring, OCR and 1D and 2D code reading. They can be trained with the software choosing the right algorithms and setting the matching parameters, meaning that knowledge of image processing is not an absolute requirement. Applications such as pick & place can be configured with the support of wizards.

mvBlueGEMINI mvIMPACT-CS

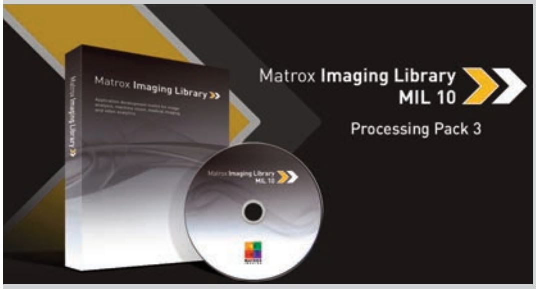
MATROX IMAGING

www.matrox.com

Major MIL 10 software update with deep learning offer

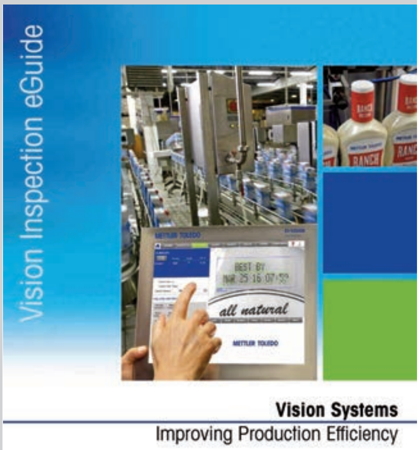
Matrox® Imaging has released the Matrox Imaging Library (MIL) 10 Processing Pack 3 software update. This features a CPU-based, image classification module which makes use of deep learning technology for machine vision applications. Processing Pack 3 also includes a new photometric stereo tool to bring out hard to spot surface anomalies such as embossed and engraved features, scratches and indentations. A new dedicated tool to locate rectangular features is able to simultaneously search for multiple occurrences of rectangles with different scale and aspect ratios.

Leveraging convolutional neural network (CNN) technology, the Classification tool categorises images of highly textured, naturally varying, and acceptably deformed goods. The inference is performed exclusively by Matrox Imaging written code on a mainstream CPU, eliminating the dependence on third-party neural network libraries and the need for specialized GPU hardware. Matrox Imaging utilises its accumulated experience, knowledge, and skills in the the intricate design and training of a neural network.



MIL_10_PP3

MEMBERS NEWS



Vision Inspection eGuide

METTLER TOLEDO www.mt.com

Helping food manufacturers get best value from vision systems

Mettler-Toledo has developed a series of online support tools to help food manufacturers optimise the application of vision technology and calculate payback periods based on real production data. Intelligent line optimisation enables food manufacturers to make the most of their production assets by securing uptime and reducing rework.

Mettler-Toledo's new animated infographic, 'Vision Systems - Increasing operational efficiencies and reducing costs' (https://www.mt.com/gb/en/home/library/guides/product-inspection/vision-inspection-eGuide), takes the viewer through a typical production process. The animation demonstrates how vision systems can be applied at every stage in order to improve efficiencies and reduce costs.

Mettler-Toledo's online ROI calculator (www.mt.com/civision-roi) is designed to help manufacturers who are considering investment in a vision system and need to quantify payback. By inputting real data about the actual production process that requires improvement, the likely payback period for their vision system application can be calculated. Potential payback times for vision systems typically range from 12-18 months.

Halcon V18.05

MULTIPIX IMAGING www.multipix.com

Halcon 18.05 runs deep learning inference on CPUs

The latest release of the Halcon machine vision software from MVTec Software is now available from Multipix Imaging. With Halcon 18.05, the deep learning inference, i.e., the use of a pre-trained Convolutional Neural Network (CNN), is now running on CPUs for the first time. This inference has been highly optimised for Intel®-compatible x86 CPUs, meaning that a standard Intel CPU can reach the performance of a mid-range graphic processor (GPU) with a runtime of approximately two milliseconds. Industrial PCs, which usually do not utilise powerful GPUs, can now be used for deep learning based classification tasks.

The new Halcon version also enhances functions such as deflectometry. This improves the precision and robustness of error detection for objects with partially reflective surfaces. Developers will benefit from two other new features. They can now access HDevelop procedures not just in C++, but also in .NET via an exported wrapper. This significantly facilitates the development process. In addition, Halcon 18.05 makes it much more comfortable to work with handles.

HIK Smart Camera

SCORPION VISION www.scorpionvision.co.uk

Versatile smart cameras

The range of HIK Vision Smart Cameras has recently been extended to include 1.3, 2 and 5 megapixel sensors, all with global shutter sensors. This innovative smart camera is built around a powerful x86 platform with multi-core CPU and is capable of running both Microsoft Windows and Linux operating systems. It features an integrated LED light source, lens cover and external light source interface, all in a small footprint (126 x 66 x 113mm) and a housing with full IP67 environmental rating.

Scorpion Vision Software™ is a framework automation package that contains almost 200 machine vision tools, including an advanced 3D vision toolset. It runs on the HIK Smart Camera series and is ready to use out-of-the-box to offer a very powerful machine vision package capable of both 2D and 3D applications. Using the quad core processor, Scorpion Vision is optimised to process multiple images per second. The package is an ideal platform for applications such as robot vision for pick and place and other non-contact applications where the camera can be mounted on the robot, both for guidance and measurement or inspection.

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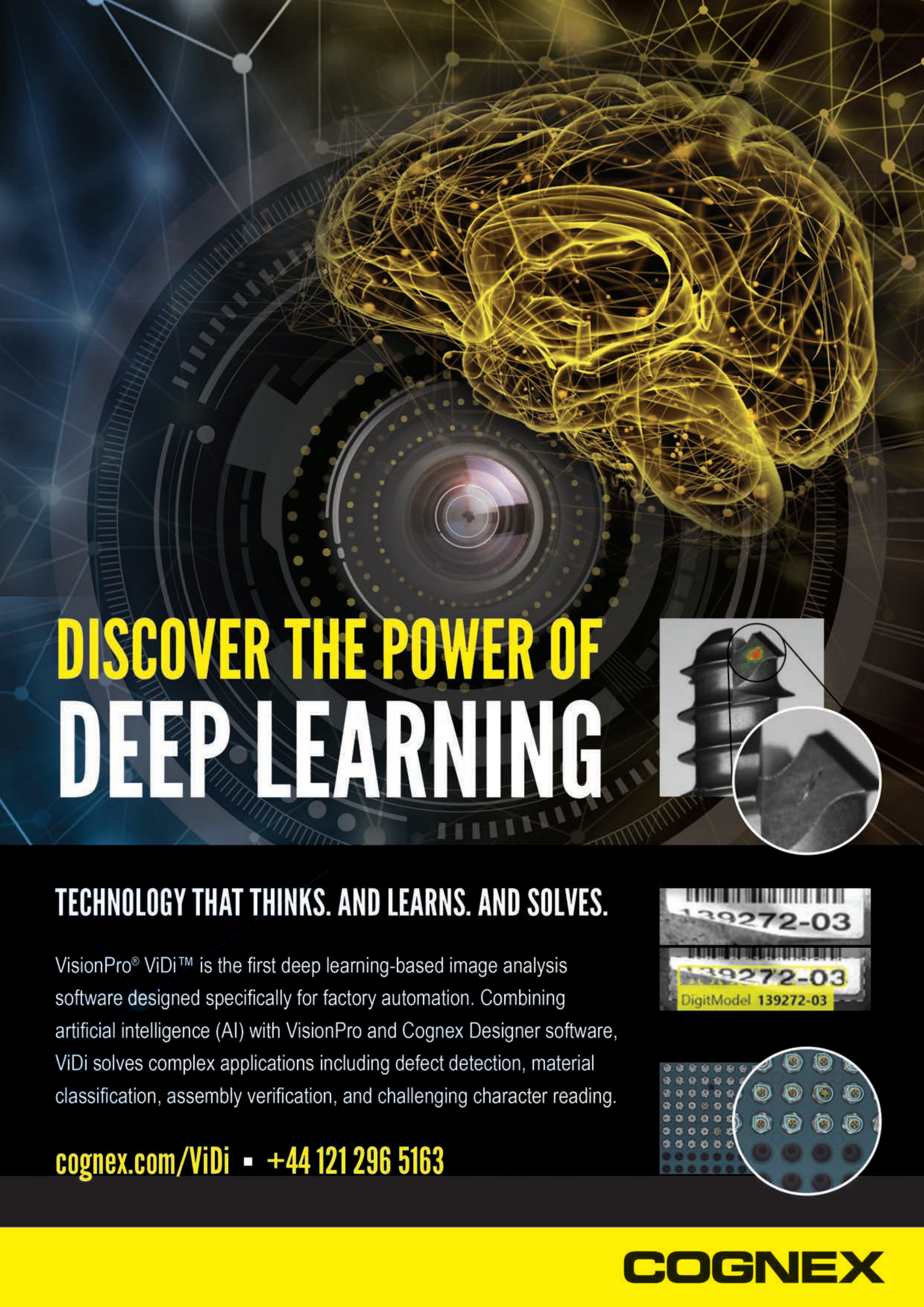
www.ids-nxt.com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SICK (UK) LTD www.sick.co.uk

'Easy Vision' robot guidance for part localisation

Sick has launched 2D and 3D vision-guided part localisation systems for easy and quick set-up of robot picking from a belt, or from a bin or stillage. Suitable for both cobots and conventional industrial robots, the Sick PLOC2D and PLB 520 have been developed specifically to facilitate affordable, or entry-level automation and for use in handling smaller parts and components.

Both systems combine high-performance image processing hardware with a powerful Sick-developed algorithm to deliver 'out of the box' integration with pick and place robots. Both the PLOC2D and the PLB 520 can be rapidly and easily connected directly to the robot control without programming skills or training and are ready to use almost immediately.

The PLOC2D is an easy set-up vision system for 2D localisation of parts, products or packages to be picked from a static workstation, moving belt, or feeder system. The PLB 520 uses a stereoscopic vision camera to enable 3D vision-guided bin picking applications of much smaller objects than was previously possible.

PLOC2D Group

STEMMER IMAGING www.stemmer-imaging.co.uk

High resolution Time-Of-Flight 3D cameras

Stemmer Imaging can now offer Time-Of-Flight (TOF) 3D cameras from Odos Imaging. The Starform Swift 3D camera has a 640 x 480 pixels sensor, making it the highest resolution industrial TOF camera currently available. With integrated 850 nm LED illumination, the camera can acquire 3D point clouds for imaging at 44 fps from a range up to 6 metres. These fast frame rates can be used to track dynamic scenes in 3D or accumulate static scenes for improved precision. Fully factory calibrated, the camera can provide range (or depth) information, 3D images and measurements and 2D images.

Its versatile imaging capabilities and GigE Vision connectivity make the Starform Swift ideal for a wide range of factory processing, packaging and logistics applications. These include palletisation/depalletisation and pallet management, carton/object dimensioning and profiling, and package completeness checks. Camera-integrated software packages are available for completeness, height detection and box measurement. The GeniCam interface enables easy integration of Starform Swift cameras into popular machine vision software packages (such as Common Vision Blox) for developing machine vision solutions.

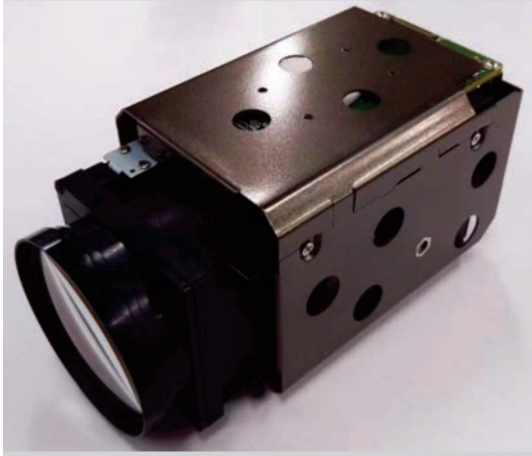
Starform Swift

TAMRON www.tamron.eu/uk

Tamron's first block camera

Lens manufacturer, Tamron, has launched its first global shutter block camera. The MP2030M-GS is equipped with Sony's IMX265 1/1.8" CMOS sensor. This camera features a built-in high-power 30x zoom lens and is suitable for both wide angle and telephoto imaging. In addition, the advanced feature set makes the new camera a perfect candidate for both day and night conditions in security, surveillance or traffic applications.

The sensor provides 3.19 Megapixel resolution with high light sensitivity and guarantees excellent picture quality with low noise. Various output modes from NTSC/PAL to 1080p/60 are available. The global shutter CMOS imager prevents motion blur in the images when capturing fast moving objects. The lens has a 30x optical and 16x digital zoom, giving it a zoom range from 6-180mm optical and up to 2880mm equivalent focal length using the digital zoom. This makes the camera suitable for a wide variety of working distances. The field of view is between 60° and 2.5° and features an f-stop between 1.5 and 4.8, depending on the zoom factor.



MP2030M-G

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EVENTS

PPMA Show
25 - 27 September, 2018, NEC, Birmingham, UK
Many UKIVA members will be exhibiting
www.ppmashow.co.uk

Photonex
10 – 11 October, 2018, Ricoh Arena, Coventry, UK
www.photonex.org

VISION
6 - 8 November, 2018, Messe Stuttgart, Germany
Many UKIVA members will be exhibiting
www.messe-stuttgart.de/vision/en

Future Robotics
13 November, 2018, The Slate, Warwick University, UK
The UK's only independent industrial robotics conference
www.futurerobotics.co.uk

Multipix WiseUp – What The Eyes Can't See
28 November, 2018, Advanced Manufacturing Technology Centre, Coventry, UK
29 November, 2018, AMRC, Sheffield, UK
A look at techniques such as Infrared, Hyper-spectral and Multi-spectral Imaging
http://multipix.com/events

Multipix WiseUp – Deep Learning
February, 2019, Advanced Manufacturing Technology Centre, Coventry, UK
Covering the Deep Learning CNN classifier and application possibilities
http://multipix.com/events

TRAINING

Training courses offered by UKIVA members:

STEMMER IMAGING
(in association with the European Imaging Academy)
'Optics & Illumination' – October 04
'LMI 3D Sensor' – October 18
'Hyperspectral Imaging' – November 15
'Machine Vision Solutions' – November 28-29
'Common Vision Blox' – December 13
All courses at Tongham, UK
www.stemmer-imaging.co.uk/en/events/training-events/

TECHNICAL TIPS

Some useful technical tips from UKIVA members

Choosing the best machine vision system for your business (ClearView Imaging)
www.clearviewimaging.co.uk/blog/choosing-the-best-machine-vision-system-for-your-business

Enhanced 3D vision (IDS Imaging Development Systems)
https://en.ids-imaging.com/technical-article/en_enhanced-3d-vision.html

Vision Systems: Improved Production Efficiencies (Mettler Toledo)
www.mt.com/gb/en/home/library/guides/product-inspection/vision-inspection-eGuide.html

Can embedded vision revolutionise imaging and machine vision? (Stemmer Imaging)
www.stemmer-imaging.co.uk/en/technical-tips/can-embedded-vision-revolutionise-imaging-and-machine-vision/

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