The evolving world of vision technology

Imaging is an enabling technology in a vast range of industries – from manufacturing to security, sport and space exploration. **Mark Williamson** from Stemmer Imaging comments on the technologies available

No longer confined to traditional manufacturing and processing inspection applications, industrial vision is now finding applications in industries as diverse as security, transport, sport and space exploration. It is even part of the attempt to set a new world land speed record in 2015, as industrial camera systems will be deployed on 'BLOODHOUND SSC', the jet and rocket powered car designed to travel at 1,000mph. These will include rear-facing cameras looking at the output from the rocket and jet engine exhausts, and cameras monitoring critical engineering parameters such as the wheel-ground interface (Figure 1).

Not surprisingly, therefore, vision technology is in a continuous state of evolution as suppliers strive to develop systems that can produce higher quality images, fit into spaces that previously were too small, and are able to carry out faster and more complex inspections.

Figure 1: BLOODHOUND SSC showing camera positions

[Image courtesy of Siemens NX]

SMART CAMERAS

All-in one units that combine image capture and processing in one housing, smart cameras process the image in the camera and output the results from the analysis over industry standard connections. These can be used in the traditional industrial vision applications such as high volume component inspection, robot guidance, 1D and 2D (DataMatrix) code reading and verification, optical character recognition, etc.

The availability of faster and dual-core processors means that smart cameras can benefit from more sophisticated image processing and measurement software – in some cases they can offer processing capabilities previously only available on PC-based systems. The Boa 200 smart camera from Teledyne DALSA, for example, features a 1.2GHz dual core processor that brings four times the processing speed compared to standard Boa models.

Furthermore, smart cameras are getting smaller, yet higher resolution image sensors continue to be introduced, enhancing the range of applications.

3D IMAGING

The emergence of affordable 3D imaging systems as a credible alternative to 3D contact measurement and metrology is due to the availability of processors capable of handling the computational overhead required (at production line speeds) to create and process complex 3D images.

Probably the most popular 3D imaging technique is laser profiling using triangulation. The object to be measured passes through a line of laser light and a camera mounted at a known angle to the laser records the changing profile of the laser line (Figure 2). The resultant point cloud can be analysed to allow calculation of shape and volume and even 'golden template' matching between the expected and measured shape of a 3D object. 3D systems can be built using individual components or systems where the illumination and camera are combined in a single housing.

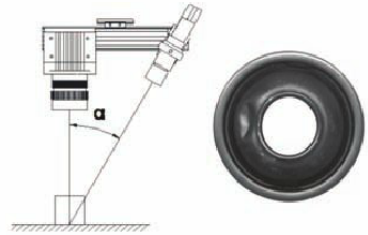
Smart 3D systems, like their 2D counterparts, perform acquisition, measurement, decision and control within the unit, although data can be output for further processing if required. Another approach is to mimic nature with a stereo set-up where two cameras are used to record 2D images of an object. A 3D image can then be calculated using triangulation. While the laser profiling method requires the object to move through the laser line, the stereo system can also work with static objects.

The new 3D 'snapshot sensor' Gocator 3100 from LMI Technologies, for example, is a smart 3D stereo system with powerful built-in measurement tools that include rectangular opening, circular opening, slot, cylinder, threaded stud, corners, edges, and gap and flush.

CONTACT IMAGE SENSORS

For the inspection of flat products, contact image sensors (CIS) are an interesting alternative to line scan cameras. They also form an image line by line, and the new Mitsubishi Electric KD series of CIS features a double-row lens array, using gradient index rod-lenses, matched to a colour tri-linear CMOS sensor.

Each individual rod-lens captures an image of a very small region of the target, producing a quasi-telecentric image at each pixel, giving image uniformity with virtually no distortion and a resolution of 600 dpi. In addition, excellent colour rendition and fast scan speed make the CIS ideal for print inspection; and integrated white LED illumination allows for detailed defect inspection in textiles, foils and other web-like materials. Flexible lighting in combination with external illumination allows inspection of glass and metal. Other applications include inspection of PCBs, wafers and solar cells.



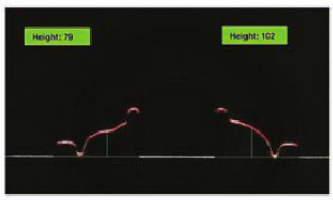


Figure 2 (below, left): Laser profiling of dent in component

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Stemmer Imaging has organised a Vision Technology Forum which will be held on May 22nd at the Silverstone Wing Exhibition and Conference Centre in Northamptonshire.

At the event, visitors will be able to choose their own programme from around 40 seminars on a wide range of vision topics that will be run over five parallel 'tracks'. In addition, over 25 machine vision manufacturers will be running hands-on demonstrations of hardware and software throughout the day, and there will be a talk by Richard Noble OBE, leader of the BLOODHOUND Project team and previous land speed record holder.