

High Tech Coupled with Finesse

Calibrated 3D Area Sensor for Industrial Image Processing

In part inspection, 2D machine vision sometimes gets to its limits, namely when the contrast is too low, or the lighting conditions vary too much. Not so with 3D machine vision: Here the digital stripe light projection ensures the decoupling of image acquisition quality and lighting conditions. Thus, a 3D sensor supplies much more meaningful raw data than the traditional 2D sensor.

Not only in the movies, also in machine vision 3D technology is rapidly gaining in popularity. 3D systems simplify many industrial applications in which conventional 2D image processing requires implementation of highly complex solutions. In recent years, there have been a host of interesting new developments both in the area of image acquisition of three-dimensional objects and 3D image processing software. 3D image processing systems are already used for object measurement and testing in the fields of



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automation and robotics. In addition to a comparison of target and actual variables, 3D image acquisition of objects can also significantly optimize production processes for inspection tasks relating to position and completeness. Robust and easy-to-integrate image acquisition technology is an essential prerequisite for efficient use of 3D technology in an industrial environment.

This is now presented by the German camera manufacturer VRmagic with its new 3D area sensor. This sensor

is based on digital stripe light projection and supplies ready-calculated 3D data records for industrial image processing. The AreaScan3D sensor outputs the recorded 3D data to the evaluation computer via the standardized Ethernet interface. The data is output directly as a point cloud or a grayscale-coded range map. Image processing can then take place in this computer, e.g. to check the completeness of free-form components. The AreaScan3D sensor is addressed via a GenICam transport layer (GenTL). The

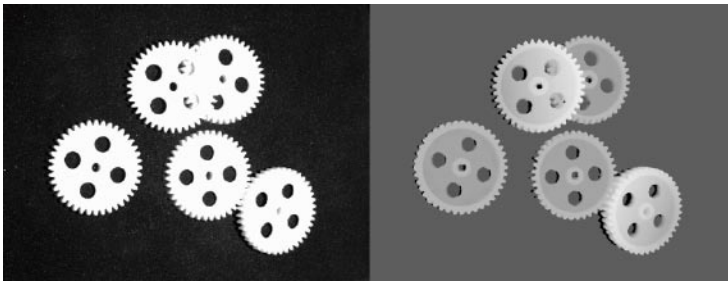
A Wealth of Possibilities

In many countries, the company Stemmer Imaging will be exclusively responsible for distribution of AreaScan3D. INSPECT spoke with Peter Keppler, Sales Manager at Stemmer Imaging, about 3D machine vision and the 3D sensor.

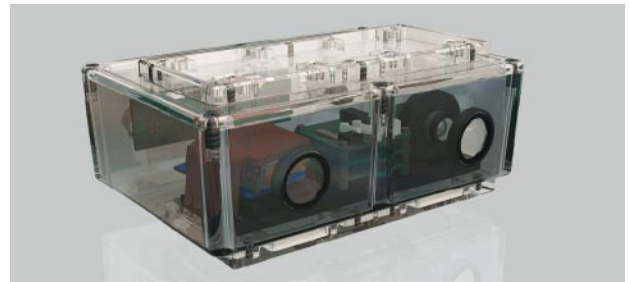
INSPECT: During recent years 3D imaging has taken a large technological step. Not only as far as the acquisition of 3D images is concerned, but also in regard to analysis algorithms. Interesting technologies are now available and impressive applications have been realised. What has been accomplished at Stemmer Imaging?

P. Keppler: For the last few years Stemmer Imaging has been working with this technology and offers different acquisition hardware as well powerful analysing algorithms. Of special interest are the 3D tools from the independent image processing library Common Vision Blox with an emphasis on completeness checks





The advantages of 3D pre-processing are shown by this grayscale-coded range map: three-dimensional image acquisition offers more meaningful data than a two-dimensional camera image



The interior of the 3D area sensor in a schematic presentation

3D sensor is therefore compatible with all image processing libraries and packages that can already communicate with a GenTL, such as Common Vision Blox or Halcon.

Plug & Play Technology

The 3D sensor can be integrated in robots and automation installations via the Ethernet interface. The sensor features a robust metal housing with IP65 protection, screw-type standard industrial connectors, a 24 V connection, an Ethernet interface as well as hardware and software triggers.

“We are offering plug and play technology with an extremely interesting cost-benefit ratio,” says Oliver Menken, Sales Manager at VRmagic. “The advantages of 3D technology for machine vision are above all in decoupling of lighting problems. Compared with classic 2D image processing, optical 3D measurement with stripe light projection can offer more efficient and robust testing methods. Particularly for inspection objects with low contrast or under varying lighting conditions, 3D data acquisition frequently supplies much more meaningful raw data. This data can then also

be analyzed using conventional 2D inspection algorithms.”

High Measuring Accuracy

The AreaScan3D sensor offers maximum external light stability through use of a color LED combined with a band-pass filter. The material color also does not have any influence on measuring accuracy. The sensor is a ready-calibrated system and supplies metrically calibrated images with guaranteed measuring accuracy for non-moving objects. The image acquisition time is less than one second. “Stripe projection, image acquisition and generation of the point cloud are performed in an integrated manner based on an intelligent camera from VRmagic,” explains Menken. “The DLP pico projector from Texas Instruments and the camera are synchronized with a frequency of 60 Hz.” Output of a complete 3D data record is currently possible with approximately 360,000 individual points per scan. The AreaScan3D sensor is available with measuring fields ranging from a few millimeters up to a square meter. It offers a guaranteed accuracy in the sub-micrometer to millimeter range, depending on the size of the field-of-view.



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of free-form objects. The CVB tools work in real 3D space processing point clouds plus all other 2D-tools within CVB can be used with the 2.5D grey scale coded images produced by 3D cameras.

Which requirements have to be fulfilled by a 3D sensor in the industrial field?

P. Keppler: In order to better establish 3D technology, a robust and easy to integrate acquisition technology is necessary. This technology has to offer high precision at a realistic price in order to be competitive with other 2D or 3D solutions. VR-

magic specifically developed their new AreaScan 3D sensor to meet those basic conditions. The flexible stripe light generation with a DLP projector allows the easy acquisition of 3D image data of non-moving objects. The complete system including camera and digital stripe light projection is calibrated and delivers metrically calibrated images. The IP65 housing with screwable standard industrial connectors fulfils industrial requirements. The camera is available for different fields of view that are tailored to typical industrial applications.

Which application possibilities do you envision for the AreaScan3D sensor?

P. Keppler: In combination with the CVB 3D tools, but also with algorithms from other manufacturers, this sensor will open up interesting new possibilities in the industrial field. Applications and markets for this technology are mainly completeness checks for free-form objects using CVB Match 3D, PCB inspection, logistics applications, food and packaging applications, or robotic pick & place applications.