

Smart sensors

3D sensors provide a raft of advantages for high-speed, high-sensitivity inspection in a range of applications – assessment of tread profiles, tire uniformity, gum strip lamination and more

Automated quality control in the rubber and tire industry (R&T) requires a 3D machine vision solution with specialized features and capabilities. This is because R&T applications involve scanning low-contrast, dark materials with complex geometry at very high speed, something that can only be achieved using robust 3D sensor technology.

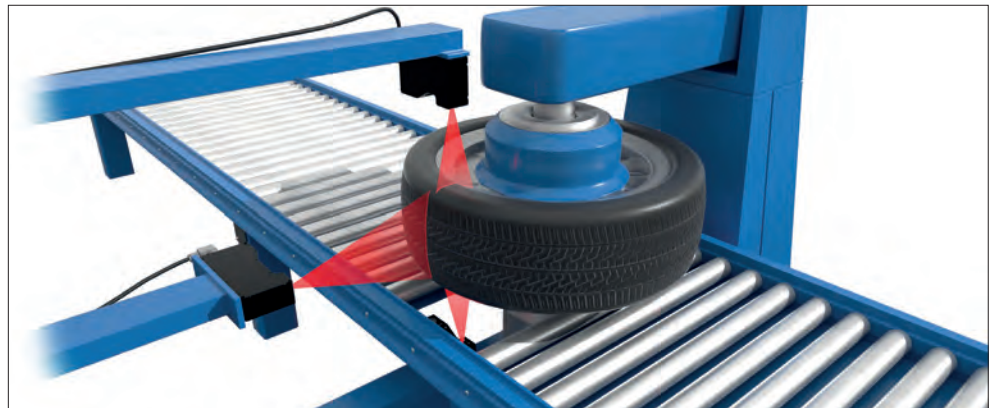
System engineers often turn to 2D machine vision sensors to solve their scanning challenges. Unfortunately 2D on its own cannot provide an adequate solution. One reason is that 2D sensors require complex lighting to see the black-on-black contrast. In some applications the lighting is placed underneath the material (e.g., when measuring the width of a strip), and hot sticking rubber contaminates the lights.

Another disadvantage of 2D sensors is that they can't produce measurements related to object geometry (i.e., 3D shape). As a result they are unable to measure critical features such as object flatness, surface angles or part volumes, and are limited to contrast-based inspection. This makes 2D sensors a poor solution for scanning complex shape-based features on dark surfaces, or for operation in low-light conditions.

In comparison, 3D sensors are contrast invariant and generate high-resolution scans regardless of the material or lighting conditions. They also capture the complete 3D geometry of the scan target, including critical depth measurements on surface features such as grooves in a tire tread.

LMI recently released two new smart sensor models, Gocator 2430 and 2440, to meet this demand for high-speed, high-sensitivity 3D in R&T applications. Both sensors feature the latest optical technology.

A new generation 2MP imager delivers high-resolution profiles at twice



the speed of the popular Gocator 2300 series, making them ideal for any high-speed scanning task including tread/sidewall, rubber extrusion and more. Faster scanning enables users to speed up their inline process and achieve the highest resolutions.

The imager in the Gocator 2430 and 2440 is twice as sensitive, which results in cleaner profiles (i.e., less noise and outliers), and therefore better results on dark targets. Other notable features of the 2430 and 2440 include a large FOV for wider scans and a compact new package with both top and side mounts built-in.

These sensors can be networked (buddied) to scan more of the target so that the user can accomplish more with fewer sensors while capturing fine surface and edge details. The Gocator 2400's measurement range covers larger depth variation and a wider variety of targets.

Gocator 2400 sensors are a smart 3D solution for R&T applications such as tread profiling, tire uniformity, gum strip lamination, tire building drum, rubber unroll, and rubber extrusion profiling. These smart sensors combine

Above: Tire inspection machine

Below (left to right): Inspection with a Gocator 2430; monitoring tire strip lamination with a Gocator 2440; tire tread profile inspection

3D and 2D technology in a single device to provide an effective solution for specialized R&T applications, such as identifying sorting code and DOT codes on tire sidewalls.

The raised or embossed DOT code characters on the tire sidewall are black on black, with effectively zero contrast. This prevents 2D machine vision from capturing the outline or edges of the characters. To solve this zero-contrast problem, 3D sensors generate point cloud data of the embossed characters and render them as a height map. The height map is processed by OCR algorithms common in machine vision libraries to extract the DOT code.

Gocator's built-in user interface presents a fluid and responsive point-and-click experience using any web browser on any computer or operating system. With no additional software to install, Gocator is ready out-of-the-box to set up and measure critical dimensions in R&T applications. **tire**

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