SOFTWARE

Vision Systems Improve Quality, Productivity

Kris Nelson is senior vice president, vision sensors, for Cognex Corp. (Natick, MA), a developer of machine vision systems for manufacturing.

Manufacturing Engineering: How important have vision systems become for today's quality-conscious manufacturers?

Kris Nelson: If you look at why people use vision today, everyone is driving towards a zero tolerance for defects. Most people are finding they just can't get there with human inspection or traditional sampling techniques. Machine vision does a couple of things. It improves the yield and it improves productivity. Today, a lot of people use machine vision as a sensor to find a part, take a measurement, and make an inspection while the product is being manufactured. If the process goes astray, vision sensors can provide feedback to adjust the upstream process in order to avoid defects downstream. Traditionally, vision systems were primarily used at the end of the line to weed out the defects and prevent shipment of defective products. As people have gotten smarter about how to use vision, they've used it more as an intelligent sensor, as part of a closed-loop control to make adjustments in the line. Using vision in this way allows manufacturers to adjust the process before defects occur. The reason we're able to do this today is that machine vision is a lot less expensive than it was in the past, and it's a lot easier to use. You don't need to go out and hire an expert in C++ or Visual Basic or machine vision to install an In-Sight or a DVT vision sensor today.

PASSWORD

"If you look at why people use vision today, **everyone is driving towards a zero tolerance for defects.**"

Kris Nelson

ME: How can current vision system software programs help boost productivity and product quality?

Nelson: Software programs are now more intuitive to users because of their Microsoft look-and-feel. It's easier to learn how to use them. Because the DSPs that run vision systems are so powerful, software engineers are able to put in very robust and intuitive algorithms that in the past you could only run on expensive PC-based systems. What that means for customers is that they now get a robust algorithm that's going to work easily on the line without investing a ton of time in lighting, fixturing, and all the things that were necessary in the past when the algorithms really weren't as robust. As an example, In-Sight vision sensors now run PatMax, the most accurate and reliable object and feature location software from Cognex, so customers spend less time and less money on fixturing and lighting the part than in the past. More importantly, PatMax is so robust that users don't have to spend a lot of time tweaking the image with filtering and pre-preprocessing to enhance the features of interest to make the algorithm work.

ME: What are some key capabilities of newer, easier-to-use vision system software?

Nelson: It's important that vision software support the latest communi-

cation standards, to enhance connectivity by providing relatively easy ways to hook systems up to an Ethernet network. We've added many new capabilities in this area. With PC-type interfaces, now it's easy to move the data from a vision system over to a standard HMI or a PLC, and to your data management system. Today, customers don't have to use Visual Basic to build their own interface, they can use a standard HMI and use OPC to move the data over.

ME: How does OPC help vision system suppliers offer improved manufacturing process capabilities to customers?

Nelson: The leading-edge vision system suppliers see OPC as an excellent vehicle to move the tremendous amounts of data that vision sensors generate about a process to a host system. Whether it's a yield number, a location, a measurement, or a part serial number, data is most useful when it can be shared and used. As we become more mature suppliers to the automation industry, we realize which standards we need to support to help customers move data around, so we support OPC to deliver the tools customers need to more readily integrate vision into their factory automation systems.

"As people have gotten smarter about how to use vision, they've used it more as an intelligent sensor, as part of a closed-loop control to make adjustments in the line."

ME: What do new ActiveX display controls offer manufacturers deploying vision systems?

Nelson: Many of today's most efficient production lines incorporate a standard HMI or SCADA package. In addition to moving data around with OPC, the machine operator might like to look at the image of the part that's being inspected to be sure the vision sensor is acquiring new images as it should be. We also have an extensive amount of graphics that we can put on top of these images that indicate the features being measured and

what's out of tolerance that they might want to display. ActiveX takes the image, the operator interface buttons, and graphics such as pass-fail indicators, and allows customers to view them within standard HMI packages, such as Intellution or Wonderware, that are already on the production line, or is being newly implemented on the line to work with the PLCs and the other sensors. The overarching message is that it has become much more efficient for users these days to integrate vision sensors into their manufacturing process compared to what would have been required even just a couple of years ago. Again, it's aided by the semiconductor world giving us faster chips on which to run this software.

ME: How have manufacturers in the automotive industry implemented the latest vision systems technology?

Nelson: If you look at automotive industry applications for vision sensors, there are probably three or four rapidly emerging ones that we see quite a bit. One is error-proofing, which is to make sure that the right parts are processed in the right order at the right time. Vision for error-proofing may include simple inspection and assembly verification, precision gaging or measurement of parts and assemblies, and industrial identification for part traceability programs. Error-proofing is a big thing in the automotive industry because as more products are being manufactured on a given production line, manufacturers need a way to ensure the right piston is going into the right engine, or that the right mirrors, hubs, tires, and bumpers are attached to a given chassis.

ME: What other areas in automotive does vision help?

Nelson: The next one we see is an ID-related task, called traceability. If they look at a transmission, for example, manufacturers want to understand what parts, and the history and the origin of every part, that are in that transmission. Typically they'll mark a Data Matrix code directly on the metal using dot-peen, laser, or electrochemical etching. Because the code is not printed on a label, it's very difficult to read and can't be read that with a laser-based ID scanner. That's

a machine-vision task that is rapidly expanding in the automotive industry, with many automotive plants using vision sensors to read these Data Matrix codes and then feed the data into a high-level data-management system that allows tracking not only inventory but, most importantly, allows tracking which parts go into a given transmission.

A third item is that auto parts suppliers, to meet the quality levels that have been pushed on them by the automotive manufacturers, really can't rely on human inspection or traditional sampling techniques any longer. Parts suppliers either realize this on their own, or they make a bad shipment, are under containment, and automakers request that they use machine vision to do inspection. The last rapidly expanding area for machine vision is robotics. Because there is so much robotics going on in the automotive space, using vision can minimize a very heavy investment that they have to make in fixturing for 'blind' robots. If a robot can see with machine vision, manufacturers don't have to fixture a part exactly to be able to add a bolt to the assembly. It is important for vision in 2-D vision-guided robotic applications to be inexpensive and relatively easy to integrate.

ME: How is vision being deployed in aerospace and medical?

Nelson: In aerospace, the traceability issue is the predominant one today, because this industry doesn't manufacture at the high volumes found in the automotive industry. There are error-proofing applications as well, where, for example, vision could be used to ensure that rivets are properly installed in an airplane wing. In the medical industry, traceability, again, is the major issue.■