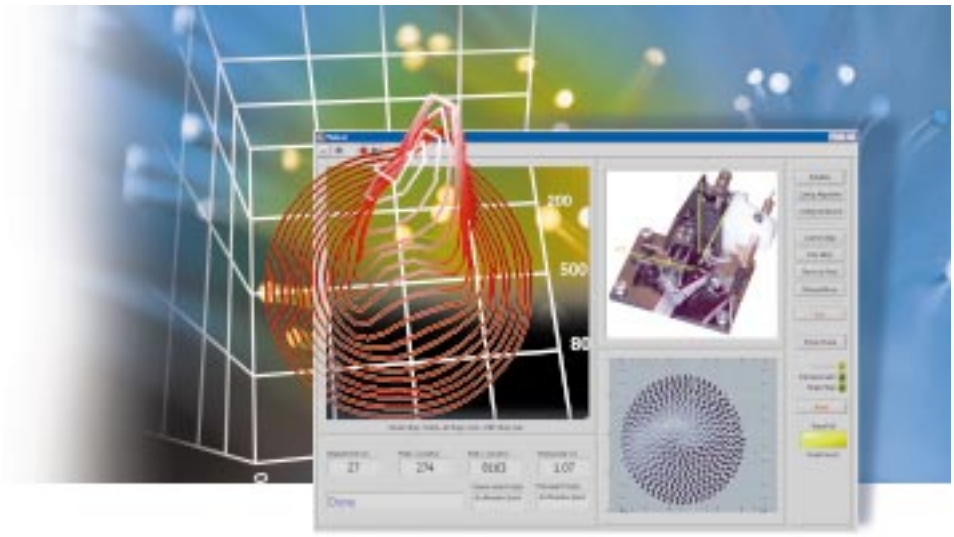
Integrating Precision Alignment Systems with LabVIEW

by Kerry Quinn, Principal, PE, SES Technology Integration Group

The Challenge: **Automating the traditional manual processes of fiber optics and optoelectronics alignment systems using a cost-effective, open systems approach.**

The Solution: **Using our expertise in software development for data acquisition, machine control, and computer vision, we create high-performance, precision alignment and assembly systems using LabVIEW graphical programming.**



By using integrated technologies, such as vision and motion, companies can make their automated manufacturing processes more effective.

Several significant challenges face optical device companies during device development and subsequent transition of these devices into manufacturing. Because of the small size and precise tolerances imposed by most of these devices, manufacturers usually need one or more precision alignment systems for the manufacture and sometimes evaluation of the manufactured components.

The SES Technology Integration Group, a National Instruments Select Integrator, recognizes the issues associated with automating the manufacturing process, as well as the advantages of having an open systems approach.

Integrated precision alignment systems using the National Instruments LabVIEW platform offer unmatched flexibility, capability, reliability, and are easily integrated into the production environment.

Gain Flexibility with Open Architecture and LabVIEW

With the various elements in a vision system – from inspection, to motion, to capturing other types of data – integration becomes a critical task. One challenge facing developers of commercial precision alignment systems is integrating these systems in a manufacturing environment. Unfortunately, most of these systems have not met that challenge and sit as “islands," unable to communicate with one another or with associated devices on the manufacturing floor.

One tool we use in creating our open systems is the LabVIEW graphical development environment. LabVIEW is one of the most widely used commercial packages that integrates seamlessly with data acquisition, machine/motion control, and computer vision. It is a logical platform for developing open architecture, high-performance, and optical device assembly systems. In a recent example, SES used LabVIEW to control a legacy nano-positioning stage using RS-232 commands. When the nanopositioning stage proved insufficient for the job at hand, it was relatively simple to remove it from the system and replace it with stages using brushless servo motors. These motors receive step and direction commands from National Instruments powerful universal motion interface (UMI) technology.

The UMI-7764, in combination with a NI high-performance motion controller, has proven useful to integrators of LabVIEW-based precision alignment systems in an interesting way because integrators can use it to drastically shorten system delivery/lead times and downtimes. The UMI-7764 makes it easy to switch one vendor’s servo and/or stepper-based drives with another, so we can respond to slipping deliveries and even to field retrofit/replace a failed motor from one vendor with a similar motor from the same or another vendor.

LabVIEW systems can also mix and match motor types and drive technologies on an axis-by-axis basis. A single alignment system can easily control servo motors on some axes, RS-232 “smart motors" for pick-and-place, piezo stacks for final positioning, and more.

System Designed for a Manufacturing Environment

When designing an optoelectronics system for a manufacturing environment, the system should incorporate specialized design features, such as high levels of forced convection cooling and vibration-toughened connections and construction. Rugged plug-in boards based on the PXI standard have a long, proven track record of reliability. In addition to the highly specialized backplane trigger and other data handling features, these systems incorporate specialized industrial design features, high levels of forced convection cooling, and vibration-toughened connections and construction.

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A system using the PXI standard is also very expandable, permitting a single PC controller to control and communicate with more than 200 plug-in boards. Expandability ensures your investment in hardware has an extended, serviceable life.

Today's standards also require communication with remote facilities. LabVIEW applications are "Internet-aware." These features range from simply sending e-mail messages to a supervisor or text pager with status information, to hosting active two-way Web pages created by LabVIEW that show up-to-date alignment statistics and historical trends, and even performing remote control of the application via the Web browser from anywhere in the world.

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For more information, contact Kerry Quinn at SES, tel (800) 935-8468, or visit the Web site at sestechnologyintegration.com

For more information on alignment and a common configuration using NI products, visit ni.com/info and enter exdyea.

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