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Vision Systems Design

OEM development platform bundles motion and vision

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Applications such as screen printing, chip bonding, LCD glass bonding, and PCB drilling require systems that can precisely align both fixtures and tools or parts in two dimensions. In addressing these applications, system integrators need to seamlessly integrate both motion-control and vision-based systems using off-the-shelf components such as x-y tables, motor controllers, cameras, and frame grabbers. With the plethora of products currently available, developing such systems can be time-consuming.

Innovation Matrix (Los Altos, CA, USA; www.innovation-matrix.com) has developed an integrated aligner software platform that combines motion and vision, controlled using a single Windows-based application programming interface (API). "In the design of the aligner platform," says Eimei Onaga, president of Innovation Matrix and former director of Pacific Rim business for Adept Technology (Livermore, CA, USA; www.adept.com), "we recognized that an opportunity existed to supply an OEM subsystem that could be rapidly deployed by system integrators."

Onaga is targeting both the US and Asian markets with the system. "Although the cost of assembly for commodity items is lower in Asia," he says, "the need to develop high-precision products both here and overseas still demands automated manufacturing systems. While companies understand their particular application, many require subsystems that will allow precision alignment to be rapidly deployed."



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Innovation Matrix alignment platform offers OEMs a fast way to deploy integrated vision and motion systems. At present, the system is offered in both a PC-based version and as an integrated Ethernet-based control system.

Innovation Matrix has used off-the-shelf components in the design of its alignment platform.

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While the system can be supplied in a number of configurations, the company demonstrated its first product at the May 2005 Vision Show West (San Jose, CA, USA). Based on an x-y-theta three-axis alignment stage from Micro Motion Technology (InCheon, Korea; www.micromt.com), the 300 x 300-mm table features a travel range of ± 5 mm in both x and y directions and $\pm 2.5^\circ$ motion in theta. To drive the three axes of the stage, three 2-phase stepper motors are interfaced to amplifier drivers that are, in turn, controlled by a GT-400 PCI-based motion control card from Googol Technology (Hong Kong, China; www.googoltech.com).

"With an on-board DSP and FPGA," says Onaga, "the card can be programmed to perform point-to-point, linear and circular interpolated motion." To perform alignment of parts mounted on the x-y table, the system must first capture at least two reference images from objects placed on the x-y table. The company uses three vertically mounted CCD cameras from Toshiba Teli (Irvine, CA, USA; www.toshiba-teli.co.jp) interfaced to a VD-878 PCI bus image-acquisition card from Vision Dragon (Shenzhen, China; www.visiondragon.com).

"To locate the fiducials on parts mounted on the stage to subpixel accuracy," says Onaga, "captured images are processed by Adept HexSight object-location software." With multimodel and multiscale capability, this software simultaneously locates and finds multiple locations on each part.

"Because the HexSight tools are available as dynamic C++ libraries (DLLs), they can be integrated into the system's API using an ActiveX or a DLL C++ layer." Once these objects are located, position information can be transferred to the Googol motion-controller software to precisely align the object on the x-y stage.

By using a single API to control both motion and vision functions, the aligner system offers a faster, integrated approach to vision-based alignment applications. The company plans a number of these systems that will offer the developer greater choices of x-y tables and motion-control solutions.

"In many systems," says Onaga, "the integrator may not require a PC-based solution." For such applications, the company will work with Precise Automation (Los Altos, CA, USA; www.preciseautomation.com) to integrate its Guidance 3400 Controller into the alignment system. "Because the Guidance 3000 series of motion/vision controllers integrates motion control, drives, IO, network communications, and machine vision, it can effectively replace the PC." And, because the controller is based on Ethernet, multiple controllers can be networked to control up to 32 axes.

Innovation Matrix will serve as US distributor for Micro Motion Technology, Googol Technology, and Vision Dragon and Asian distributor for Adept and Precise Automation. "This way," says Onaga, "we can offer US OEMs both single-point products and integrated motion/vision solutions, while supplying Asian companies with system-integration experience.

Vision Systems Design July, 2005

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