Can You Imagine . . .

. . . an optical processor that is at home on the factory floor and in the cell biology laboratory.

SMD'S HIGH-SPEED CCD-BASED CAMERA WON THE SBIR TECHNOLOGY OF THE YEAR AWARD AT THE 1995 NASA TECHNOLOGY 2005 CONFERENCE.

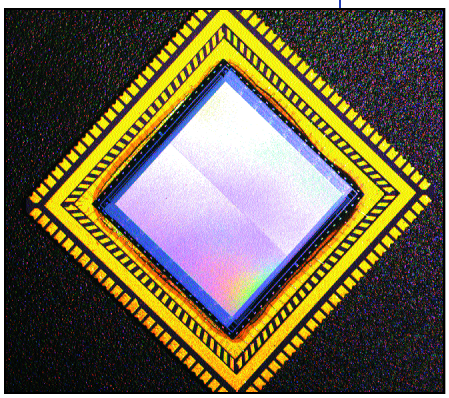
OPTICAL PROCESSOR LOOKS FOR PACKAGING FLAWS

A large food-processing company can suffer hundreds of thousands of dollars in losses each week, owing to such packaging problems as smudged ink on labels and unreadable price codes. Better inspection technology can identify a problem early in the production stage to prevent large batch losses, saving both money and time.

Silicon Mountain Design, Inc. (SMD; Colorado Springs, CO), designed an optical processor that can image products on the assembly line and determine package integrity. The company is working with Teledyne, Inc., to integrate this technology into an optical computing system for industrial inspection. This system can identify faulty packaging, enabling inspectors to remove defective products from the assembly line.

The technology grew from a BMDO-funded SBIR contract for rapid target recognition and missile detection. SMD's optical processor consists of a camera based on a charge-coupled device (CCD) and a spatial light modulator located on the same chip. This arrangement eliminates a data bottleneck and helps acquire images rapidly. For example, the optical processor can image products in various stages of completion and identify such manufacturing parameters as package integrity and visual appeal.

The optical processor can also be used for medical imaging in combination with computer-aided diagnosis. Historically, human inspection of Pap smears posted false negative results up to 30 percent of the time. SMD's technology can screen a microscope slide and identify the most atypical cells, saving technicians time and quickly routing suspicious slides to an experienced pathologist. This technology can also be used to examine radiographic images or to analyze live fluoroscopic images. SMD projects a prototype within a year.



■ SMD's optical processor, pictured above, consists of a CCD-based camera and a spatial light modulator located on the same chip.

The company is also working with the University of Colorado (Colorado Springs) to develop a solid-state miniaturized imager with a disposable imaging head. This device will give doctors a better view during endoscopic procedures, such as examining patients for esophageal cancer or performing surgery inside the body.

NASA singled out SMD for excellence at the October 1995 NASA Technology 2005 conference, held in Chicago, Illinois. The company received the SBIR Technology of the Year Award for its high-speed CCD-based camera, used for analyzing kinetic weapons and the flight dynamics of missiles.

ABOUT THE TECHNOLOGY

For pattern recognition, the two principal functions are digital image acquisition and image comparison. The first function can be performed by a pixel array detector or a digitizer. A hardware solution for the second function, a spatial light modulator (SLM), can produce a pixel-by-pixel comparison image from two digital inputs.

Parallel process architectures speed both image-processing steps dramatically. Under these conditions, however, the serial data transfer step between the detector and the SLM becomes a bottleneck. SMD used a combination of micromachining technology and ultrathin wafer processing to put a CCD and the SLM on the same chip. The resulting high-speed optical processor performs real-time screening or enhancement of any digital image database.