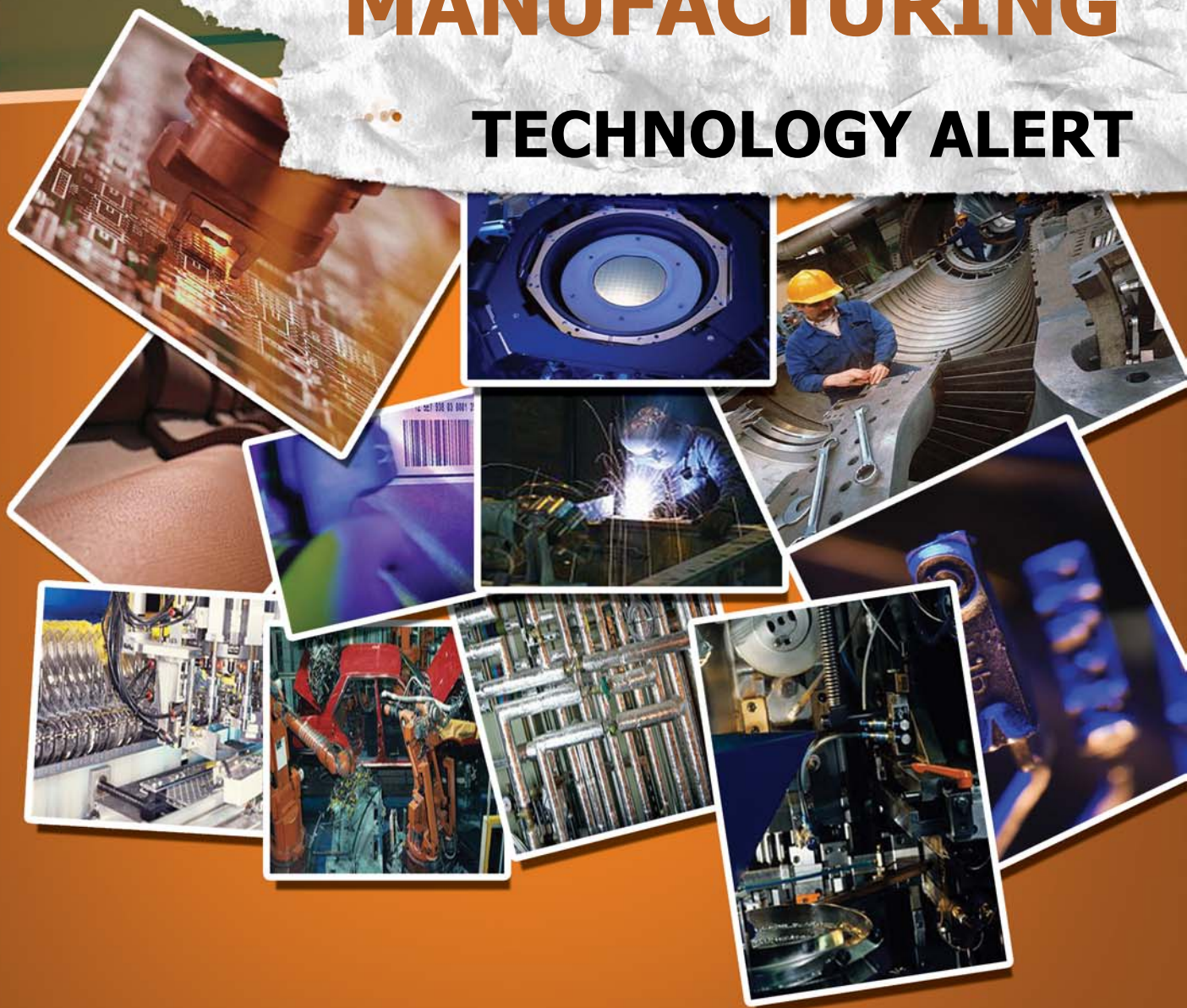


TECHNICAL INSIGHTS

ADVANCED MANUFACTURING

TECHNOLOGY ALERT



NOVEL TECHNOLOGY FOR REAL-TIME 3D OBJECT TRACKING

Using cameras for different scene-capture tasks, such as reverse engineering or obstacle detection, has been excessively investigated in recent years. One of the fields where such imaging is also applied is three-dimensional (3D) tracking and position measurement of a remote object.

"Today in many industrial environments, this kind of technology is often not available or prohibitively expensive," says Veljko Milanovic, CEO, of US-based Mirrorcle Technologies Inc. Mirrorcle Technologies is a small, private-held company, founded in 2005; it provides products and services based on its proprietary optical MEMS (micro-electro-mechanical system) technology. One of the key applications of this technology is object tracking. In current object-tracking solutions, it may be necessary to rely on robot-motor accuracy or direct measurements of limited set of points, supported with advanced calibration procedures. The technologies utilize imaging methods with multiple cameras and image processing. Camera-based solutions offer precision in the order of millimeter,s and it becomes costly, when it comes to real-time or close to real-time operation. Milanovic says, "Our solution provides the ability to track the 3D position co-ordinates of an object with low-cost optical technology".

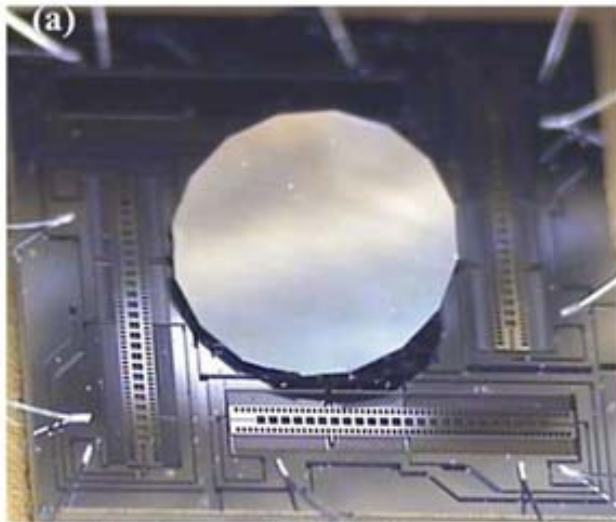


Figure 1 depicts the gimbal-less two-axis MEMS mirror used in the object-tracking system.

Picture Credit: Mirrorcle Technologies, Inc.

"Similar to the way human eyes track objects and judge distance, our technology uses two optical detectors and two steering mirrors," explains Milanovic. The new system uses MEMS mirrors, lasers, optics, and optical sensors. "The mirrors are made of single-crystal silicon, which is the best elastic material for mechanical applications at small dimensions, resulting in exceptionally good repeatability and long-term reliability," adds Milanovic. The MEMS mirrors also include Mirrorcle's proprietary gimbal-less design that allows fast and equal in speed operation of both scanning axes. As a result, the new system offers the capability of very precise, fast tracking, and position measurement of an object. The mirror movement allows the photo-detectors to track the direction and movement of the object. "Based on the tilt position of two MEMS mirrors that are tracking an object, we can quickly calculate the distance and complete 3D coordinates of that object with respect to those mirrors," says Milanovic. This measurement can be performed 20,000 times in a second at submillimeter resolution. The system enables real-time interaction with computers, robots, and other machineries. As a MEMS-based solution, it features small size, low-power consumption, and allows battery-powered mobile version. "Our first focus market is industrial automation," says Milanovic.

The industrial applications include precise 3D tracking of objects and control and positioning of robots and vehicles during manufacturing processes. This solution would be of interest to producers of machines, robotic systems used in factories, and so on. Besides the manufacturing floor, the technology could not only be applied for human-machine interfacing, such as in gaming, but also in education, logistics, remote medicine, and military sectors.

Mirrorcle Technologies received a 'Small Business Innovation Research Phase' one grant for a project entitled, "Real-time 3D Tracking and Position Measurement System Using Scanning MEMS Mirrors." The company is open for collaboration discussions with manufacturing automation companies, gaming motion detection firms, and others. MirrorcleTech would also be potentially interested in venture capital investment to finalize the technology development and realize mass production in a shorter time-frame. The company also offers licensing possibilities of its 3D tracking and measurement systems to customers who would utilize their MEMS mirrors in their products.

The company's technology is protected with several patents, such as-- MEMS device control with filtered voltage signal shaping (US Patent no.

7,428,353), or Gimbal-less micro-electro-mechanical-system tip-tilt and tip-tilt-piston actuators and a method for forming the same (US Patent no. 7,295,726).

Analyst Insights

Science fiction movies or books often show futuristic technologies that come true in one, two, or more decades. In the technology foreground of the "Avatar" movie is, perhaps, the ability to control virtual beings with a human mind. Nevertheless, many examples of advanced robotics were also included. One of those that rivets attention was the ability to wirelessly control a huge robotic machine with human movement. High-speed image capture, super high-speed data processing, then backlash-free motors and mechanics are some of solutions initially coming to mind. Looking at the MEMS-based object tracking technology, one could see that we are coming closer to the reality of such a direct robot control. Nevertheless, no image capture technology is used here. The latest 3D scene capture developments show a trend toward finding new ways of data acquisition; scene data gets preselected or preprocessed, so that only very limited number of bits enters data processors for further processing and decision making. The MEMS-based solution from Mirrorcle Technologies is a significant indicator of the trend.

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