

**PRESS RELEASE**

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**Mirrorcle Technologies exhibits at SPIE Photonics West 2020**

Mirrorcle Technologies [www.mirrorcletech.com](http://www.mirrorcletech.com), a Silicon Valley manufacturer of MEMS-based optical beam-steering products and system solutions, is attending Photonics West, the #1 laser, photonics, biomedical optics conference with 23,000 attendees, 4,900 R&D presentations and more. The company continues to present a variety of the world's best MEMS-mirror based beam steering solutions for OEM developers of medical, industrial, and other systems. In addition, Mirrorcle's booth #3018 will showcase the company's new MEMS Mirror based mid-range 3D LiDAR system, SyMPL. On display will also be Mirrorcle's compact full color vector graphics laser projection (VGLP) system, RGB Playzer and a 3D Scanning Metrology (3DSM) demonstrator which yields 3D point-cloud information by combining high-resolution laser scans with a fast frame-rate USB 3.0 camera.

"We are excited about the opportunity to present our latest system-level solutions here at Photonics West," said Mirrorcle's CEO, Dr. Milanovic. "Our presence confirms a strong commitment to this industry and we are excited to demonstrate the latest customer-driven system solutions powered by Mirrorcle's silicon-based MEMS mirror technology. We appreciate the support and trust that our customers place in our technologies and believe it will further aid us by tapping into rapidly growing market segments, such as the fast-growing field of industrial robotics for which our SyMPL 3D LiDAR system is specifically designed." When asked whether the community of optical system solutions developers and academics need to have any concerns regarding the company's addition of own system solutions into the market, its VP of Global Sales Mr. Jeff Davis explains: "We understand we have earned the reputation over the past 15 years for being a unique company that provides accessible solutions to universities, hobby, defense and significant industrial products. This remains our paramount priority and we are only adding more to the offering."



*Figure 1. At Photonics West 2020, Mirrorcle continues to offer MEMS Mirror Modules and subsystems, and adds System solutions for 3D Perception Sensing (SyMPL 3D LiDAR) and Visual Messaging (RGB Playzer).*

## Mirrorcle's Technical Team presented overview of MEMS LiDAR technologies at SPIE OPTO Conference

The company's commitment to the photonics technical community both academically and commercially was reconfirmed again in the technical conference sessions that accompany the biggest photonics event in the world. Namely, Mirrorcle's team of experienced R&D engineers joined the technical conference program with their presentation "Comparison of MEMS mirror LiDAR Architectures" on February 1<sup>st</sup>, 2020 at the MOEMS and Miniaturized Systems XIX Conference 11293. Mirrorcle co-sponsored this conference as in the previous years by providing its best paper awards and Dr. Veljko Milanovic chaired the LiDAR session which drew an expectedly large and engaging audience.

After his well-received talk, Mr. Kasturi thanked collaborators from Beamagine, ARL, NASA GSFC, Carl Zeiss AG, and Hangzhou OLE Systems for providing materials for the paper and presentation which described their approaches and architectures and finally focused on Mirrorcle's own solution with Synchronized MEMS Pair LiDAR (SyMPL).



Figure 2. Mirrorcle's Abhishek Kasturi enjoys discussions with collaborator from Carl Zeiss AG Dr. Stefan Richter, following his presentation on MEMS Mirror LiDAR architectures at the SPIE OPTO conference.

## Mirrorcle SyMPL 3D LiDAR System

The Mirrorcle team presents its new SyMPL 3D LiDAR system in a live and interactive demo. Compact and lightweight, this plug-and-play solution offers programmable scanning of time-of-flight (ToF) distance measuring beams which yield 3D point-cloud perception sensing data. It may be deployed in a variety of client applications in robotics, UAVs and other industrial use cases. The system works with a low-cost 905nm-based ToF solution and is capable of sensing objects of varied materials and reflectance out to distances of ~30m with 1cm distance resolution.

Users can easily control scanning over more than 10,000x10,000 discrete angles (in two axes), allowing fast and versatile scans across the full field of regard, enabling full control of aspect ratio, scan speeds, scan rotations, and distance ranges. Based on Mirrorcle's patented dual-axis solid-state MEMS mirrors, the SyMPL system's point cloud data is streamed to a display where both a top-down view as well as a color-coded (based on the distance data of each voxel) '3D-image' of the live action in front of the booth is shown. "This solid-state LiDAR system is a plug-and-play solution that we offer with fully integrated hardware and software applications," said Sr. Electronics Engineer, Abhishek Kasturi. "The

system includes mirrors capable of extremely repeatable 2D scans with hundreds of lines per second, and this high repeatable accuracy enables our Synchronized MEMS Pair LiDAR SyMPL architecture." Mirrorcle Software Suite SDKs are available for full programmability and product customization as needed. This product mainly targets Robot Vision and similar low-mid range LiDAR applications, including AMR, AGV and drones.

## **Mirrorcle RGB Playzer**

Also on display are Mirrorcle's Vector Graphics Laser Projection (VGLP) systems – specifically the RGB Playzer featuring red, green and blue light sources. This architecture utilizes the company's fast point-to-point beam steering capabilities in combination with visible lasers to display vector graphics content tailored to convey information and/or to entertain viewers.

Mirrorcle's solutions generally employ the complete system-level stack of optical and electronics hardware, firmware, and software. In this case, the proprietary and flexible solution begins at the application software layer where customers can input content in a variety of ways, from images, files, laser-show (ILDA) files, touchscreens etc. Content is processed in the API layers and provided to MEMS and Laser Controller hardware which has been developed for over a decade at Mirrorcle for automotive, biomedical and other customers. Finally, the latest and fastest gimbal-less point-to-point MEMS mirrors do the magic of tracing out the content in bright laser beams so fast and so repeatably that the viewer perceives only the high contrast flicker-less images. The Playzer is known to achieve about 100X higher levels of brightness and contrast compared to other display technologies such as a standard video pico-projectors making it suitable for outdoor use, e.g. in automotive display and many other applications.

The first version of the RGB Playzer was demonstrated at CES 2019 and was received with interest from automotive and other visitors. The new Playzer announced at CES 2020 is based on free-space coupled sources which are typically found in pico-projectors, and has much greater optical power capability, beam quality, and compactness.

"We offer the Playzer systems as part of a development kit for evaluation by anyone interested in launching products based on this OEM subsystem," said Dr. Milanovic, "These kits provide a ready-to-use, simple and playful environments for displaying and evaluating laser applications. Modules include either single-wavelength laser sources or an RGB laser unit enabling full-color projection." The target markets for Playzer include industrial, advertising, heads-up displays (HUD), automotive digital signage and entertainment.

## **3D Scanning and Metrology Demo**

The 3D Scanning and Metrology Demo 3DSM is designed to demonstrate the capabilities of Mirrorcle's MEMS mirror and controller with simple Windows based applications to provide Programmable Illumination for 3D Scanning applications. Conventional 3D scanning and metrology tools use a line laser and camera mounted on a stand, and a movable stage for target illumination. The 3DSM is available as a demonstrator kit ("DEMO-06") and contains a MEMS mirror scan module that can be programmed to perform line scans with variable line time, density and orientation to image and capture any 3D shape into a point cloud. Users may programmatically steer a laser over a field of regard of  $\sim 32^\circ \times 32^\circ$  and more. The software uses API integrated from Basler's Pylon platform to capture frame by frame images

to extrapolate the 3D point cloud data. "With the extremely repeatable and reliable 2D scanning that our MEMS technologies enable, 3D information can be retrieved following a number of different strategies," Dr. Milanovic said. "One can combine our scanners with e.g. a ToF subsystem as we demonstrate in our LiDAR solutions, or with a conventional 2D camera which allows for the generation of 3D point clouds by triangulating the predictable pixel-per-pixel illumination by calculations based on the known distance between illuminating laser scanner and camera." The 3DSM targets applications that require 3D datasets, e.g. industrial process control and quality assurance, as well as e.g. reverse engineering or other tasks where objects might be recreated with 3D printers.

### **About Mirrorcle Technologies, Inc.**

Mirrorcle Technologies, Inc., founded in 2005, is a private corporation that commercially provides products and laser systems based on its proprietary optical microelectromechanical system (MEMS) technology. Since its founding, and supported by its continuous investment in R&D, the company has been offering the world's fastest point-to-point (quasi-static) two-axis beam-steering MEMS Mirrors, as well as resonant-type micromirror devices with video rates. Mirrorcle is globally the only provider of tip-tilt MEMS actuators in combination with mirrors from submillimeter to several mm in diameter, offering customers a wide selection of specifications to optimize their paths to successful commercialization. Mirrorcle products can be found today in 3D metrology systems, biomedical imaging systems, solid-state LiDARs, AR/VR prototypes, laser projectors, and classrooms. Mirrorcle's system solutions include the world's most compact vector graphics laser projectors and 3D LiDARs.

Mirrorcle maintains multiple cleanroom laboratories at its Richmond, California headquarters, and year-round, 24-7 access to a wafer-based CMOS and MEMS fabrication facility. Beyond its own facilities, the company has established high-volume manufacturing with leading MEMS wafer foundries and qualified opto-mechanical assembly houses.

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