



METROLOGY

3D SCANNING AND PHOTOGRAMMETRY

Structured blue-light scanning uses a projector to cast lines onto a surface. As these lines move across an object, a pair of stereoscopic cameras are used to capture the curvature of these lines which correlates to a change in surface profile. Each scan takes a matter of seconds and can capture upwards of 5 million data points per scan.

Optical 3D scanning provides millions of data points across surfaces of varying complexity in mere seconds. Items that can be scanned with this high fidelity system range from the size of a small screw or dime to larger projects such as a plane, ship, or space vehicle. Photogrammetry provides a collection of individual data points on a surface by using photography. These data points can be used to create and measure elements such as points, planes, cylinders, cones, surfaces, etc.

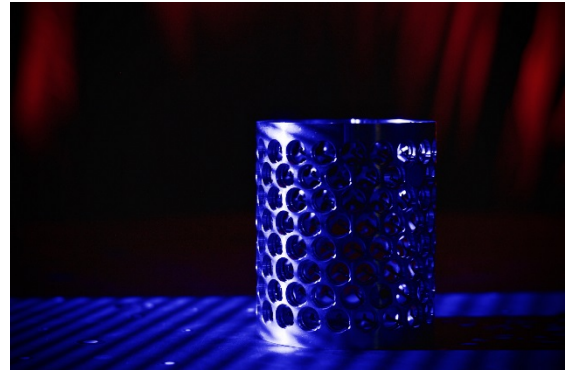
Photogrammetry coupled with 3D scanning enables dense data collection at high accuracy over large projects. This includes objects such as vehicles, aircraft, and water vessels.

DEVELOPING CAPABILITIES

High-Speed Dynamic Measurement - by using two high speed cameras, the system is able to track real-time, dynamic measurement of an object. This capability provides dynamic stress and strain analysis, modal analysis, and other dynamic measurements without mounting traditional and potentially problematic sensors.

Process Automation - optical 3D scanning processes have the ability to be automated. Incorporating robotics into the existing scanning capability enables more efficient and timely operations with adaptive manufacturing and for quality control of large batches of parts. This has been proven and is currently seeking customer support for implementation.

The U.S. Army Combat Capabilities Development Command Aviation & Missile Center metrology team can enhance and improve machining operations by implementing quality control during the machining process - adaptive manufacturing. Metrology can solve problems with Army efficiencies such as paying for design tolerances that are not being met or not even needed. 3D metrology also helps avoid spending large amounts of money on



unnecessary requirements for both modern and traditional machining and fabrication. Metrology can find defects in parts before they fail, reduce the number of failed parts, and guide CNC operations to achieve critical design tolerances. These manufacturing discoveries have been applied to injection molding, CNC lathe and mill operations, casting and forging, sheet metal fabrication, additive manufacturing (3D printing), and more. This work in manufacturing has led to breakthroughs in enabling CNC operations for impossible to machine materials.

OUTLOOK FOR THE FUTURE

Optical 3D scanning processes have the ability to be automated. Incorporating robotics into the existing scanning capability enables more efficient and timely operations. The Metrology Team has implemented robotics into some facilities on Redstone Arsenal, Alabama, and is exploring the possibility of implementing these automated operations at facilities such as maintenance depots, rapid response facilities, R&D labs, and production lines.

FOR FURTHER INFORMATION:

U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT
COMMAND AVIATION & MISSILE CENTER:

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