3D LASER SCANNING 101

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Over the last several years, 3D laser scanning technology has taken off and has become a more prominent tool in the Architecture, Engineering, Construction (AEC) industry, as well as many other industries. Laser scanning is also known as “reality capture” or “high-definition surveying” (HDS). In short, 3D laser scanning is a high-tech process that digitally captures the shape of objects within the scanner’s line of site using laser beams. To break it down more, we take a look at a little history and some of the basics.

WHERE DID IT START?

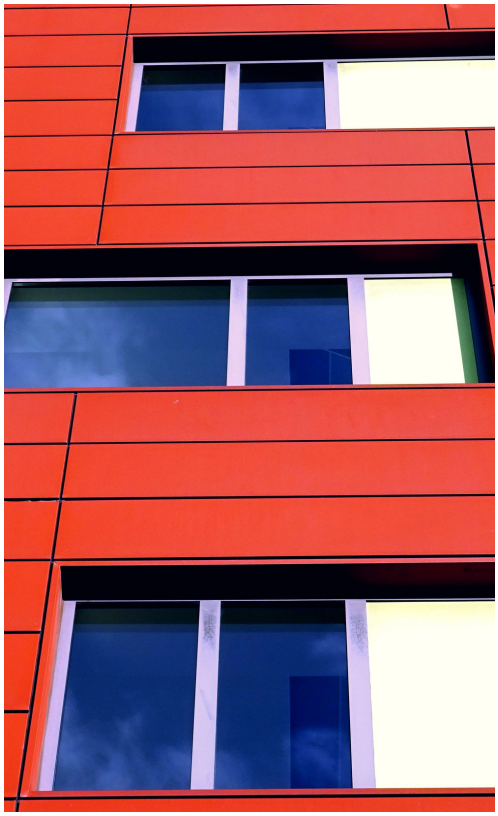
Even though it's fairly new to the AEC industry, laser technology is not a new concept. The theory has been around for over 100 years, stemming from Albert Einstein, but the first practical lasers weren't invented until the 1960's.

From that time point, the technology developed into a variety of laser types and uses – bar code scanners, telecommunications, medical devices, weaponry. For a more detailed history, check out this article from Interesting Engineering. Laser technology for AEC has had a slower ramp up than the other uses but has now quickly become a reliable technology and a standard in the industry.

HOW DOES IT WORK?

While there are many types of 3D laser scanners with different ranges, features and capabilities, they generally work off the same basic principles. The scanner emits a non-visible laser beam while it rotates. While the scanner is rotating, an oscillating mirror also spins, moving the laser beam up and down. When the laser beam bounces off a physical object and returns to the scanner, it is sensed, measured and recorded. The 3D laser scanner calculates an X, Y, and Z coordinate for each measured point. The resulting scan is millions of combined 3D points, referred to as the “point cloud.”

To capture an entire site or to work around obstructions, the 3D laser scanner is physically moved to a different vantage point for each scan area. Then, the individual point clouds are stitched together, or “registered,” to create a reality capture, digital 3D representation of the site.



THEN WHAT?

Once the registered point cloud is in the office, various software applications can be used to pull information from the point cloud to create a deliverable, with super high efficiency and accuracy. Creativity is key as products can range from simple to complex. The options are almost unlimited as to what can be created with a 3D laser scan. With so much information captured in the point cloud, a deliverable can be fine-tuned to provide exactly what a client needs. The following are a few examples when it comes to design.

2D BUILDING PLANS

Laser scanning captures a very high level of detail and can be used to create an as-built or record drawing for owners and facility managers. Ultimately, this can be used for records on file, building renovations and operations.

ARCHITECTURAL ELEVATIONS

Building elevations have many uses, from providing a visual representation, to design, to jurisdictional permitting. Producing a detailed architectural elevation to illustrate a building façade is a straightforward process with a 3D point cloud.

PRECISE POINT TO POINT MEASUREMENTS, SECTIONS, PROFILES AND VOLUMETRICS

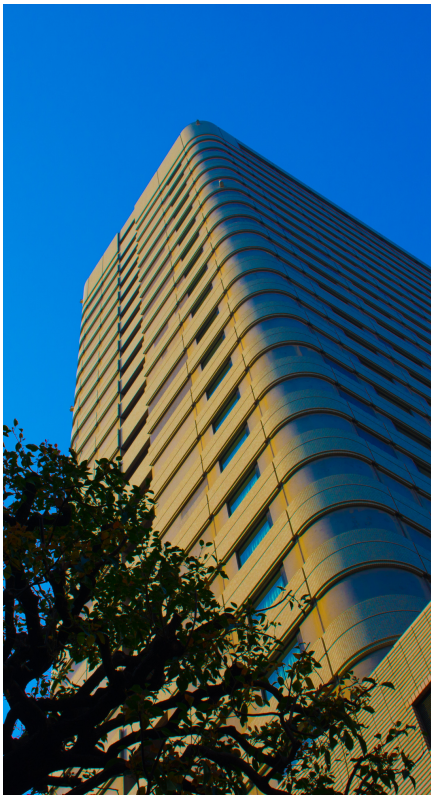
Reality capture provides millions of data points and the functionality of the office software allows for almost limitless uses. Measurements in the registered file can be made between any point, for a precise distance. Sections within the point cloud can be made in different planes to create vertical and horizontal views to create deliverables such as roof plans, reflective ceiling plans, site plans, sections views and detailed call outs. The 3D data also allows for calculating volumetric measurements such as cut or fill estimates.

BUILDING INFORMATION MODELS (BIM)

Because the point cloud is a 3D real capture of a site, it can be used to create an accurate building 3D model for the process of BIM. BIM is a collaborative process that allows AEC teams to design, coordinate, document and explore ideas throughout the duration of a building project.

TOPOGRAPHIC MAPS

Laser scanning can be used to create topographic surveys by gathering elevation data points. Contours can be generated, along with the locations of natural and man made features, for a practical mapping application.



WHY USE 3D LASER SCANNING?

From a field perspective, it reduces labor. Information can be gathered faster, more thoroughly and is accurate beyond what can be done manually. More work can be done in less time. The data is quickly accessible, and point clouds can be registered immediately.

Once the point cloud is in the office, all the site information is one click away. Real data points can be analyzed, and measurements can be made without making multiple site visits for verifications or more information. This can streamline design productivity, shorten deliverable timelines and reduce the potential for rework. Overall, 3D laser scanning provides a clear-cut advantage over other methods of work with its unmatched accuracy, efficiency and quality.

To learn more on how scanning can help support your project, please visit https://www.gmr1.com/services/3d-laser-scanning/.

ABOUT GMR

Over the past three decades, GMR has become known as the "Industry Best Practice" for helping facilities document existing conditions, prepare for improvements, and minimize risk. We are a diverse supplier, woman-owned and operated firm, specializing in ATM lighting compliance surveys, custom facility inspections, engineered lighting designs, program management, 3D laser scanning, and security consulting. Headquartered in the Dallas/Fort Worth Metroplex, we self-perform over 45,000 inspections and engineered solutions each year nationwide. Just as each client is unique, so are our methodologies and solutions.

You can learn more about GMR by visiting one of our websites at www.gmr1.com or www.gmr410.com.