RC10535

Real-World Applications of Laser Scans

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Learning Objectives

After completing this class, attendees will be able to:

- Know how to apply Laser Scanning for surveying, quality control, and as-built document.
- Use ReCap for registering scans, generate models, measurement, and markups.
- Utilize laser scan data with Revit models and Navisworks models

Description

This class will cover an introduction of laser scanning, including time and cost of performing the scan; how to autoregister scans using ReCAP software; and the usage of the scan data for design assistant, construction quality control, and operation and maintenance. We will use educational, theme park, and airport projects as case studies to illustrate the benefits of using laser scanning.

Your AU Experts

Claire Mao

With over 5 years of experience in the design and construction industry, Claire Mao has been instrumental in the successful completion of numerous high-profile projects. Claire is a key member of the virtual design and construction (VDC) department at Balfour Beatty plc. Claire is experienced in utilizing Building Information Modeling (BIM) to deliver project information, including site logistics and coordinated 3D/BIM shop drawings. She takes her experience even further with the creation of coordination plans, teaming agreements and co-location strategies for BIM implementation from design to preconstruction and through closeout.

Rudy Armendariz

35+ years of experience in Design and Construction industry, Architectural and Civil Engineering background, trained in old school techniques (T square, triangles, lead pencil on vellum, ink on mylar, and various artistic media forms). Jumped into the 'new' CAD bandwagon when it was in its infancy, experimenting with a variety of software seeking for the most appropriate to leap forward in our competitive Design industry at the time, ranging from DataCAD, Microstation, AutoCAD and Revit. Developed useful lisp routines, detailing processes and graphic standards during the time span he worked for different Architectural firms in Southern California. Currently a member of Balfour Beatty's VDC Department since 2008.

Jenny Yuan

2 years with Balfour Beatty since 2013, Jenny've been working on BIM Coordination for several projects independently. Besides that, she is the champion of Balfour's Florida division on Laser Scan. She's also performed 4D simulation, model quantification and BIM training within the company. She helps manage the technology to make the model beneficial through entire life-cycle of the project.

*Our sincere appreciation to **Greg Dasher** for sharing and assisting in preparing the Class Content.*

This handout is intended to provide the basic information of the definition of laser scanning and its history. Please read them before coming to the class if you are not familiar with the subject.

In the class, we will discuss

How to choose the right scanner for your project or company

- Scanner Type
- Cost
- Learning curve

Workflow

- Plan
- Perform scans
- Registration
- Process the data

The applications of laser scanning

- Site condition and lay-outing
- Quantity surveying
- Benchmark existing condition with design
- Quality control and assurance
- Document as-built condition.

Benefits

- Safety
- Cost
- Time
- Efficiency

Laser Scanning 101

Introduction

A widely acceptable definition of this technology states that, through the controlled steering of laser beams followed by a distance measurement at every pointing direction, 3D laser scanners create a point cloud of geometric samples on the surface of the objects. These points can then be used to extrapolate the shape of the subject.

At the heart of this type of scanner is a time-of-flight laser range finder. The laser range finder finds the distance of a surface by timing the round-trip time of a pulse of light. A laser is used to emit a pulse of light and the amount of time before the reflected light is seen by a detector is measured.

Typical time-of-flight 3D laser scanners can measure the distance of 10,000-100,000 points per second. Phase-Based 3D laser scanners up to 1,000,000 points per second in the current models.

High Definition Survey, Laser scanning is simply a high accuracy mapping or reality capture. Unlike method only capture specific points one at a time, a scan captures quickly rich details of entire scene. It's like a camera taking 360 degree photo but with accurate position for every pixel.

History

The earliest we have recorded use of 3D Scanning technology is during the 1960's, at the time using the advanced available resources at hand. Lights, cameras and projectors to name the main elements to perform this task. Equipment was very limited, therefore, to have accurately scanned objects took an excessive amount of time.

In the mid 1980's Lasers were adopted to improve 3D scanning, the new features entice dynamic capturing of shapes thru omnidirectional devices, that had become progressively advanced as newer elements enter the scene.

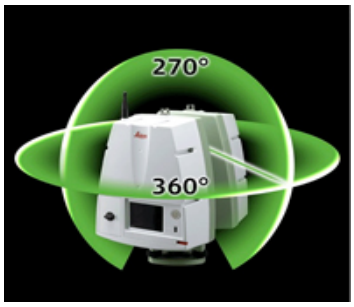

FIGURE 1.1 OMNIDIRECTIONAL DEVICE

Related milestones:

1990 First robotic total station introduced by Geodimeter

1995 First laser scanner developed by Cyra

2005 BIM revolution begins