LIDAR SCANNING TECHNOLOGY IN DESIGN

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AGENDA

Potential Uses

- Why do it

Scanner

- Field practices and workflow
  - Locating setup points for the scanner
  - Best practices for scanning
    - Looking through the eyes of the scanner
    - Resolution

Indexing and Registering Scans

- Registering the scans with ReCap
  - Automatic vs. Manual Registration
- How to integrate with BIM and CAD

Case Study

Heritage Square Park, Orlando Florida
WHAT IS LIDAR?

The acronym stands for Light Detection and Ranging

It is a remote sensing method that uses light in the form of a pulsed laser to measure variable distances
POTENTIAL USES

For the Architect and Engineer

For the Owner and GC
Improvement in Accuracy

- Better accuracy
- Quicker measurements
- Longer range
- Ability to access hard to reach places
- Still transcription errors

Errors in reading the tape
Deficiencies with the tape (sagging tape, etc)
Transcription errors
Distance limitations

More accurate results
Faster surveys
Panoramic imagery to get a sense of place
Expensive initial cost
IMPROVEMENTS TO THE SURVEY PROCESS

More efficiency with time and labor for surveys
Less confusion on what to do when you get to the site
No more uncertainty about suspect dimensions
The ability to capture the space with HDR photo panoramas
Provides the ability to go back to the space virtually instead of doing another survey. No more doubts on whether everything was captured during the survey.
Stitching together the scans at the site saves time and gives feedback on whether to do more scans
Instrument Components

- a) Flash light for HDR camera
- b) HDR camera
- c) IR camera
- d) Ring-shaped LED
- e) Scanner 360°
- f) Power button
- g) 360° WLAN antenna

- a) Laser aperture
- b) Nadir reference plate
- c) Rotating prism
- d) Quick release mount
WALKING THE JOB

Autodesk ReCap Pro
Scanning best practices
HORIZONTAL SHADING / SHADOWS
LOOK THROUGH THE EYES OF THE SCANNER
VERTICAL SHADING / SHADOWS
WHAT IS THE CORRECT RESOLUTION FOR MY LASER SCANNER?
RESOLUTION EXAMPLES

1/20 at 7 meters
1/10 at 7 meters
1/5 at 7 meters
1/2 at 7 meters
WHAT IS RECAP, REGISTRATION, AND INDEXING?

Recap is desktop software and a cloud service that registers (stitches together) individual 3D point cloud survey points and photogrammetry images into one aggregate point cloud (RCP) file.

It also does the following:

- Converts photos into 3D point clouds
- Exports to other filetypes: E57, PTS, PCG
- Edits point cloud data
TYPES OF DATA

Structured
- scans from fixed locations

Unstructured
- Scans from multiple locations (UAV)
Auto-Registration occurs after the initial import. Starts when the Register Scans button is pushed. All prior registration info will be purged when it is redone.

Manual Registration can occur at any time. It can start during the auto-registration process. The registration that was completed earlier would be retained, but the process will be completed manually. Manual Registration is beneficial when there is not enough overlapping matching data for the software to find on its own. Manual registration will require 3 common points between two different scan locations to register the data.
PROGRAM LAYOUT

Registered

Unregistered

Primary Scans

Manual Registration Button
ALTERNATIVES:
LEICA BLK360 APP
AND CYCLONE

Positives:
Easier path to get to data such as thermal imaging
Ability to register scans over 20 sites more efficiently

Negatives:
Extra in app purchases to generate floor plans
Additional cost for the purchase of Leica Cyclone Suite
CASE STUDY

Heritage Square Park

Second Courthouse (1927), Architect – Murray S. King
Survey Goals:

- Trees
- Sculpture
- Landscape furnishings
- Changes in hardscape
- Changes in grade
- Amphitheater
- Changes from the Design Documents from the last renovation
Identified:

- Major Sightlines
- Trees that can be removed to improve visibility of the museum
- Noncompliant grade changes
- Revealed more of the original design intent
- Documented nearby buildings, bus stops, signage
Workflow:

- Scanned the site with station points roughly 50 feet apart
- Registered and indexed the scans at the office
- Inserted the scans into Autocad
- Created sections of the site
- Generated a topo surface from the sections using Rhino
- Inserted the mesh model into SketchUp
- Build up the SketchUp presentation model
BLK 360 SCANNER SPEC SUMMARY

- 60 meter range
- 4 fixed 15MP cameras
- 130MP Color panoramic scans full 360 deg x 300 deg
- Measurable point clouds, Annotations within scans
- 3 resolutions (based at 7.5m range)
  - high res 5x5mm
  - medium 10x10mm
  - low 15x15mm
- 30 - 40 scans per battery charge, 3 batteries given
- Charging time (4-8 hours)
- Internal router to connect iPad (for now)
- Data is transferred from tablet to PCs using iTunes
- Flir Thermal imaging sensor (no software access yet)