Practical Uses of Reality Capture in Construction

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What is Reality Capture?
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Reality Capture allows the design process to happen
- In Context to the existing surrounding conditions

- 3D Laser Scanning
- Photogrammetry
- Ground Penetrating Radar
- Aerial LiDAR
- Mobile LiDAR
- Sonar Mapping
- ...even a tape measure, paper, & pencil!
What is a Point Cloud?
...what can I do with it?
What is a Point Cloud?
What can I do with it?

- How can Reality Capture help?
- ...and where does it add value to projects?

**Validate**
Combine existing As-Built data with original As-Designed plans
Verify retrofits & changes over time

**Informed Design**
Initial design created in context of all surrounding design considerations
Clash detection against accurate existing elements

**Document**
Construction processes with iterative data collection

**Monitor**
Maintain accurate facilities management data with ongoing maintenance
Monitor any form of design movement
Using Point Cloud Data...
Existing Conditions for Retrofit
Site Design, Earthwork, Material Staging
Construction Observation & Validation

Risk Mitigation, Detroit MI

Façade Mapping, Denver CO
Construction Documentation

Floor Flatness, IMAGINiT Omaha
Leica High Definition Survey Workflows
(3D Laser Scanning)
Leica HDS (3D Laser Scanning)

- **Purpose**
  - Collect existing environment in full detail to a very high degree of accuracy
    - 3mm of 3D positional accuracy, ~3-12 minutes per Setup Location

- **Workflow**
  - Data is collected with survey grade instrument based on line of sight requirements
  - Data is returned to the office or site trailer for evaluation

- **Uses**
  - Validation of existing conditions & design feasibility prior to ground breaking
  - Documentation of construction methods & proof of later non-visible items (structural)
  - Iterative verification of construction accuracies & assurance of next phase design
  - High quality as-built deliverables to owner for facilities or operational management
Quick Workflow Demo
(3D Laser Scanning)

Software in use:
Leica Cyclone
Leica JetStream
Leica Cloudworx for ACAD/Revit/Navisworks
Applicable Autodesk Design Softwares (ACAD, Revit, & Navis)
Pix4D Mapper Pro Workflows
(UAV Photogrammetry)
Pix4D (UAV Photogrammetry)

- **Purpose**
  - Collect existing environment from overhead perspective using a UAV
    - Accuracies vary greatly based on equipment capabilities, site flight time typically 6-12 minutes

- **Workflow**
  - UAV is flown in an automated manner to collect a series of photographs
  - Photo’s are returned to the office or site trailer for processing

- **Uses**
  - Updated Complete Site Aerial Photo illustrating site development process
  - Validation of site conditions (status of SWPPP measures, etc.)
  - Volume measurements of stock piles & borrow pits
Quick Workflow Demo
(UAV Photogrammetry)

Software in use:
Pix4D Mapper Pro
Leica iCon Robotic Total Station
(Design Point Layout)
Concept to Reality Roundtrip

**INFORM**
Pre-Construction / FM As-Builting

**ENRICH**
Construction Layout

**VALIDATE**
As-Builting During Construction (QA)

Office

Field
Concept to Reality Roundtrip

Footings, Foundations, Formwork

Penetrations in Concrete for MEP Systems

Anchor Bolts and Embeds for Steel Structure
Concept to Reality Roundtrip

1. Add Layout Points
2. Field Controller: Points, Plan Underlay & Reference Model
3. iCON Robotic Total Station
Concept to Reality Roundtrip

1. All 2D Process

2. 3D to 2D Process

3. All 3D Process
Concept to Reality Roundtrip
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Questions?

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