Reality Capture for Existing Conditions
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REALITY CAPTURE FOR EXISTING CONDITIONS

KELARPACIFIC – AEC Technology Partner

• 35 Years in business
• Partnerships with top AEC Software Solutions
• Software Consulting & Training
• BIM Project Services
• We apply the software we sell on our PROJECTS!
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Kelar Pacific - BIM Services

We invest in the latest technology so that you don’t have too!

**Design**
- Lidar 3D Scanning
- UAV Drone Photogrammetry
- BIM Specs & Execution Plans
- BIM Coordination
- BIM Modeling
- Virtual Reality

**Pre-construction**
- Lidar 3D Scanning
- UAV Drone Photogrammetry
- BIM Specs & Execution Plans
- BIM Coordination
- BIM Modeling
- 4-D – Scheduling, Phase Planning
- 5-D – Quantity Take Off, Cost

**Construction**
- Lidar 3D Scanning
- UAV Drone Photogrammetry
- BIM Coordination
- BIM Modeling
- Total Station Layout
REALITY CAPTURE FOR EXISTING CONDITIONS

What is Reality Capture?

• “Scanning a project or site & creating a digital model representation”
  • Digital Truth about the Existing Conditions
• Ground and Aerial Based
  • LiDAR
  • UAV Photogrammetry
• Accuracy
  • LiDAR +/- 2mm
  • UAV +/- 2cm
You have a project!

But:
• You have no existing drawings,
• OR, you have drawings but you don’t trust them,
• OR, the project is very complex and you want to field verify....... 
• If so, what’s next?
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Go Hand Measure & Produce .DWG?
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Or Measure by LiDAR or UAV & convert to 3D BIM!
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Which is better?
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Laser Scanning – How it Works

LIDAR (Light Detection And Ranging)

\[ d = \frac{(E_t \times c)}{2} \]

where \( c \) is the speed of light.
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**LiDAR Scanner**

**Faro X330**

- Very Accurate (+/- 2mm)
- Extra Long Distance (330M)
  - Outdoor or Indoor
- B&W or Color
- Class 1 laser
  - Non-damaging

The FARO Focus3D X 330 is specially designed for outdoor applications due to its small size, lightweight, extra long range, extended scanning possibilities even in direct sunlight, and easy positioning with the integrated GPS receiver.

- Distance accuracy up to ±2mm
- Range from 0.6m up to 330m
- Noise reduction 50%
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Why use Reality Capture?

LiDAR
- 3D
- Fast
- Very Accurate (+/- 2mm)
- Captures Everything Visible
- Vectorized Point Cloud
- Includes Overlaid Pictures
- Convertible to BIM & CAD

UAV
- 3D
- Fast / Covers Large Areas
- Accurate (+/- 2cm)
- Captures Everything Visible
- It is Pictures
- Point Cloud & Mesh
- Convertible to BIM & CAD
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**LiDAR Scan to BIM Tools**

- Faro X330 Scanner
- Faro Scene
- Autodesk Recap Pro
- Autodesk Revit
- EdgeWise
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LiDAR Scanning to BIM/CAD - Steps

1. Scan
2. Stitch
3. Unified Point Cloud
4. Trace in Revit
5. Revit 3D Model
6. Revit / AutoCAD Drawings
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Sky 2 BIM

- Introduction
- Technical
- DIY
- Safety
- Case Studies
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What is Aerial Reality Capture?

- “Photographing a project or site & creating a digital twin.”
- Digital Truth about the existing conditions
- Fast
- Large Areas
- Accuracy ~ 1/2”
- 2D & 3D
- Maps
- Sharable
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How do we do it? The Tools.

What, exactly are these things?
• sUAS: small Unmanned Aerial System
• Also, UAV or Drone
• Photogrammetry
• CAD/BIM
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How do we do it? The Tools.

Drone:
• A high-end, stable platform
• Very High resolution Data Collection System
• GPS enabled

Data Processing:
• Cloud Based
• Or Dedicated Local workstation
Photogrammetry

- Definition
- Photogrammetry is the art and science of making measurements from photographs, especially for recovering the exact positions of surface points.
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Point Cloud

• Definition
• A point cloud is a set of data points in space.
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Point Cloud

• Usage
• Exportable formats:
  • .rcs
  • .las
  • .laz
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Point Cloud

Cut & Fill Sheets
Orthomosaic Map

• Definition
• An orthomosaic map is a group of aerial photographs, stitched together and geometrically corrected (orthorectified) such that the scale is uniform: the photo has the same lack of distortion as a map.
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Contour / Topography

- Digital Terrain Model
- Contour Intervals are user selectable down to 0.1'.
- Files shareable in common formats.
- Survey grade accuracy.
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Cut and Fill / Volumetrics

- Analysis
- Confirm Earthworks
- Calculate stockpile volumes.
- Track inventory and progress over time.
- Balance import vs. export.
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Direct Data Sharing

• Team Engagement
• Seamlessly share data with your team.
• Export to GIS and Autodesk-native file formats.
LiDAR Scan-2-BIM Projects
UAV Drone + LiDAR + BIM Modeling
LAUSD El Camino HS
Seismic Ceiling Retrofit
Ceiling Seismic Retrofit As-built
All drawings are 100% accurate within +/- 2mm as verified by the 3D point cloud.
LAUSD El Camino High School
LAUSD Ceiling Seismic Retrofit
Parking Structure Scan & Height Verification
Healthcare Angio Room TI Project

Scan existing conditions to Point Clouds
Interior TI Project with Autodesk Recap Pro
Lidar Scan to BIM – MEP & Structure
Reality Capture + BIM Modeling
In-House / DIY Drone Program

Investment
• Drone ~$2K
• Training ~ $129
• 107 Certification $150
• Data Processing ~ $250/month
• Liability Insurance ~ $10/hour
Risks, The Law, and Safety

End-to-End Services
• Part 107
• Dangerous?
• Emergency Procedures
• Fly-away
• Insurance and Liability
• Leave it to the Pros
Drone Services

End-to-End Services
- Planning and Pre-Construction / Pre-Design
- Contracts and Bidding
- Earthwork
- Foundations and Utilities
- Vertical Construction
- Project Closeout
- Facilities Management
- Marketing Materials
How much does it cost?

LiDAR / UAV Time + 3D Modeling Time
Scanning Scope?

- Google Map Address
- Square Footage
- Any existing drawings or pictures of interior
  - How many rooms?
- Scope of Work
  - Black & White or Color?
  - Exterior?
  - Interior?
    - Above Ceilings?
      - T-bar
      - Hard Lid
Modeling Scope?

- What needs to be modeled?
  - At what Level of Detail (LOD)?
    - Architectural Elements
      - Walls, Windows, Doors
      - Case work, Countertops, soffits
    - Structural
    - MEPFP
      - Down to what size?
      - What about insulation
      - Fire Protection coatings?
      - Can we use generic objects?
    - Site
  - What Level of Detail (LOD)?
    - 100, 200, 300, 350, 400, 500
  - What are Final Deliverables?
    - Scan files (Black & White or Color)
    - 3D Revit model
    - Revit Sheets? (FP, elevations, RCP, etc.)
    - 3D AutoCAD
    - AutoCAD Sheets
How long does it take?
Same questions!

Scanning
- Square Feet?
- B&W or Color?
- Under ceiling?
- Above Ceiling?
- How Many Scan Locations?

Modeling
- How big?
- How complex?
- How many rooms?
- What needs to be modeled?
- At what level of detail?
Recommendations

• Compare 3D scanning and drone imaging costs to your as-built budget.

• Benefits = Time & Accuracy
  • Take any measurement from the point cloud or mesh.
  • Reduce multiple site visits.
  • Fastest path to a BIM model for design.

• Identify projects with existing conditions –
  • Ask if the GC has 3D scans or drone imagery to share.
  • Reach out to other subcontractors for cost sharing.

• Evaluate the frequency of use –
  • Hire professional for occasional use.
  • Offer services if your frequency makes sense.
QUESTIONS?

• Sky-2-BIM Service
  • UAV Drone Photogrammetry
• Scan-2-BIM Service
  • LiDAR Scanning to BIM/CAD As-Builts
• Revit BIM Modeling
• BIM Coordination

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