1A Terrestrial Data Collection: Goals

Objectives

Produce detailed spatial raw data (3D point clouds) with registered imagery for several bridge structures using high-density surveying (HDS) technologies including LIDAR (Light Detection and Ranging) and photography.

1A Terrestrial Data Collection: Input/Output

Needed Deliverables:

- Detailed, high-resolution point cloud of bridge shape and geometry for input to **solid modeling process**
- High-resolution, dense photographs of bridge structure for input to **defect detection process**

Tools

- High resolution laser scanning (LIDAR) system
- High resolution digital camera

1A Terrestrial Data Collection:
Tools: Laser Scanner

Trimble TX5

Faro Focus 3D
X330 laser scanner

Leica Scanstation
C-10

1A Terrestrial Data Collection:
Tools: How Laser Scanning works

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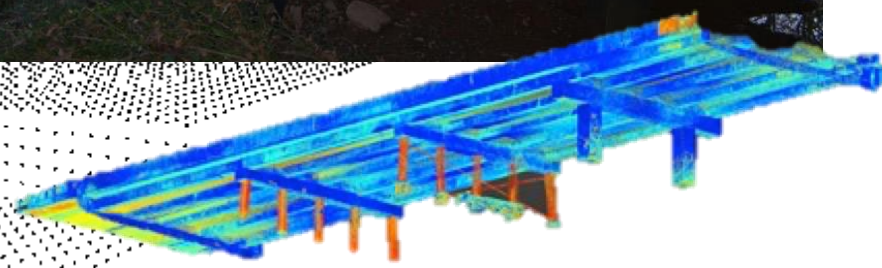
SEEBRIDGE
SEMANTIC ENRICHMENT ENGINE FOR BRIDGES



Millions of points

1A Terrestrial Data Collection:
Tools: Scanning Collection Protocol

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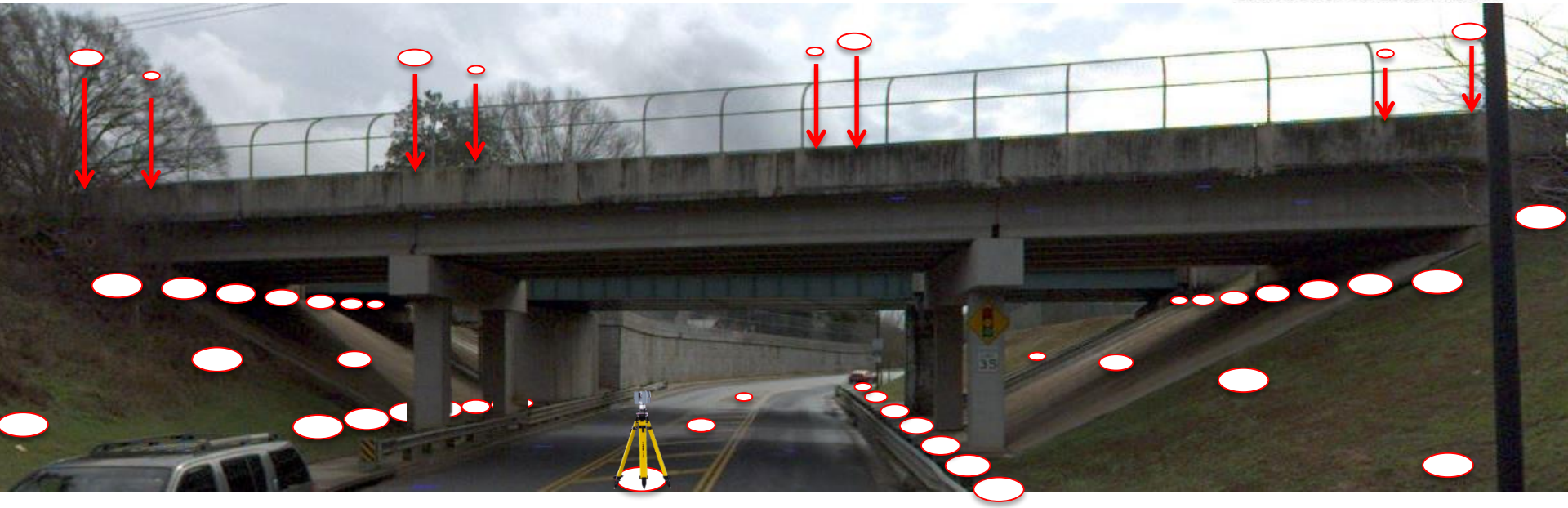
SEMANTIC ENRICHMENT ENGINE FOR BRIDGES



Dense, high resolution point clouds required:

- Large numbers of collection stations (⬭)
- High measurement speed (points per second)

1A Terrestrial Data Collection:
Tools: Close-Up Photography

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1A Terrestrial Data Collection:
Tools: Photography Protocol

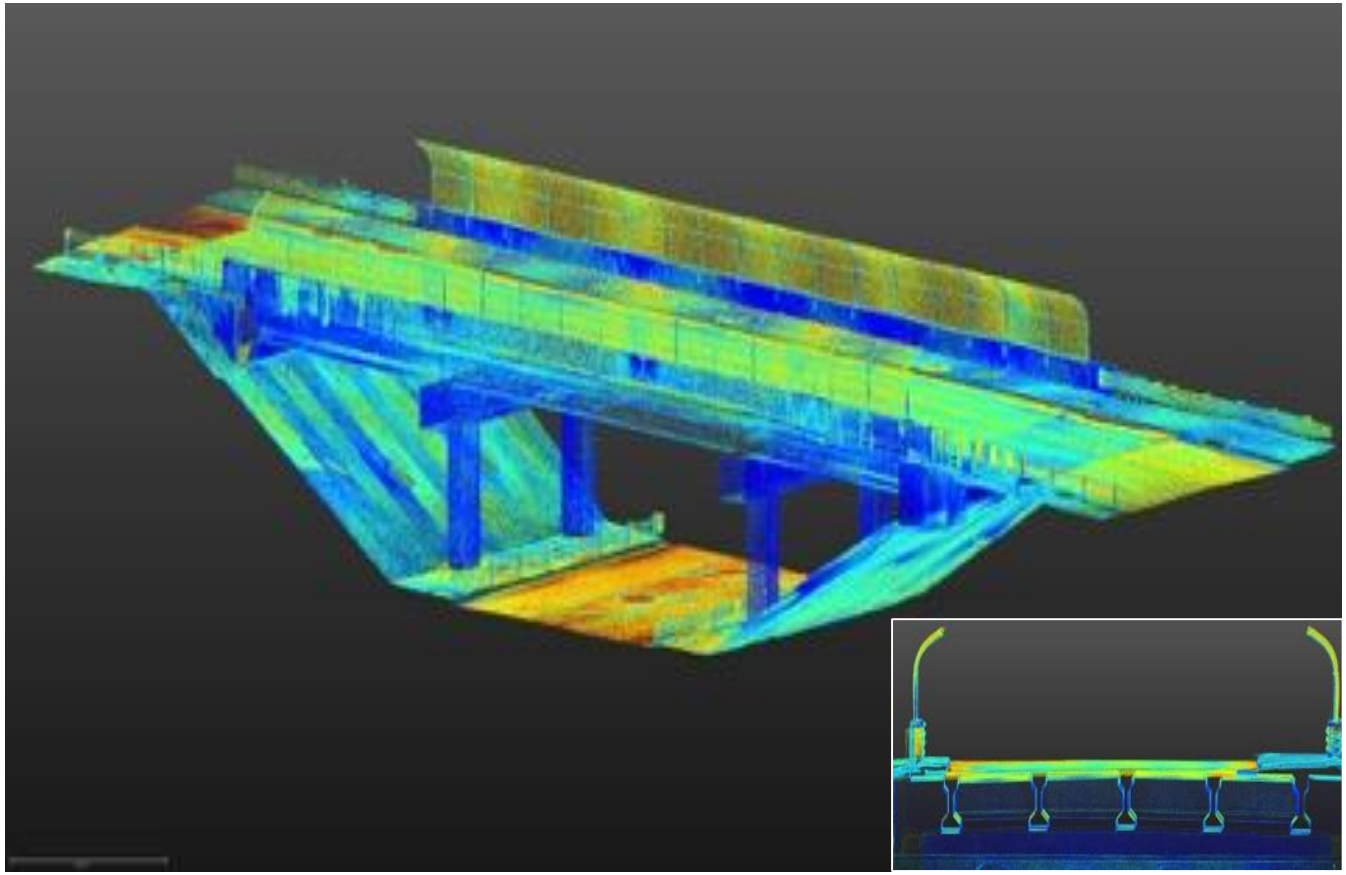
Collection Protocol:

- 42 MP resolution camera enables 0.1 mm resolution per pixel needed for crack identification
- 50% overlap between adjacent photos (for photogrammetry)

1A Terrestrial Data Collection: **Results**

1A Terrestrial Data Collection:

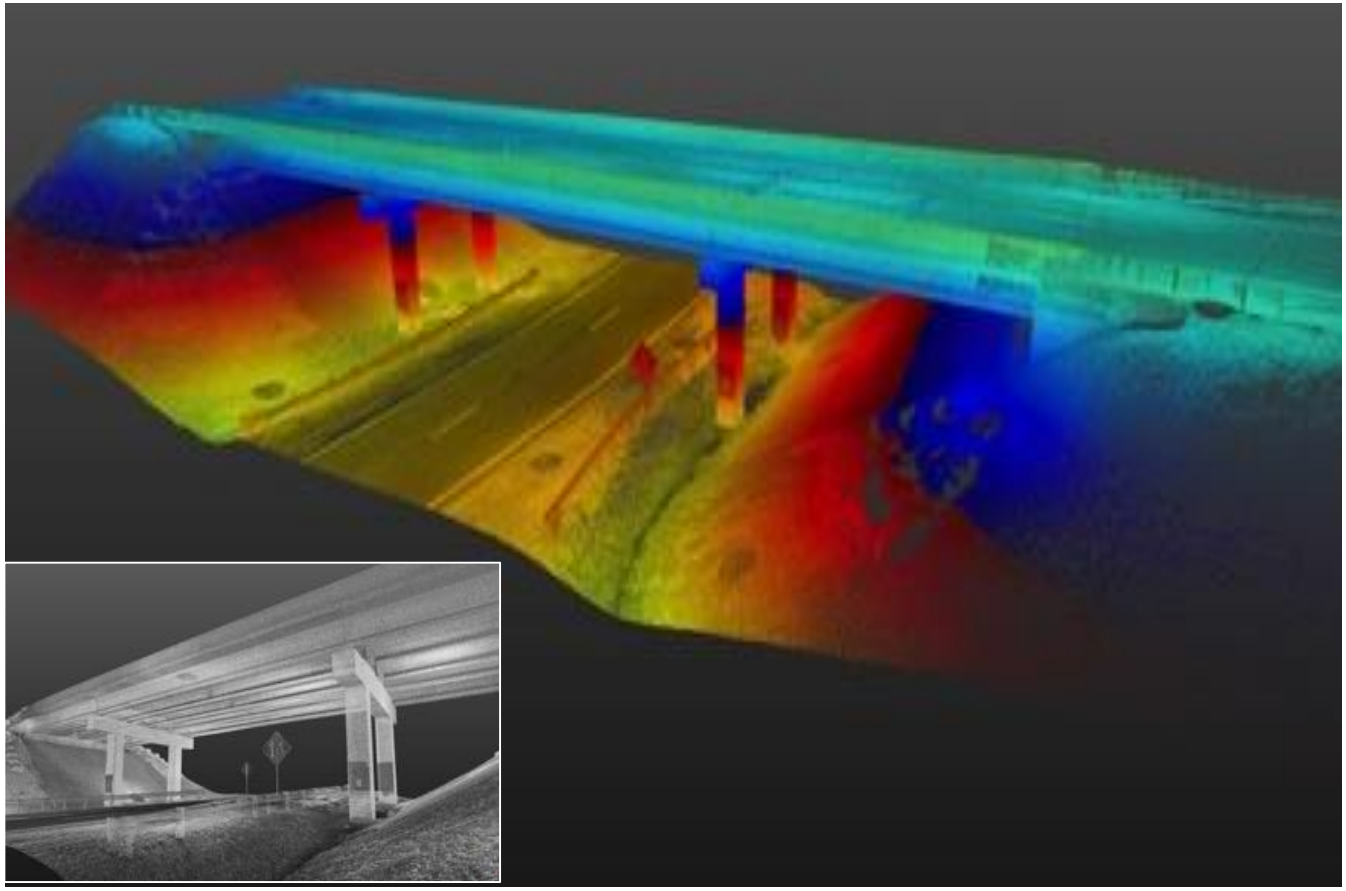
Results: What is possible…



Acworth, GA 067-5252-0

1A Terrestrial Data Collection:

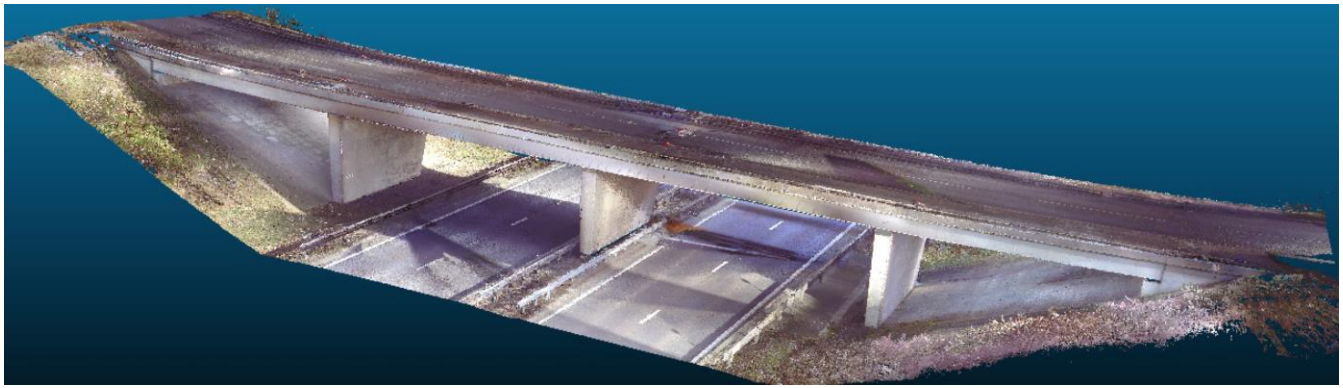
Results: What is possible…



Gwinnett, GA 135-0115-0

1A Terrestrial Data Collection:

Results: What is possible…



Cambridge, UK #2

Cambridge, UK #8

1A Terrestrial Data Collection:

Results: What is possible…

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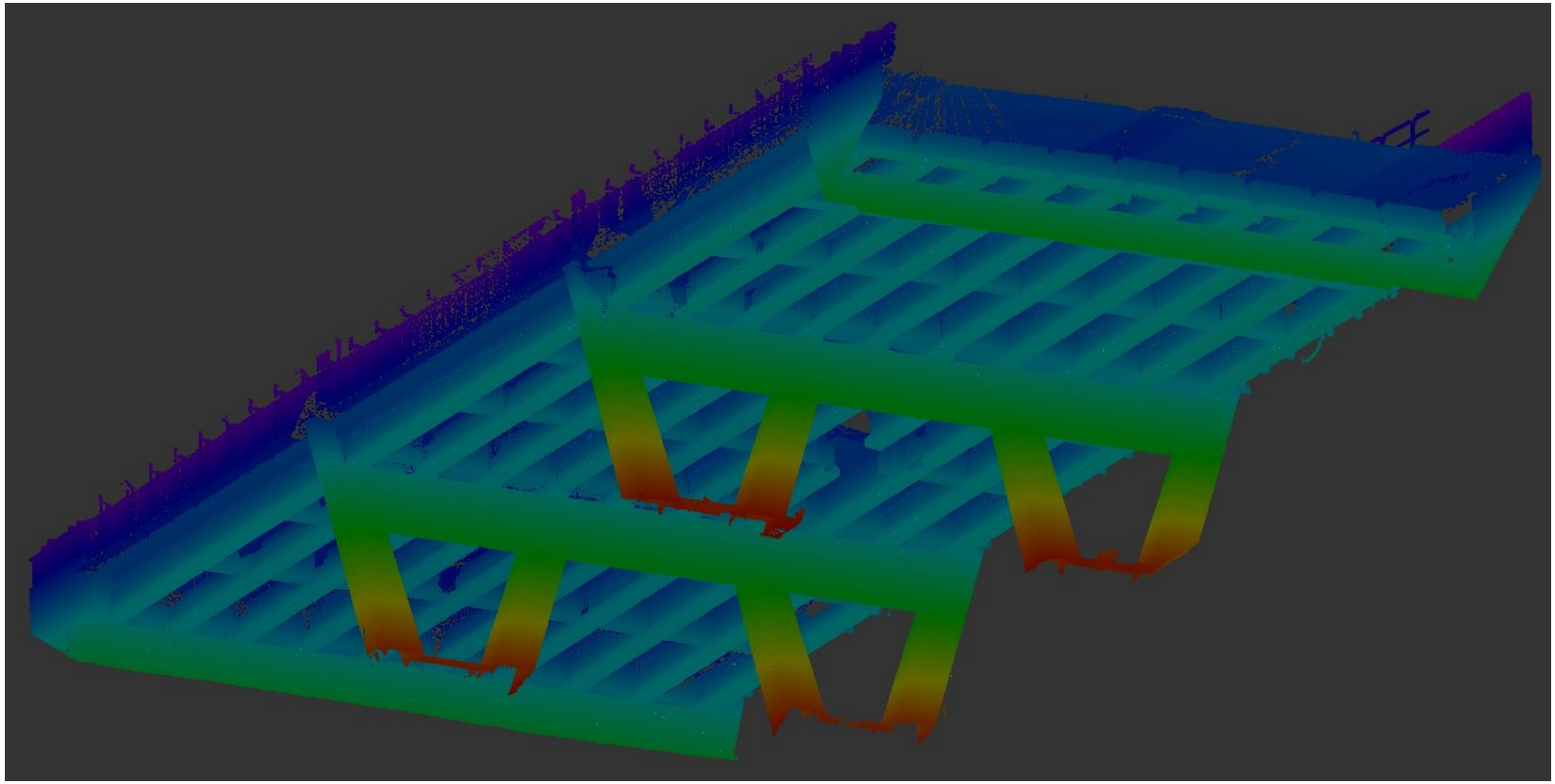

Route 79, Haifa

1A Terrestrial Data Collection:
Results: High Res Close ups

1A Terrestrial Data Collection:
Results: High Res Close ups

1A Terrestrial Data Collection: **Recommendations**

- Larger point clouds provide more data for solid modeling processor
  - More survey locations
  - Faster scanner
- Photos: More overlap

1A Terrestrial Data Collection: **Limitations**

- Intensive Data Collection
  - Detailed point cloud requires intense laser scanning with far more stations than normal survey
  - High resolution photography also very labor intensive

Bridge	# of Scans	On site Scanning Time (h:mm)	post-processing time (h)	registration quality	total points	# points in deliverable
Ackworth 067-5252-0	47	2:48	3	very good	3,804 M	2,782 M
Gwinnett 135-0115-0	21	1:20	8	very good	1,430 M	902 M
Gwinnett 135-50880	27	1:54	12	good	2,150 M	762 M

- Processing massive files requires skill & time consuming
- Focus should be on Preliminary Survey or Poor / Deficient bridges

1A Terrestrial Data Collection:
End

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