



# **AASHTO SCOM Bridge TWG Round Table Discussion Unmanned Aerial Systems: Present & Future Uses**





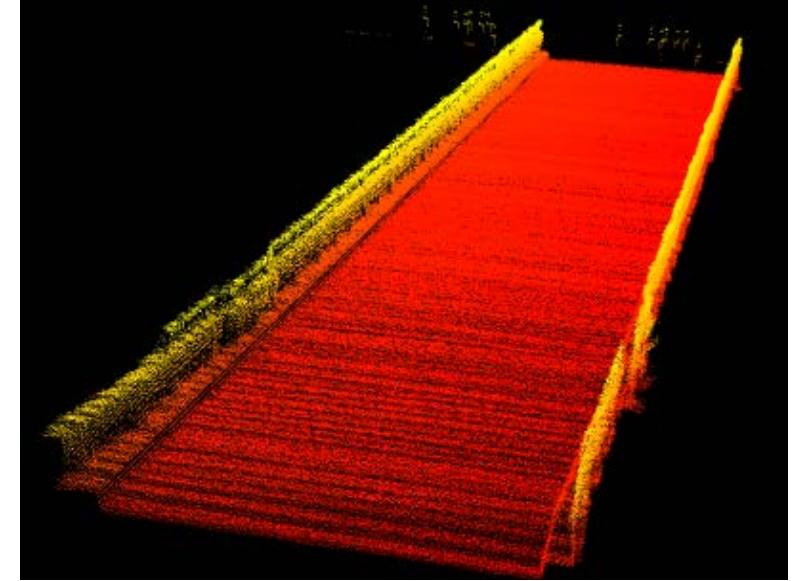
# Bridge Inspection



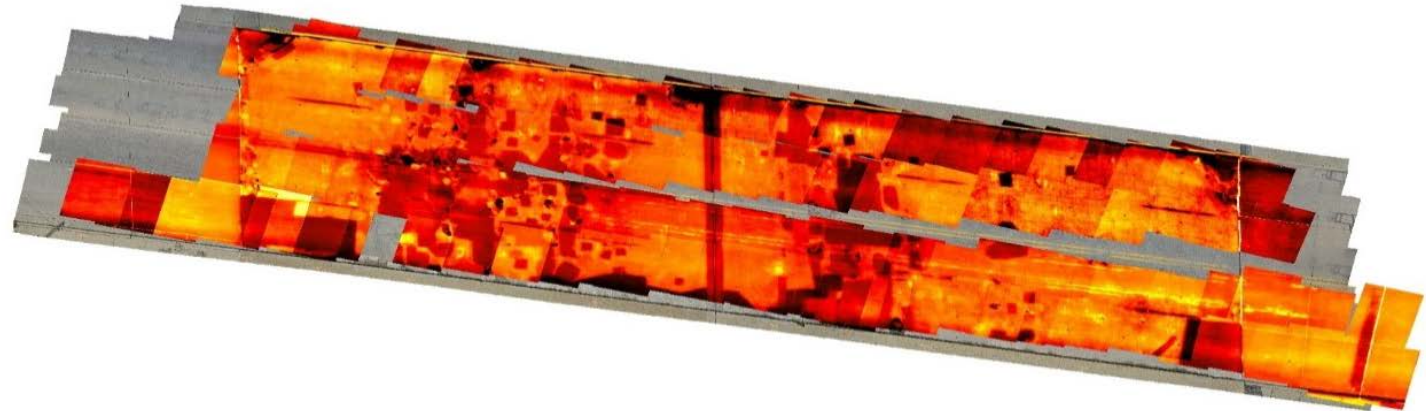
# Bridge Assessment



- Digital Cameras (optical imagery)
- Thermal Infrared
- Light Detection and Radar (LiDAR)



**Bergen Quad-8 heavy lift – 10 lb payload  
managing 3-sensory devices at once.  
Manufactured in Vandalia, Michigan**

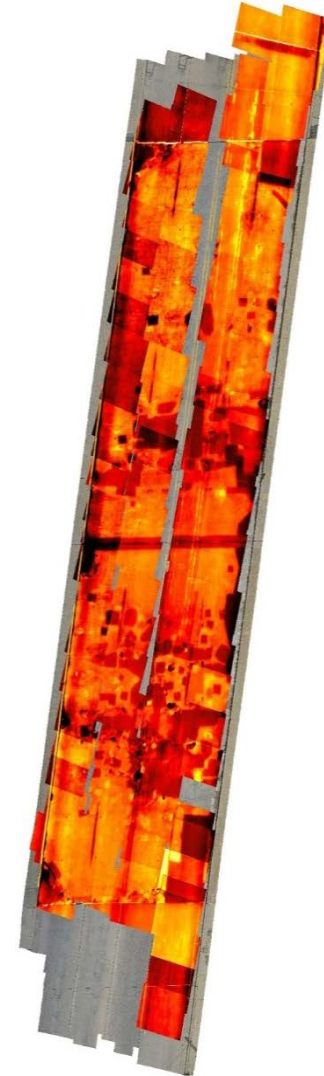
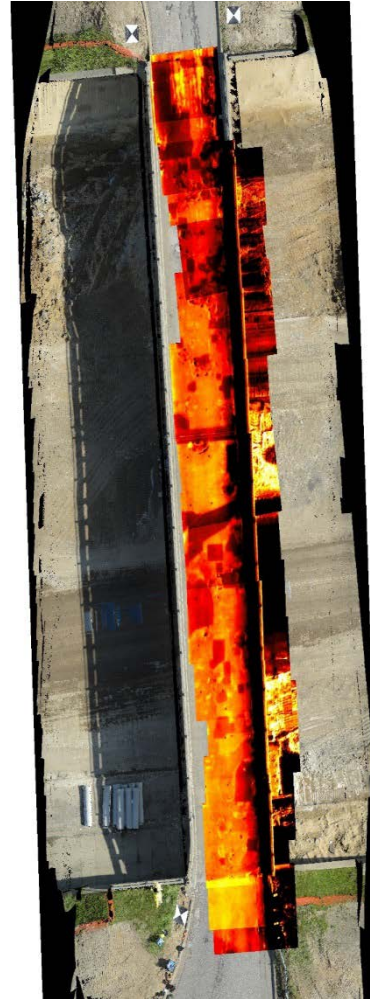


# Non-Destructive Evaluation of Bridge Elements

- Used to detect surface conditions
  - Bridge deck delamination, potholes, cracks, patching, etc.
- Overlapping imagery can be used to generate 3D models to characterized condition state of deck bridge

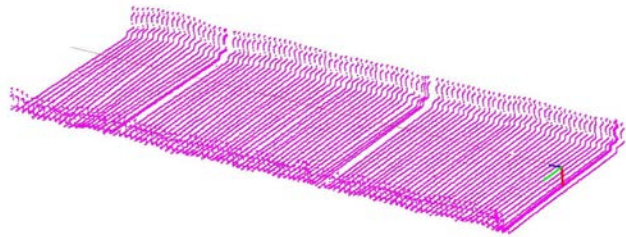


# Mapping Bridge Deterioration Thermal & Photo Data for 2 Bridges

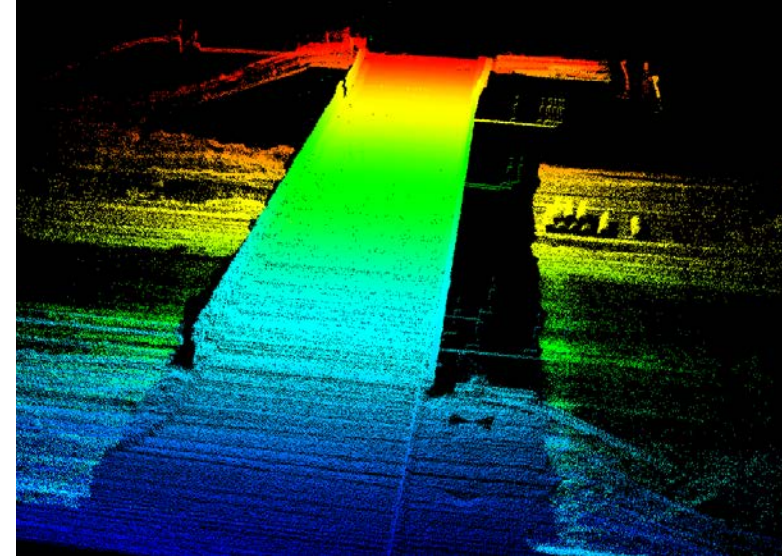


# UAV Optical and LiDAR Image Processing

- Three-dimensional Simultaneous Localization and Mapping
- Featured-based algorithms & classifiers tested
- Classifiers can be “trained” with examples of roadway assets
- Tested with street signs; could be used for other assets



Bridge with linear interpolation assumption



# Transportation Infrastructure Forensic

- Scour failure January 16, 2016, in Greece (University of Michigan)
- Failure location was physically inaccessible due to river
- Failure was mapped using high resolution photogrammetry principles
- Mapped using 649 photos from a UAS at different points of view within minutes

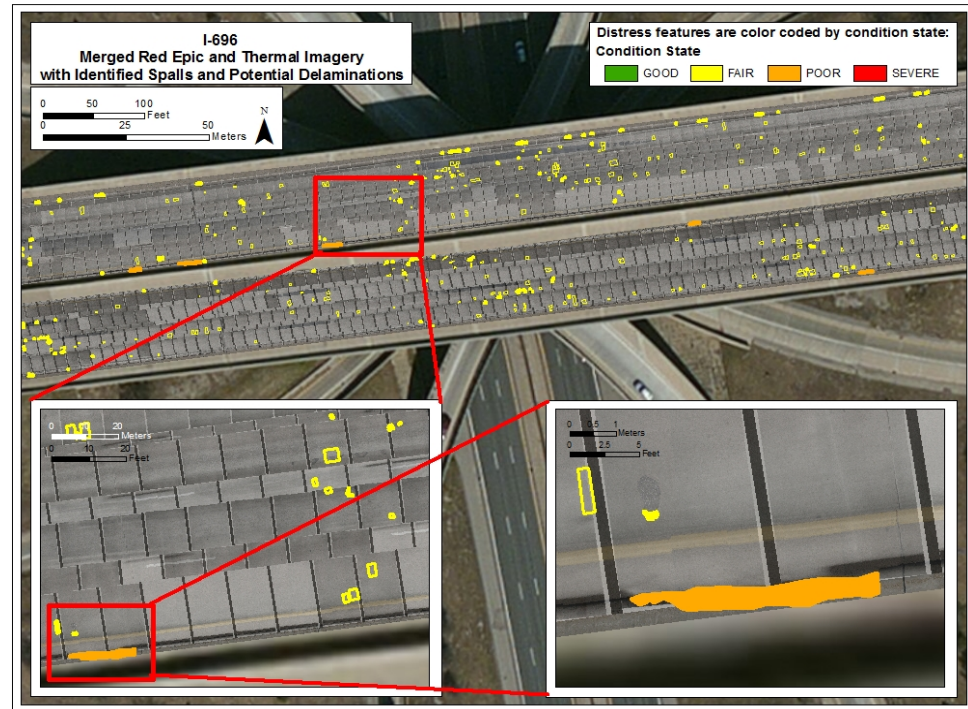


**Modeling the information from the field provided:**

- 3D point cloud
- Longitudinal cross-section
- Horizontal plane section to remove the bridge deck
- Bridge pier displacement, horizontal rotation and vertical inclination

# Automated Spall Detection

- Automated spall detection algorithm (developed by MTU)
- Applied to high-resolution 3D elevation model
- Integrate automated algorithms into operations



Location: I696 / I75	Area of Span (sf)	Area Cond. State 1 (sf)	Area Cond. State 2 (sf)	Area Cond. State 3 (sf)	Area Cond. State 4 (sf)
Span 1	23,490	23,306	169	15	0.00
Span 2	17,495	17,410	778	8	0.00
Span 3	21,406	20,998	392	16	0.00
Span 4	16,602	16,383	215	4	0.00
Span 5	21,865	21,585	273	8	0.00
<b>Total</b>	<b>100,859</b>	<b>99,682</b> <b>(98.83%)</b>	<b>1,126</b> <b>(1.12%)</b>	<b>50</b> <b>(0.05%)</b>	<b>0.00</b> <b>(0%)</b>

# AASHTO SCOM Bridge TWG UAS Discussion Agenda

- Administrative (strengths vs. weaknesses)
  - ✓ FAA - COA/333 exemption & recent changes
- State DOTs & FHWA role/responsibility
  - ✓ Internal
  - ✓ Public Perception
- Synthesis of current uses & practices
- Data vs. Sensory needs
- Research Opportunities
  - ✓ NCHRP Long term
  - ✓ PFS
  - ✓ NCHRP 20-07

