



Presented at the FIG Working Week 2023,
28 May - 1 June 2023 in Orlando, Florida, USA

FIG WORKING WEEK 2023

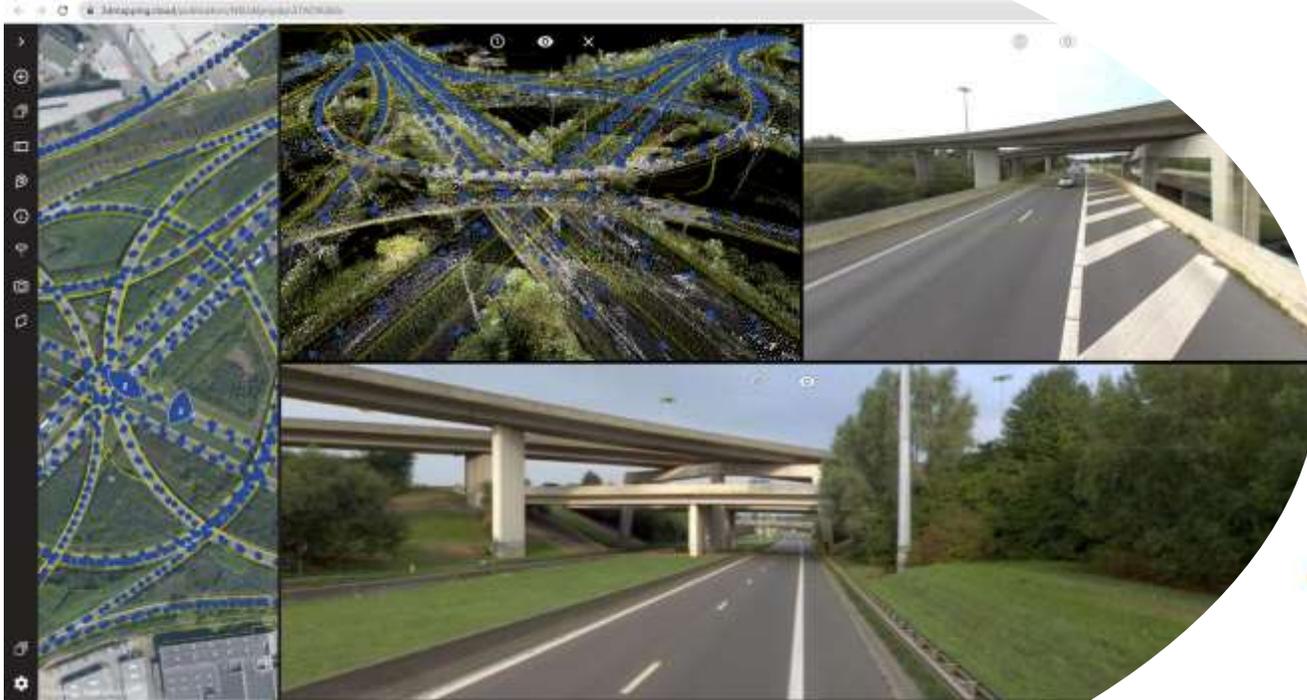
28 May - 1 June 2023 Orlando Florida USA

Protecting
Our World,
Conquering
New Frontiers

4D Surveying with Reality Modeling

The use of reality data in digital twins

Benoit Fredericque & Glen Franklin, Bentley Systems



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Reality Data and Digital Twins



Digital representation

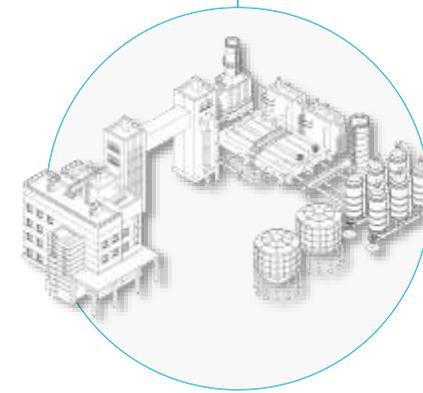


Continuous update



Creation of information

Digital Twin



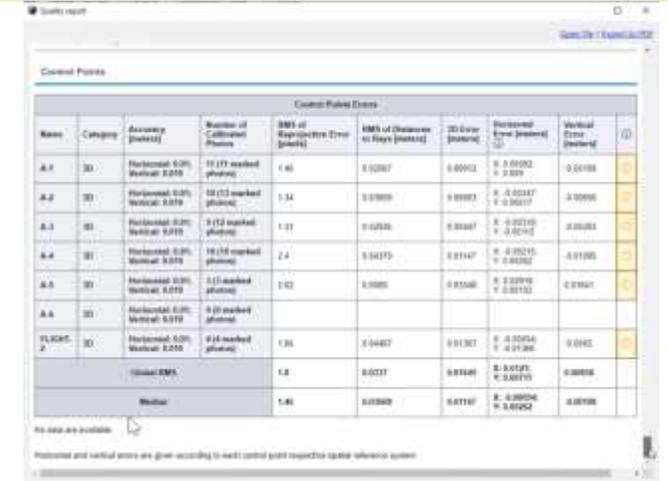
Real world



Case 1 – Digital twin for bridge inspection

How was this done?

- Use of drones & creation of a 3D model + reference photos.
- Connection to the global management system.
- Partial virtual inspection.
- Additional on-site inspection.
- Enrichment of the reference model.

Name	Category	Accuracy (mm)	Number of Collapsed Points	RMS of Reproductive Error (mm)	RMS of Residuals of Rays (mm)	2D Error (mm)	Horizontal Error (mm)	Vertical Error (mm)
A.1	30	Horizontal: 0.01 Vertical: 0.010	11 (11 marked photos)	1.40	0.0007	0.0012	X: 0.0092 Y: 0.0001	0.0108
A.2	30	Horizontal: 0.01 Vertical: 0.010	12 (12 marked photos)	1.34	0.0005	0.0003	X: -0.0037 Y: 0.0017	0.0090
A.3	30	Horizontal: 0.01 Vertical: 0.010	9 (12 marked photos)	1.21	0.0016	0.0047	X: -0.0010 Y: -0.0012	0.0081
A.4	30	Horizontal: 0.01 Vertical: 0.010	19 (19 marked photos)	2.4	0.0470	0.0147	X: -0.0025 Y: 0.0032	0.0100
A.5	30	Horizontal: 0.01 Vertical: 0.010	1 (1 marked photos)	0.02	0.0000	0.0000	X: 0.0000 Y: 0.0000	0.0000
A.6	30	Horizontal: 0.01 Vertical: 0.010	9 (9 marked photos)	0.00	0.0000	0.0000	X: 0.0000 Y: 0.0000	0.0000
VLICAT_2	30	Horizontal: 0.01 Vertical: 0.010	4 (4 marked photos)	1.06	0.0407	0.0107	X: -0.0016 Y: -0.0006	0.0102
Global RMS:				1.8	0.0217	0.0040	X: 0.0021 Y: 0.0011	0.0098
Median:				1.46	0.0000	0.0000	X: 0.0000 Y: 0.0000	0.0000

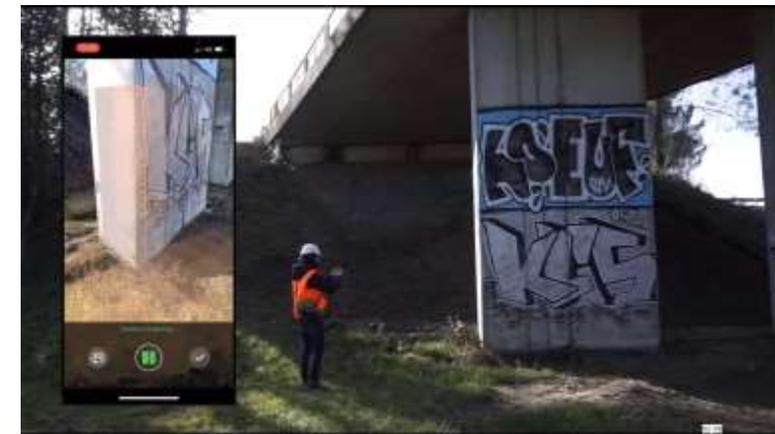
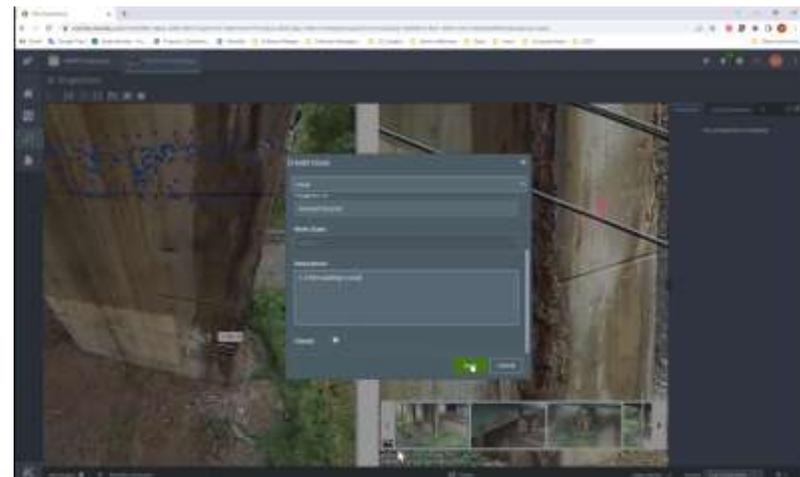
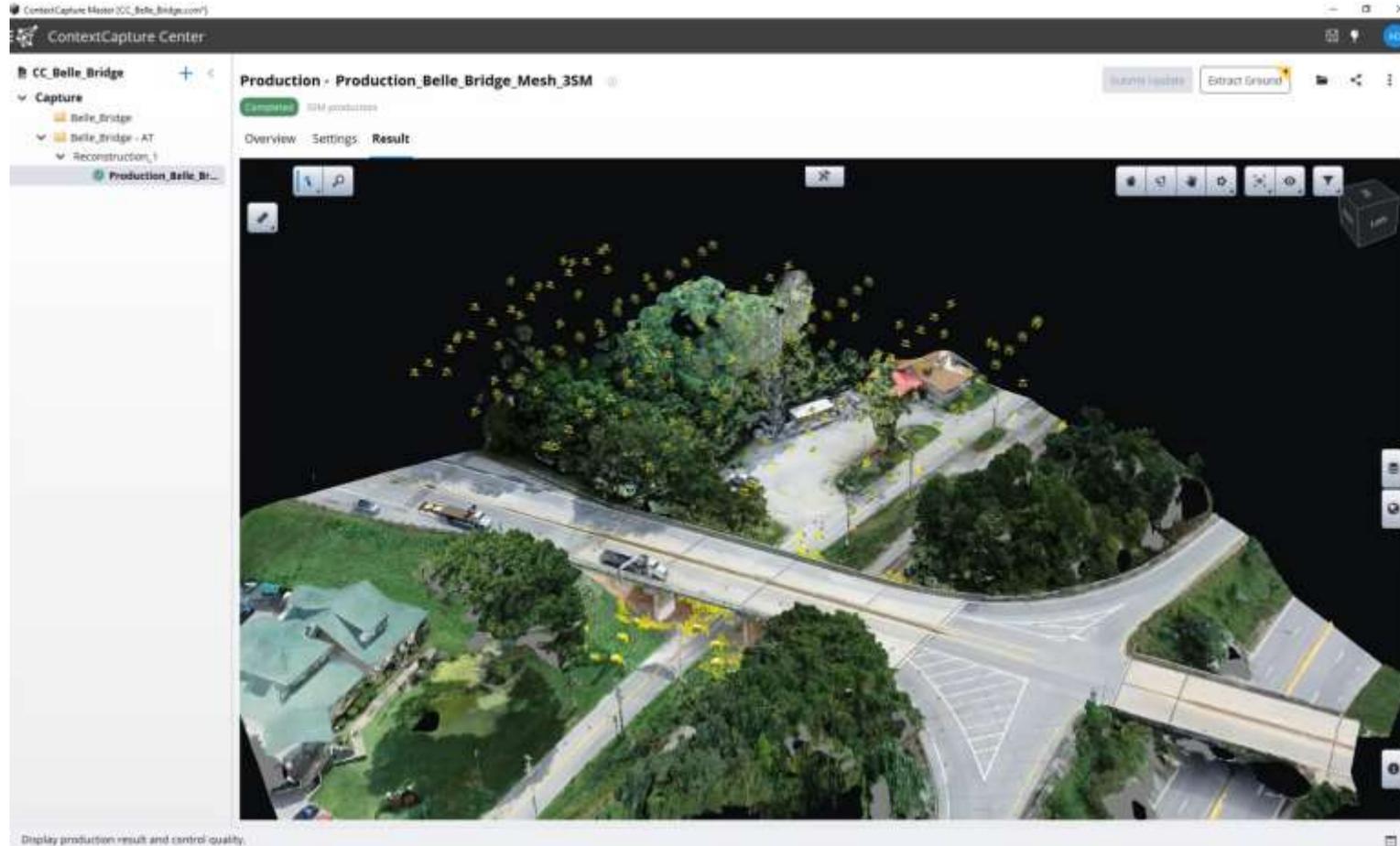


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Case 1 – Digital twin for bridge inspection

Benefits?

- Reduction of field time & closing times: Costs and Human Risks
- Better access to the information via the digital twin



“We automate data capture with drones. We automate data processing and make it much more accessible and useful for our teams.”

“Each time we don’t have to use a bridge inspection truck, which involves lane closures & traffic disruption, there are gain for users and for us”

<https://blog.bentley.com/unlocking-data-to-improve-bridge-safety/>

Case 2 – Mobile mapping data & digital twin of networks

How was this done?

- Use of a land & air mobile mapping systems.
- Statewide data capture.
- Online availability of all data via web applications
- Direct integration with network management tools.

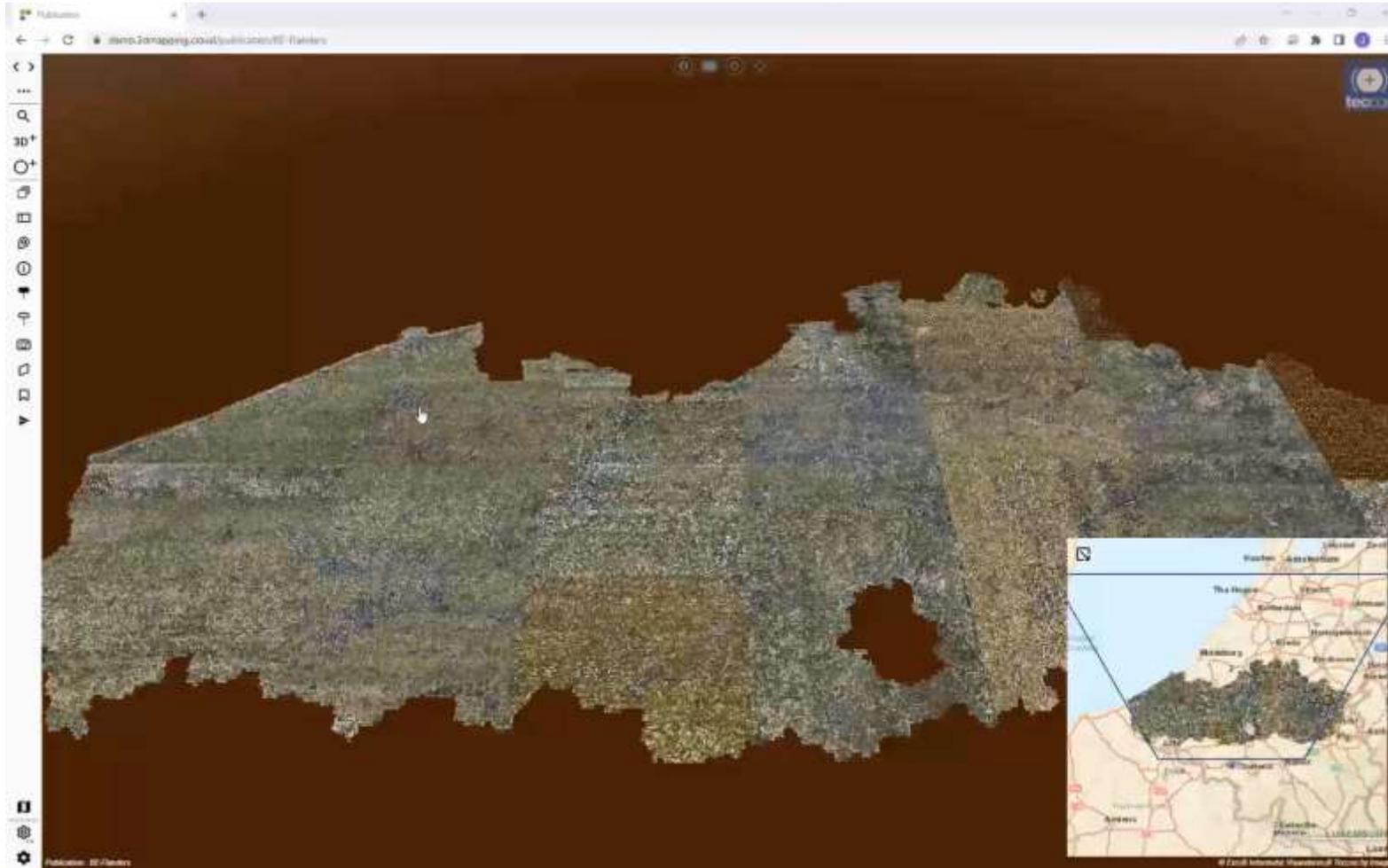


Demos: <https://3dmapping.cloud/publications-eu/>

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Case 2 – Mobile mapping data & digital twin of networks

Benefits?

- Better planning of field operations & reducing time on site.
- Better communication between teams
- Detection of errors in the network management system.





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