

*From eyes to lens, a journey
towards digital bridge
examination*

by Professor Song Wu

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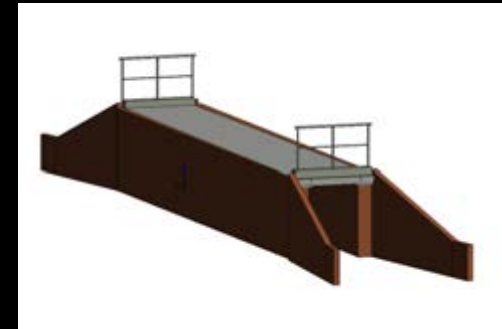
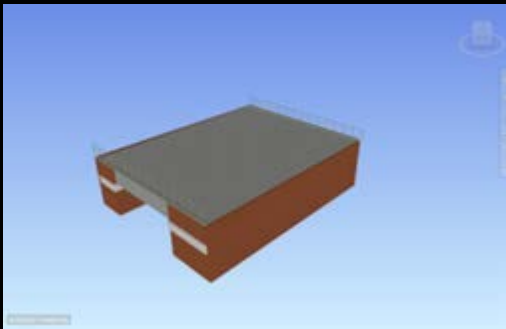
Prelude



Prelude



Little teaser (2017)



Trial run (2019)



Arch Bridge -13



Span Bridge -10

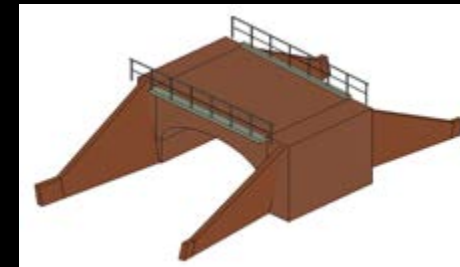
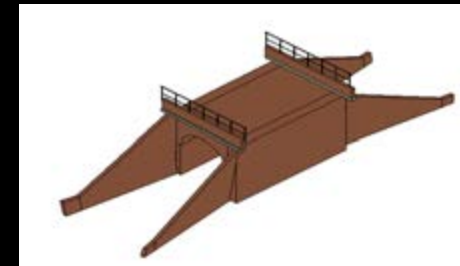
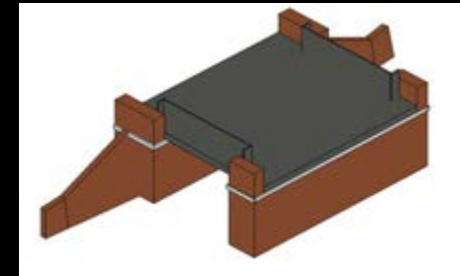


Hybrids - 10

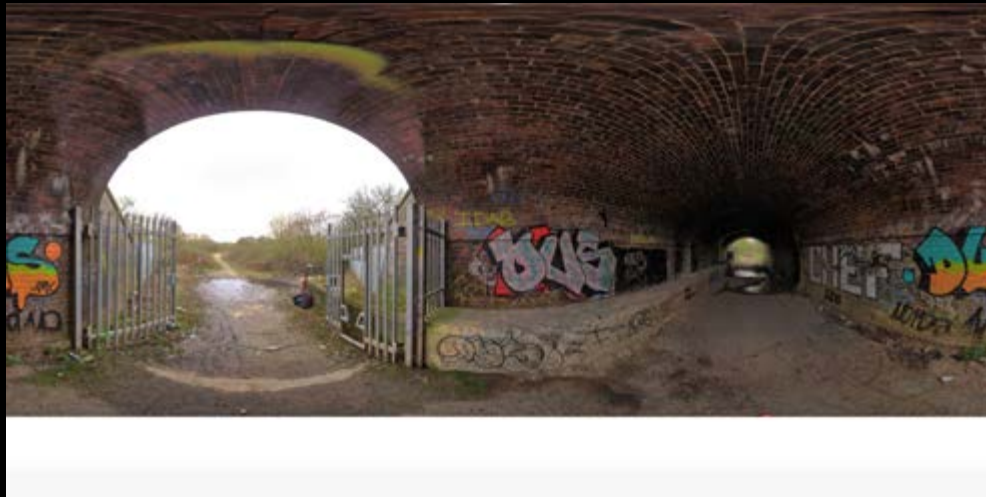


Multi-span -17

Trial run (2019)



Trial run (2019)





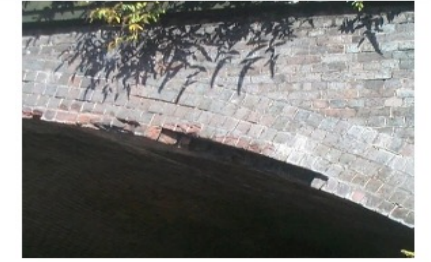



A.I. examination (2020)

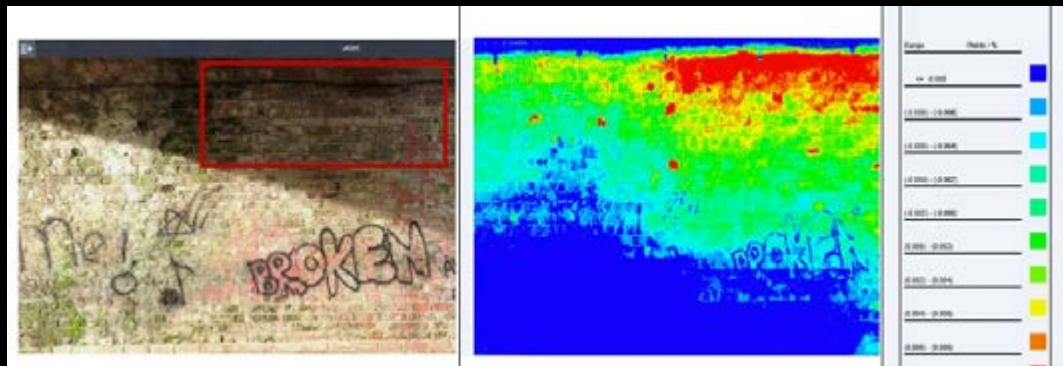
- In the UK, it is estimated that there are approximately 29000 bridges, 22000 retaining walls, 21000 culverts, 200 miles of coastal defence and 600 tunnels, which require regular visual examinations
- The conventional inspection of bridges commonly relies on visual investigations and traditional data acquisition process that are time consuming, unsafe, less reliable, costly, and inconsistent



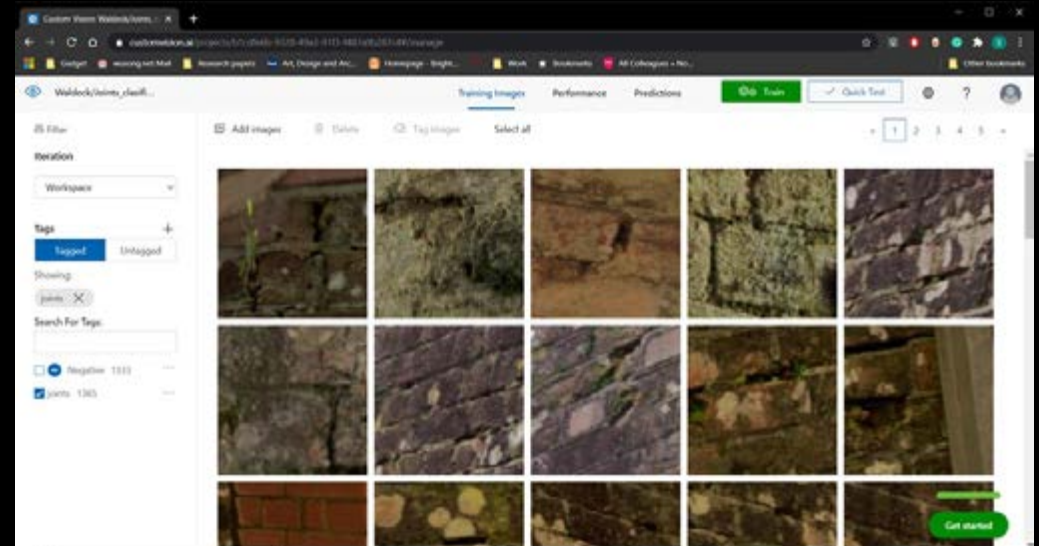
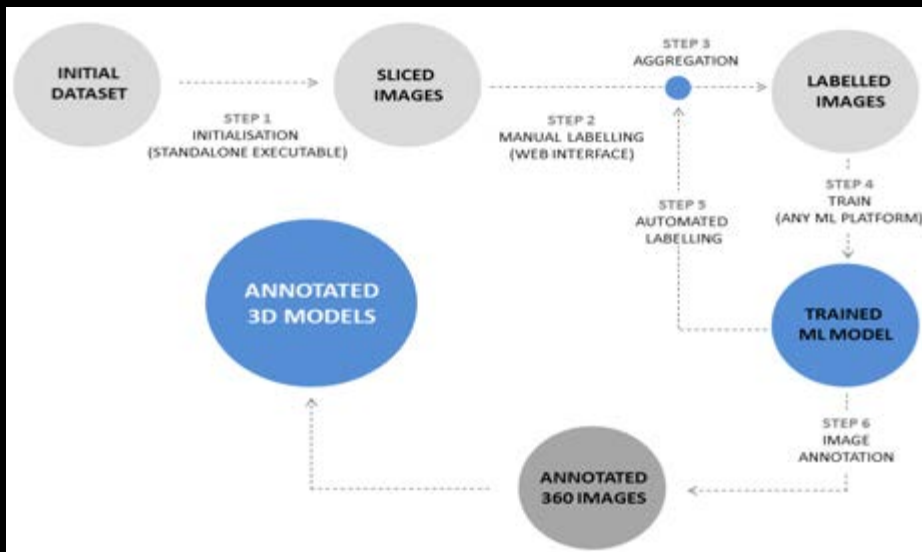
A.I. examination (2020)

<p>Bulging</p> 	<p>Crack</p> 	<p>Spalling</p> 
<p>Refers to a local "blistering" type movement of the element, possibly associated with hollowness or loose masonry, or ring separation in an arch</p>	<p>Refers to cracks, possibly caused by ground movements and live loads</p>	<p>Refers to crumbling, peeling or flaking of masonry work caused by water entering</p>
<p>Joints defect</p>	<p>Loss of section</p>	<p>Water penetration</p>
		
<p>Refers to gaps in the joints between bricks. Such joint defects are possibly caused by ground movements and live loads</p>	<p>Refers to sections of bricks missing. The loss of section is caused by ground movements, live loads, impact damage and weathering conditions.</p>	<p>Refers to leakage in bridges</p>

A.I. examination (2020)



A.I. examination (2020)



Prototype (2021)

The screenshot shows the 'Asset Visualiser' web application interface. At the top, there is a navigation bar with the company logo 'AV Asset Visualiser' and links for Home, About, FAQ, Contact, Admin, My Account, and Log off. Below the navigation bar is a search bar and a table listing various assets. The table has columns for MP ID, Start Ref, End, Structure Name, Area, BMS, CODE, Route Line, Start Codes, Corrosion, Asset Type, Last Inspected Exam, and Last Visual Exam. Each row represents a different asset with its corresponding details.

MP ID	Start Ref	End	Structure Name	Area	BMS	CODE	Route Line	Start Codes	Corrosion	Asset Type	Last Inspected Exam	Last Visual Exam
2022008	1_40	40	WESTGATE UNDER BRIDGE	Thomas Valley	08	T02R0202	Action & Northcut	800	Good Pub	80		Full Details
2022047	7_40-20	40	GLIMFOLD LAKE UNDERBRIDGE	Thomas Valley	08	T047R000	Action & Northcut	800	Good Pub	80		Full Details
2022074	36_70	84	751 MIL AKA WING MIL - 13968	Thomas Valley	34	SUR840700	Berke & Ferns Line	800	Good Pub	80		Full Details
2022076	36_70-76	84	BRIDGE	Thomas Valley	34	SUR800700	Berke & Ferns Line	800	Good MP	80		Full Details
2022143	8_40-76	84	CHURCH FOOTPATH UNDERBRIDGE - 13968	Thomas Valley	36	T02R8000	Wain Line Piddington to Plymouth St West	800	Path	80		Full Details
2022178	14_01-700	84	TURKEY WOOD UNDERBRIDGE - 13968	Thomas Valley	36	T02R4000	Wain Line Piddington to Plymouth St West	800	Good MP	80		Full Details
2022190	9_02-608	608	WYKE STREET SUBWAY UR, 600/604 - Public Right of Way under - 1 Span	Thomas Valley	36	T02T1900	Wain Line Piddington to Plymouth St West	800	Path	80		Full Details
2022000	27_71	84	LOT2 JOHN LAKE - 1 SPAN	Thomas Valley	32	SUR800700	Wain Line Piddington to Plymouth St West	800	Good Pub	80		Full Details
2022074	34_34	84	SHEPHERD HOUSE LAKE - 800 Arch - 1 Span	Thomas Valley	32	SUR800700	Wain Line Piddington to Plymouth St West	800	Path	80		Full Details

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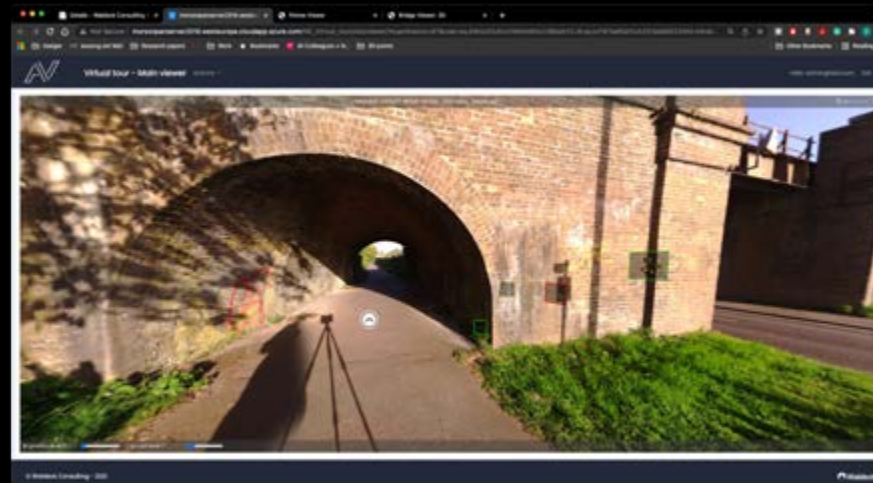
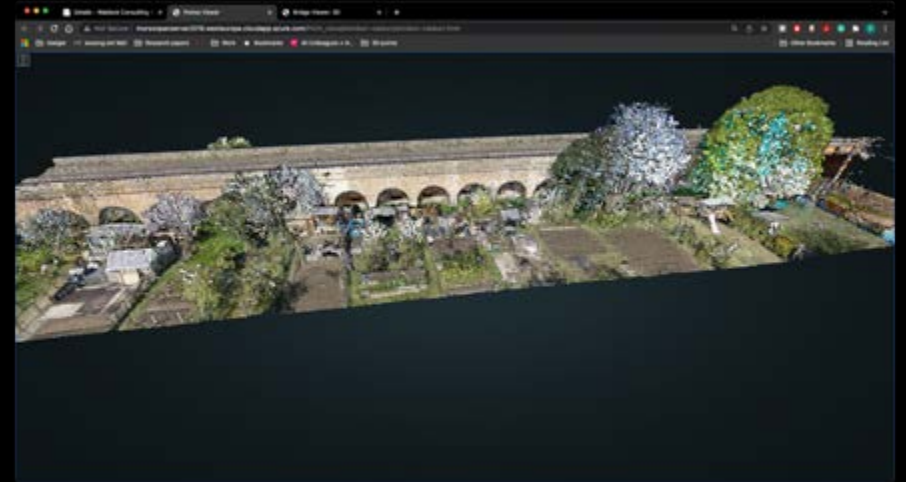
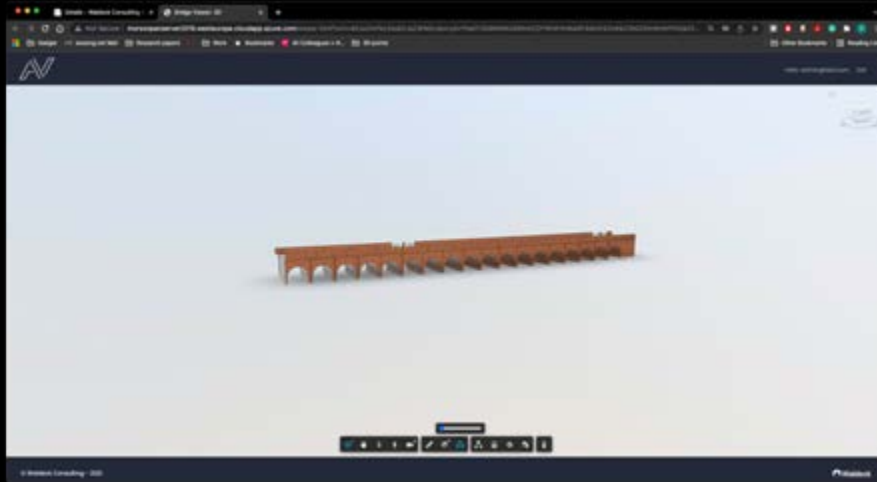
The screenshot shows the 'Asset Information' page for a specific asset. The page title is 'Asset Information' and the structure name is 'WINDSOR BRACKET SPANE 207-208'. There is a 3D model of the asset. The page is divided into several sections: 'Details' with a table of key information, 'Comments' (empty), and 'Examinations' with a table of inspection records.

Contract	Structure Ref	MP ID	Area	Type	Route Line	OS Grid Ref	BIM Model	Height	Length	Span	No. Spans	Primary Material	Secondary Material	Structure Codes	Over
2019	207-208	2022008	Thomas Valley	800	Action & Northcut	800		8.00m	9.63m	3.96m	1	800 - Brick	800 - Brick	800	Land

Examination ID	Type	Last Exam Date	By	Report
1022008	Visual	16/02/2021		
1022007	Visual	16/02/2021		

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Prototype (2021)



Prototype (2021)



Virtual tour - ML Defect import Actions ▾

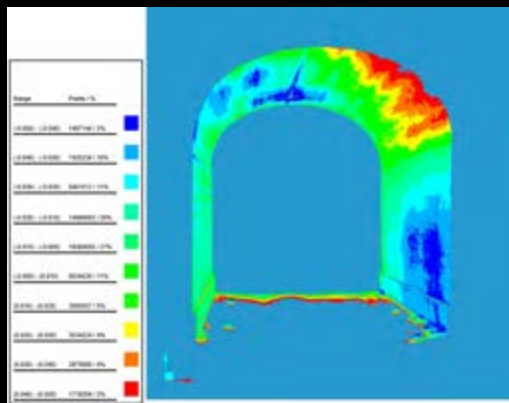
Hello admin@test.com Edit

Examination Dataset 352 - WINDSOR VIADUCT SPANS 247-230 - 2021-12-14 - Dataset 352

Total ML defect: 25, Imported: 2, Currently display: 23



Icing on the cake (2022)



1 Digital Examination Concept

Description

This competency covers general concepts and principles of digital examination for masonry bridges. You must have an awareness of various terminologies and technologies in the digital examination of masonry bridges. You should gain an understanding of the key processes and activities involved in the digital examination of masonry bridges.

Level 1	How is this competency covered by different roles?
<p>Demonstrate the knowledge and understanding of concepts of digital examination for masonry bridges</p> <p>The activities and knowledge comprised within this level are:</p> <ul style="list-style-type: none"> Defining the concept of digital examination for masonry bridge. Understanding the relationships between digital examination and Network Rail bridge examination process Understanding the definitions of data capture, data processing and data analysis Introduction to various technologies for the purpose of data capture, data processing and data analysis 	<p>This competency is essential for all roles such as Asset Owner (NR), Asset Engineers from NR, Asset Examination Engineering from suppliers, Digital Capture Operators working for suppliers who are mainly the party responsible for the data</p>



Virtual tour 2.0

Hello user Exit

Defects

Machine learning

Live significant defects

Datasets

- Point Cloud
- Int2track2_BRIS_P001
- Images
 - 360 Images
 - Bri_005_Panorama.jpeg
 - Bri_001_Panorama.jpeg
 - Bri_003_Panorama.jpeg
 - Bri_004_Panorama.jpeg
 - Bri_006_Panorama.jpeg
- BIM model

Settings

For real (2023-2026)

- Field trials and integration with Network Rail Intelligent Infrastructure platform
- Awarded KTP project to develop a commercial product for wider industry.

