

3D Inspection Unit for Pavement PG-4



KURABO
Yumi Hyogo

Contents

1. About KURABO

2. Our PG-4

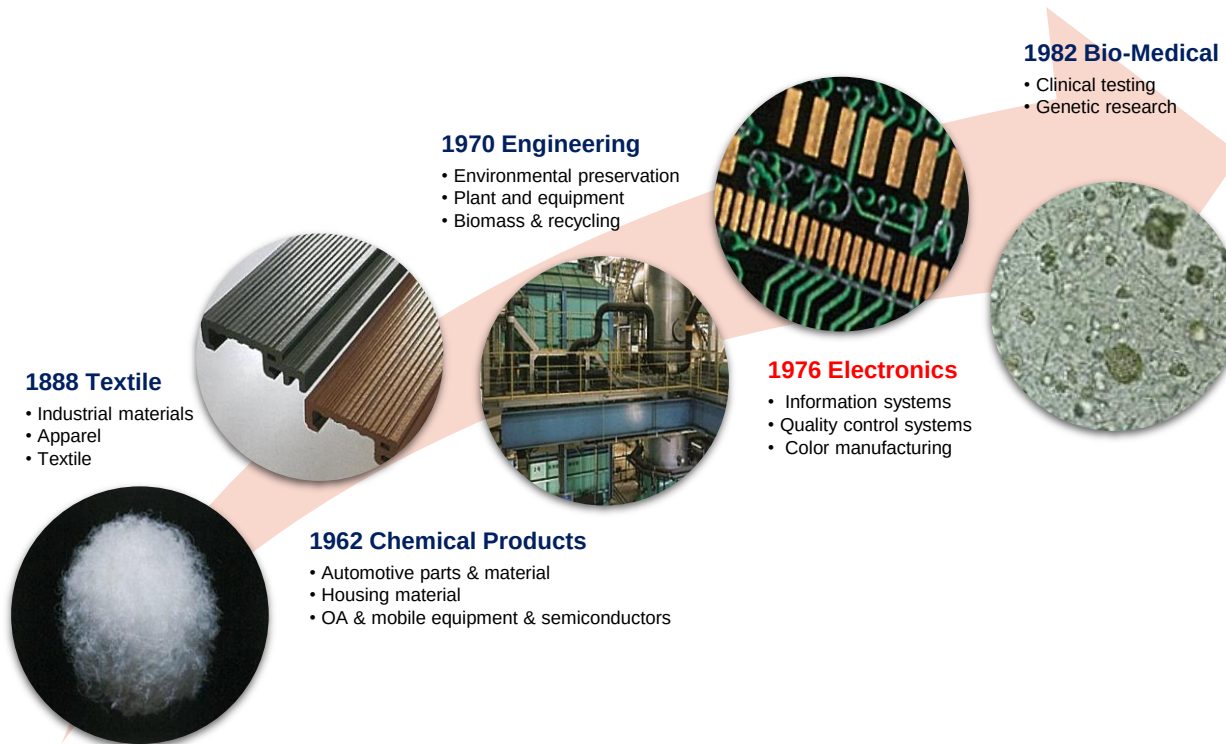
3. Our PG-4 - Data Analysis -

1. About KURABO

OVERVIEW

- Registered Name: **KURABO** Industries Ltd.
KURASHIKI= Name of the city
BOSEKI = Spinning
- Year Established: March 9, 1888
- Authorized Capital: JPY 22,040 millions
(Approx USD 220 millions)
- Number of Employees(Kurabo Group): 4,500
- Office (Japan) : Factories : 8
Subsidiaries& Affiliates : 20
(Global) Overseas Subsidiaries & Affiliates : 16

DIVISIONS



Our technology



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Our technology

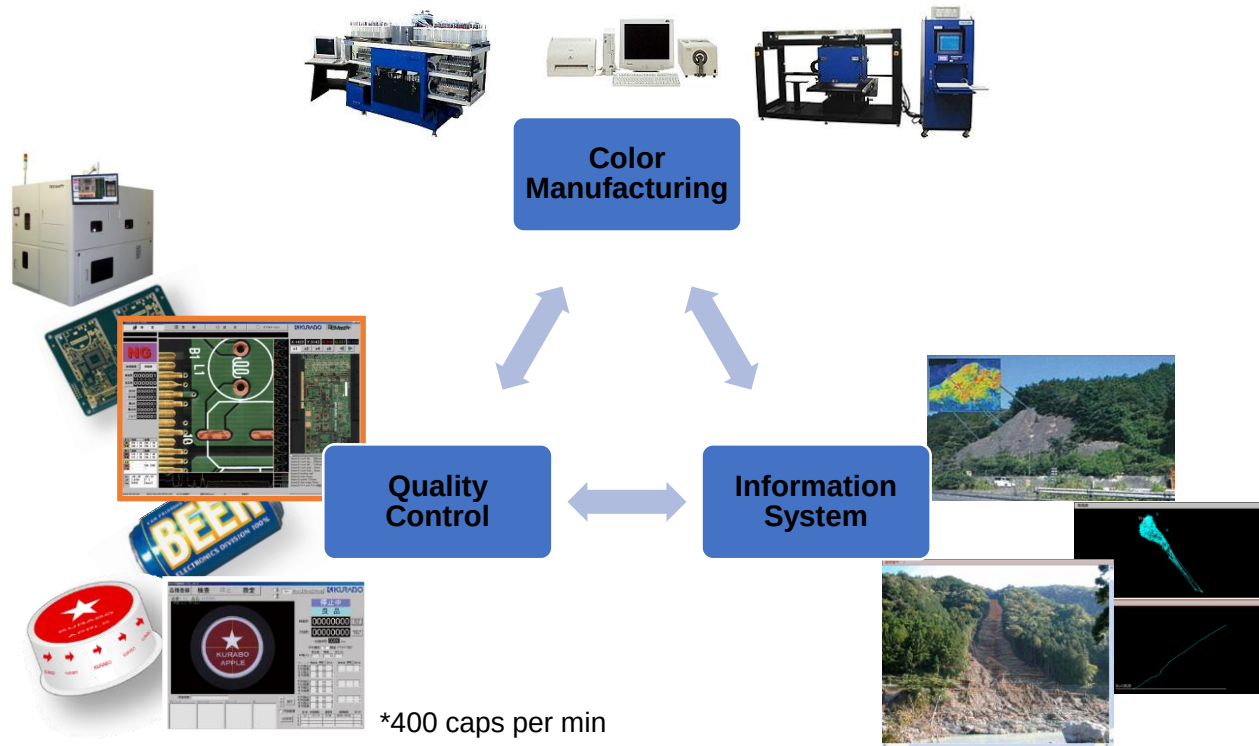
Control Color as **a Number.**



“Computer Color Matching” “Dispensing System” “Inspection System”



IMAGE PROCESSING TECHNOLOGIES



Contents

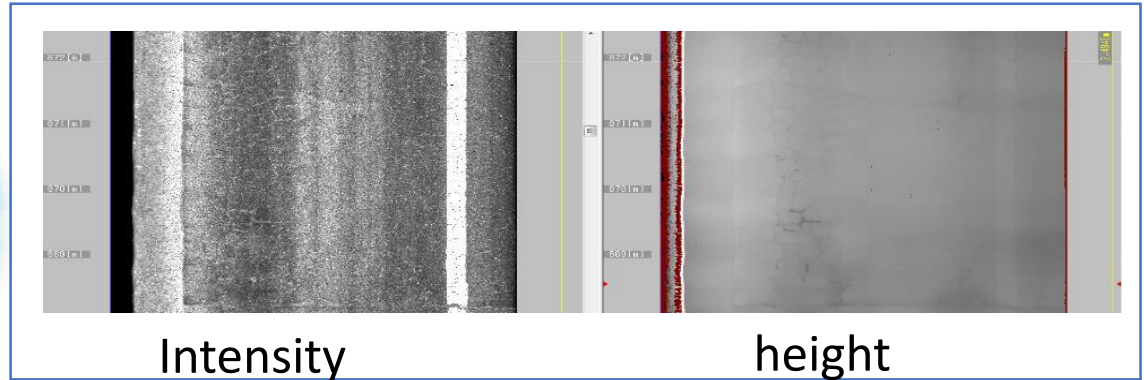
1. About KURABO

2. Our PG-4

3. Our PG-4 - Data Analysis -

PG-4

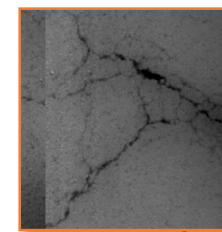
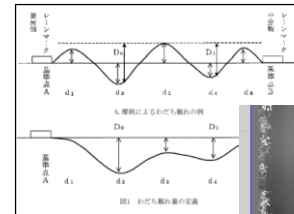
1. Acquisition



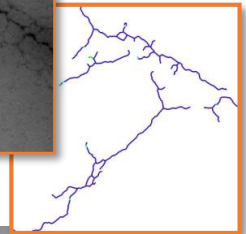
2. Analysis

Auto defect extraction by
using height data

3. Report



Cracks



Rutting



HISTORY

For NEXCO



▲路面性状調査



▲トンネル覆工面調査

**Tunnel & Pavement Scanning
Special vehicle**

PG-4



**Pavement
Compact
scanning unit**

Load to general vehicles



High Speed Scanning (Up to 100 km/h)

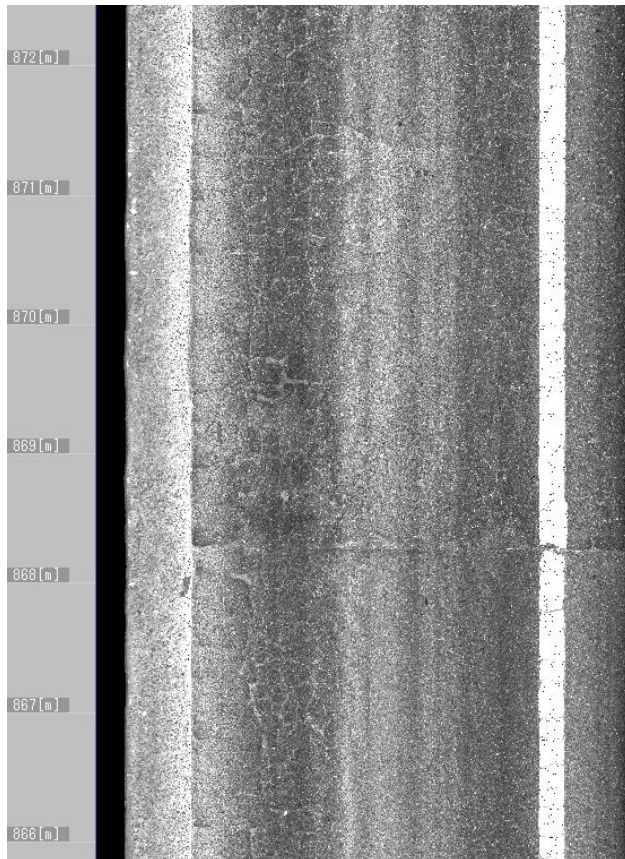


Acquisition Screen in the vehicle

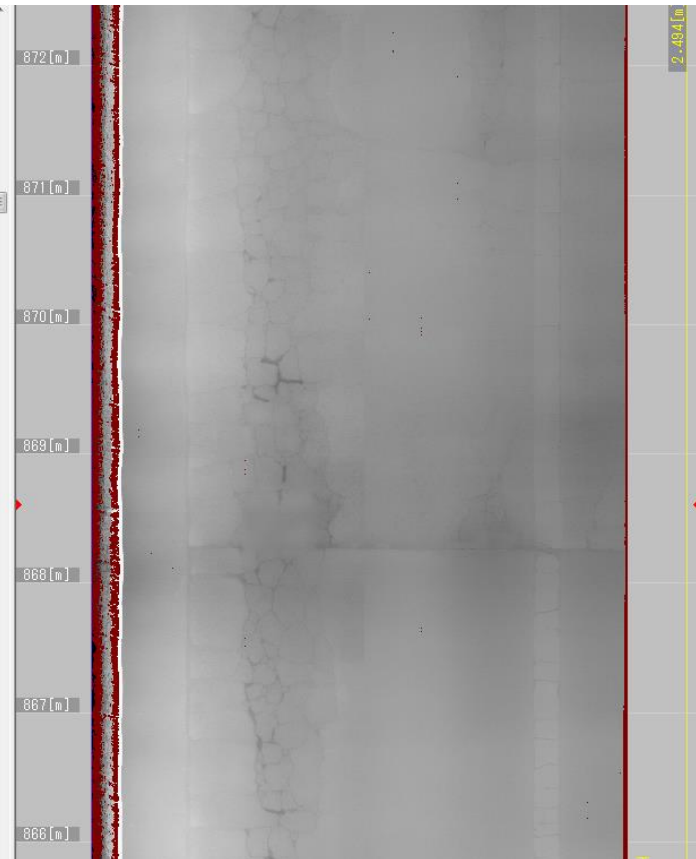


Scanned data

Intensity

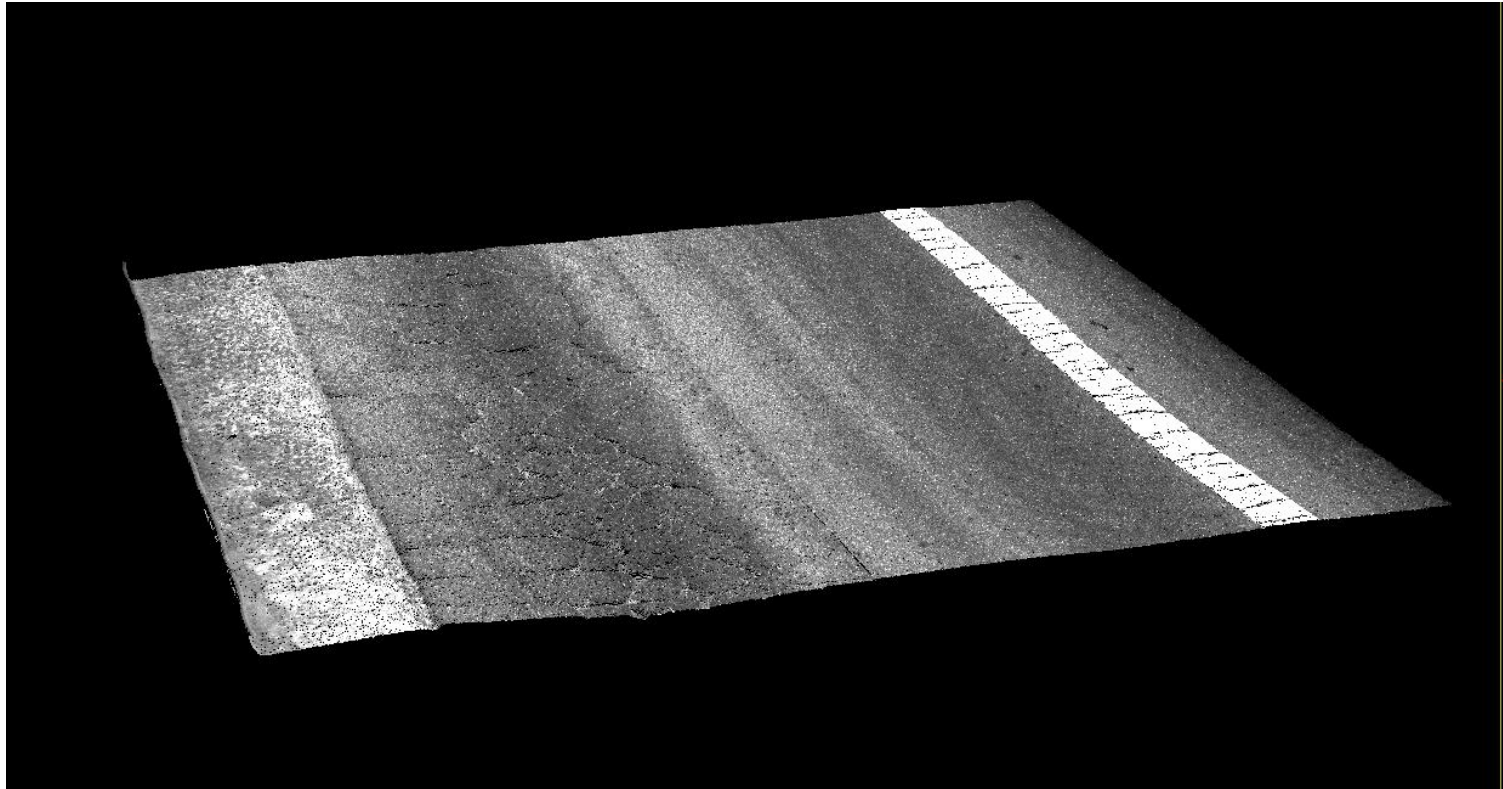


Height



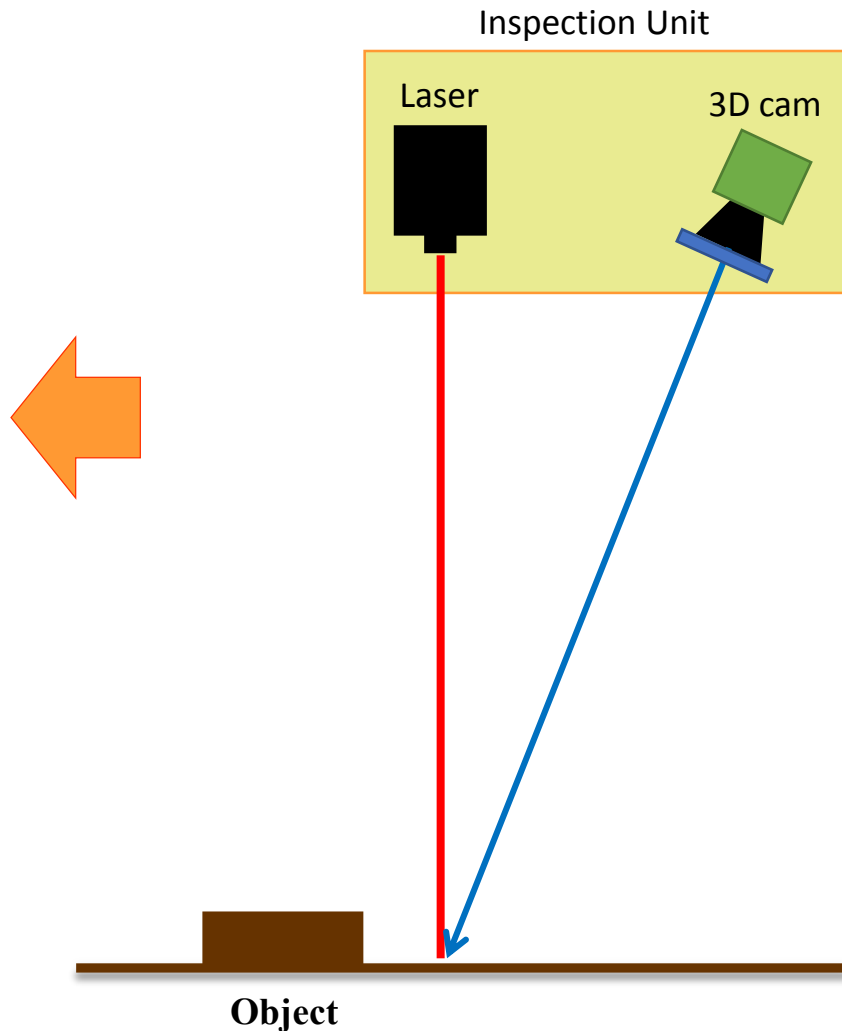
Scanned data

3D Display (Intensity & Height)



Principle

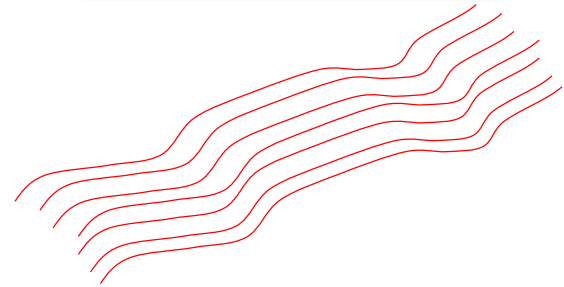
* Side view



Laser

Type : **Infrared Laser**

3D Camera

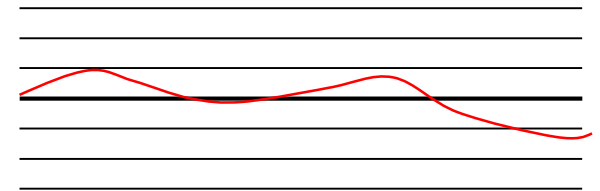
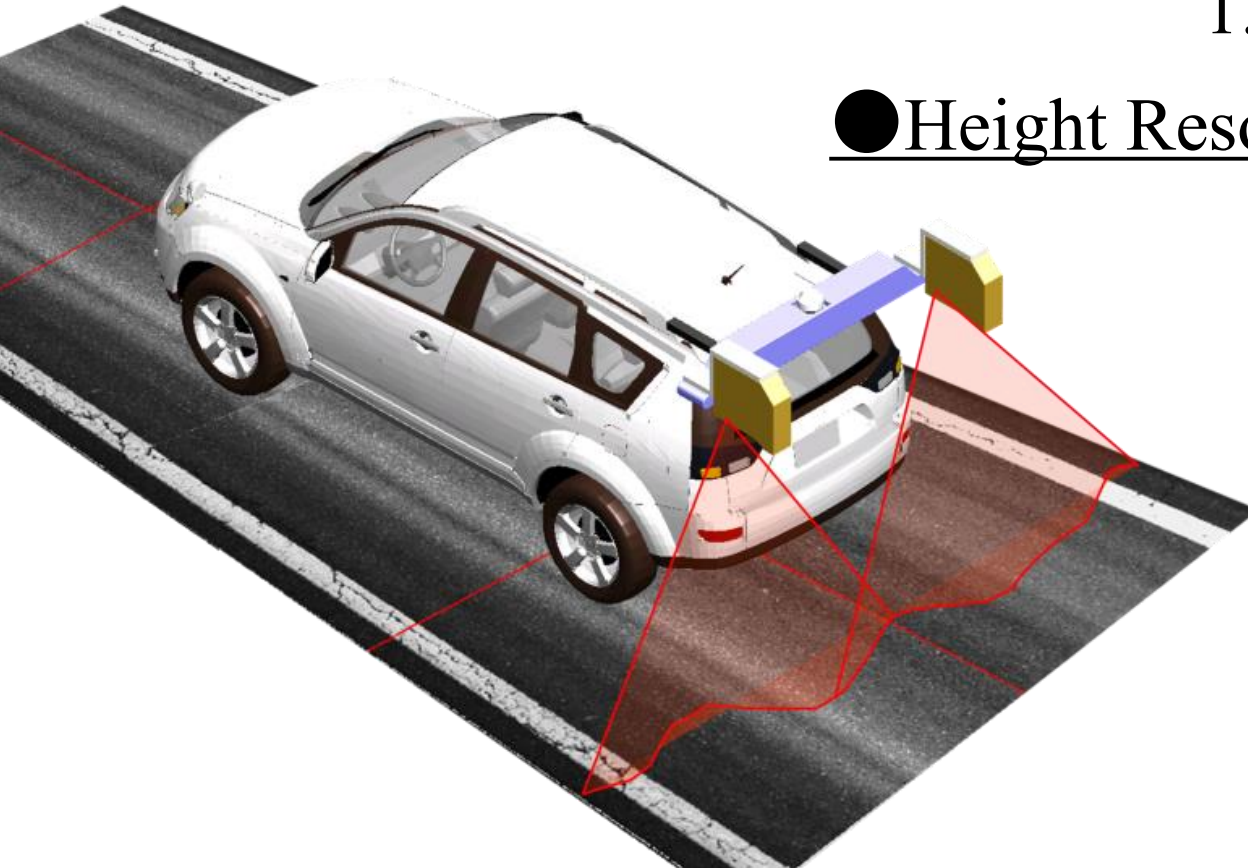


Specification

● Driving direction Resolution:
1.0~4.0mm

● Horizontal Resolution
1.0mm

● Height Resolution: **0.5mm**



Contents

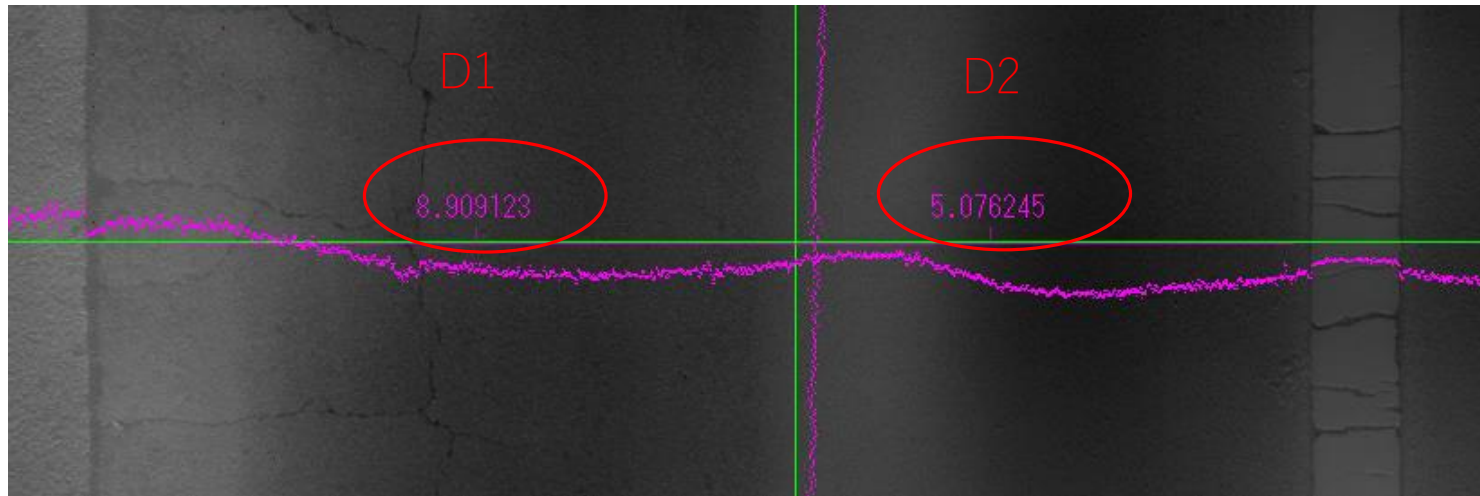
1. About KURABO

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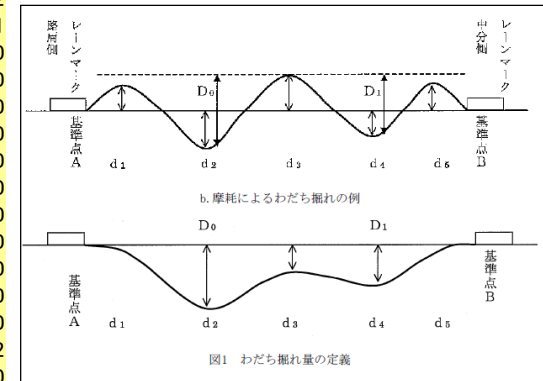
3. Our PG-4 - Data Analysis -

Analysis (Rutting)

Height



Y[KP]	d1Min	d1Max	d2Min	d2Max	d3Min	d3Max	d4Min	d4Max	d5Min	d5Max	D1	D2	DMax	W(-)	F(+)
195	-2.1	0.9	-3.3	0.9	-1.8	1.1	-2.7	0.5	-1.3	0.4	4.5	3.9	4.5	1	0.1
195.001	-2.2	1	-3.9	0.8	-2.2	1.2	-2.5	0.3	-1.2	0.1	5.2	3.7	5.2	1.1	0.1
195.002	-2	0.5	-3.6	0.1	-1.7	1.1	-3.5	0.4	-2	0.4	4.7	4.6	4.7	1.3	0.1
195.003	-1.9	0.9	-3	1	-1.8	1.7	-3.4	0.6	-1.6	0.4	4.7	5.1	5.1	0.9	0.2
195.004	-0.8	0.7	-3	0.7	-2.3	0.8	-3.5	-0.4	-2	0.1	3.8	4.3	4.3	1.3	0.1
195.005	-1.2	0.6	-4.1	0.1	-2.6	0.6	-3.6	-0.1	-2	0.2	4.8	4.2	4.8	1.3	0
195.006	-1.1	0.1	-3.6	0.2	-2.5	0.9	-3.7	-0.1	-2.4	0.2	4.4	4.6	4.6	1.4	0
195.007	-1	0.3	-3.8	0	-2.2	0.9	-4.3	-0.8	-1.9	0.2	4.6	5.2	5.2	1.3	0
195.008	-2.5	0.2	-4.8	-1.6	-3.4	-0.5	-5.3	-1.7	-2.5	0	4.8	5.3	5.3	2.4	0
195.009	-2.2	0.4	-4	-0.5	-2.5	0.4	-4.3	-1	-1.6	0.2	4.4	4.6	4.6	1.7	0
195.01	-2.3	0.1	-4.5	-1.1	-3	-0.2	-4.4	-1.3	-2.3	0.1	4.5	4.4	4.5	2.1	0
195.011	-2.6	0.5	-3.6	-1.1	-3	-0.2	-4.3	-1.4	-2	0.3	3.6	4.3	4.3	1.9	0
195.012	-3.2	0.1	-5.3	-2.2	-4	-1	-4.5	-1	-1.8	0.4	5.3	4.5	5.3	2.4	0
195.013	-3.2	0.2	-4.5	-1.5	-3.7	-0.3	-4.4	-0.8	-1.2	0.5	4.5	4.4	4.5	2.1	0
195.014	-2.9	0.5	-3.9	-1	-3	0.1	-4.1	-0.6	-2.3	0.1	3.9	4.2	4.2	1.8	0
195.015	-3.7	0.1	-5	-1.6	-3.7	-0.3	-3.9	-0.9	-2.1	0.4	5	3.9	5	2.1	0
195.016	-0.7	1.1	-2	0.6	-1.8	1.2	-2.7	0.6	-1.6	0	3.2	3.9	3.9	0.7	0.2
195.017	-1.6	0.5	-2.6	-0.3	-2	0.5	-3.4	0.1	-2.2	0.8	3.1	3.9	3.9	1.2	0
195.018	-1.2	0.4	-3.1	-0.9	-3	-0.4	-2.9	-0.5	-1.6	0.1	3.1	2.9	3.1	1.5	0
195.019	-0.8	0.5	-2.8	-0.5	-2.6	0.6	-3	0.3	-1.4	0.3	3.4	3.6	3.6	1.1	0

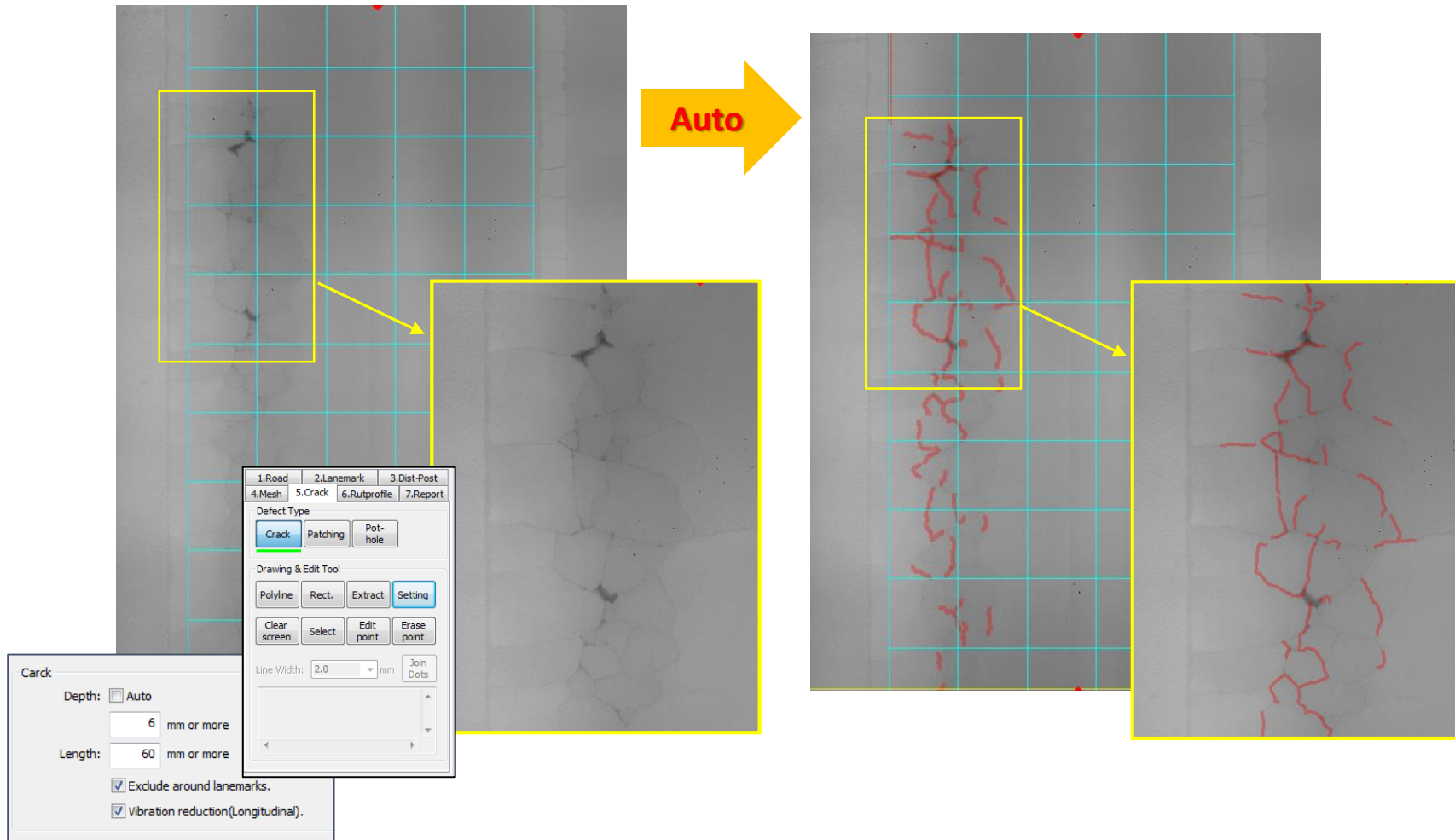


Analysis (Auto Crack Extraction)

Height

◆ Auto Crack Extraction

(Crack width, delete small cracks, auto connection)

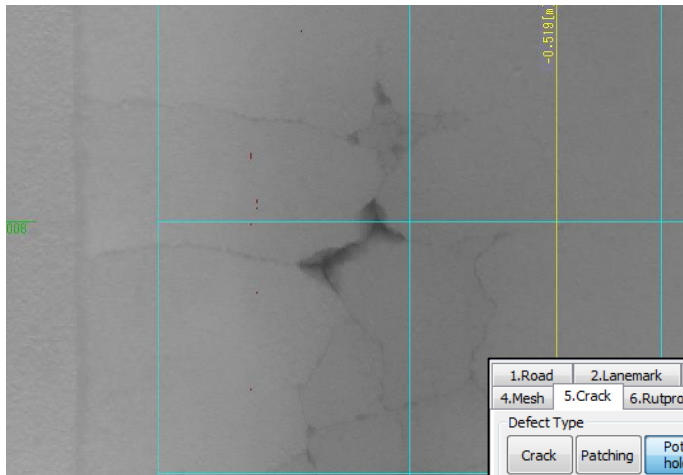


Analysis (Auto Pothole Extraction)

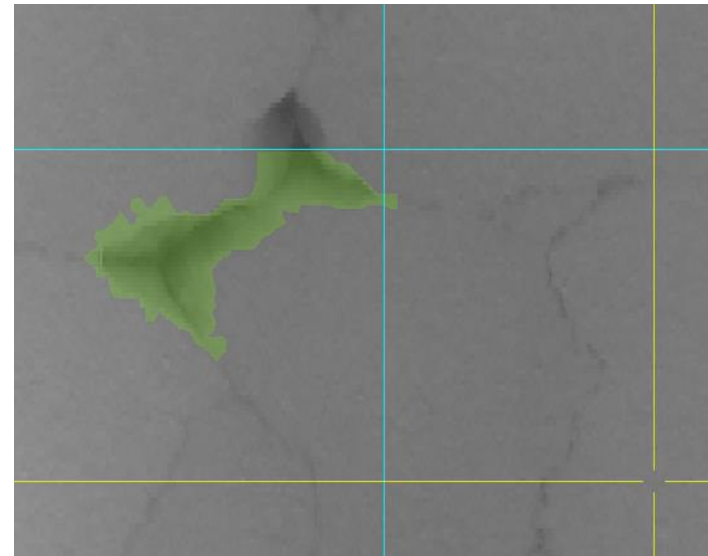
Height

Auto Pothole Extraction

(Specify parameter to detect as crack or potholes.)



Auto



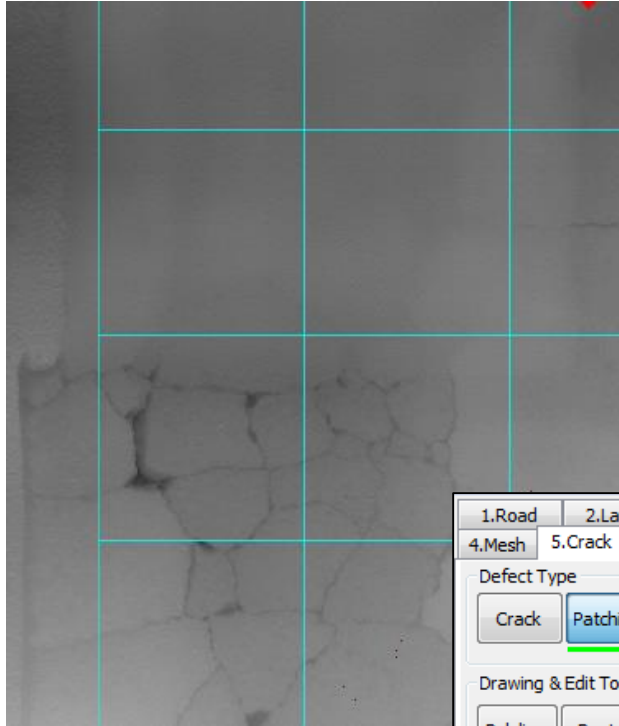
Pothole

Average width: mm or more
Length: mm or less
Average depth: mm or more
Minimum area: square mm

1.Road	2.Lanemark	3.Dist-Post	
4.Mesh	5.Crack	6.Rutprofile	7.Report
Defect Type			
Crack	Patching	Pot-hole	
Drawing & Edit Tool			
Polyline	Rect.	Extract	Setting
Clear screen	Select	Edit point	Erase point
Line Width: 2.0 mm			Join Dots

Analysis (Draw Patching)

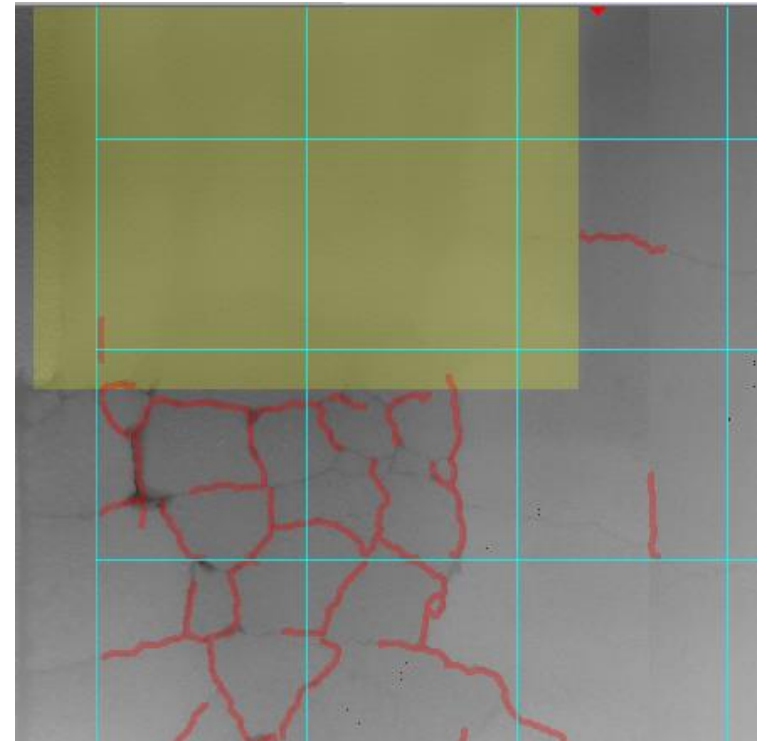
Height



Drawing

1.Road	2.Lanemark	3.Dist-Post	
4.Mesh	5.Crack	6.Rutprofile	7.Report
Defect Type			
Crack	Patching	Pot-hole	
Drawing & Edit Tool			
Polyline	Rect.	Extract	Setting
Clear screen	Select	Edit point	Erase point
Line Width:	2.0	mm	Join Dots

Draw Patching



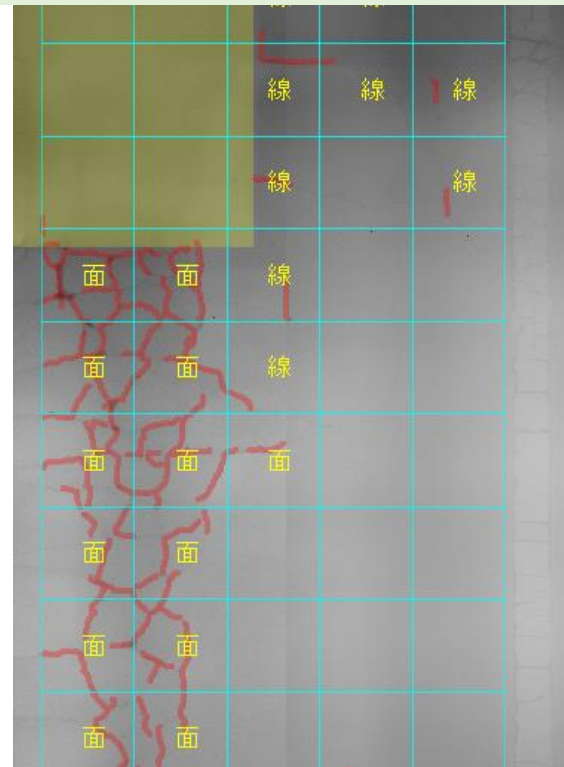
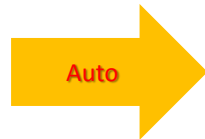
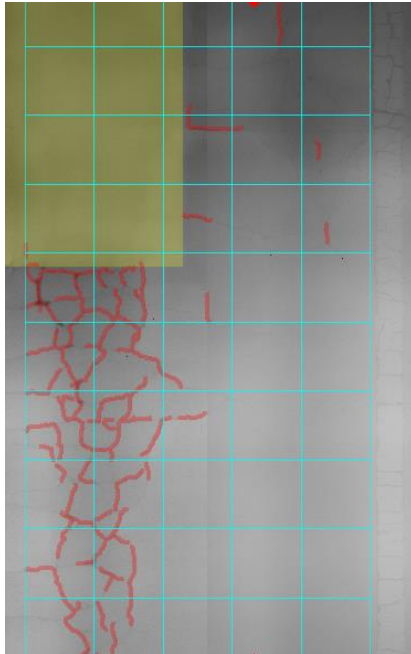
Analysis (Draw Patching)

Mesh Judgement

Area: Several cracks in one mesh

Line crack: Single crack

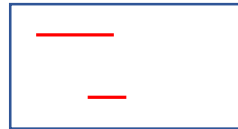
*Detect Vertical crack or
Horizontal crack



Line (Vertical)



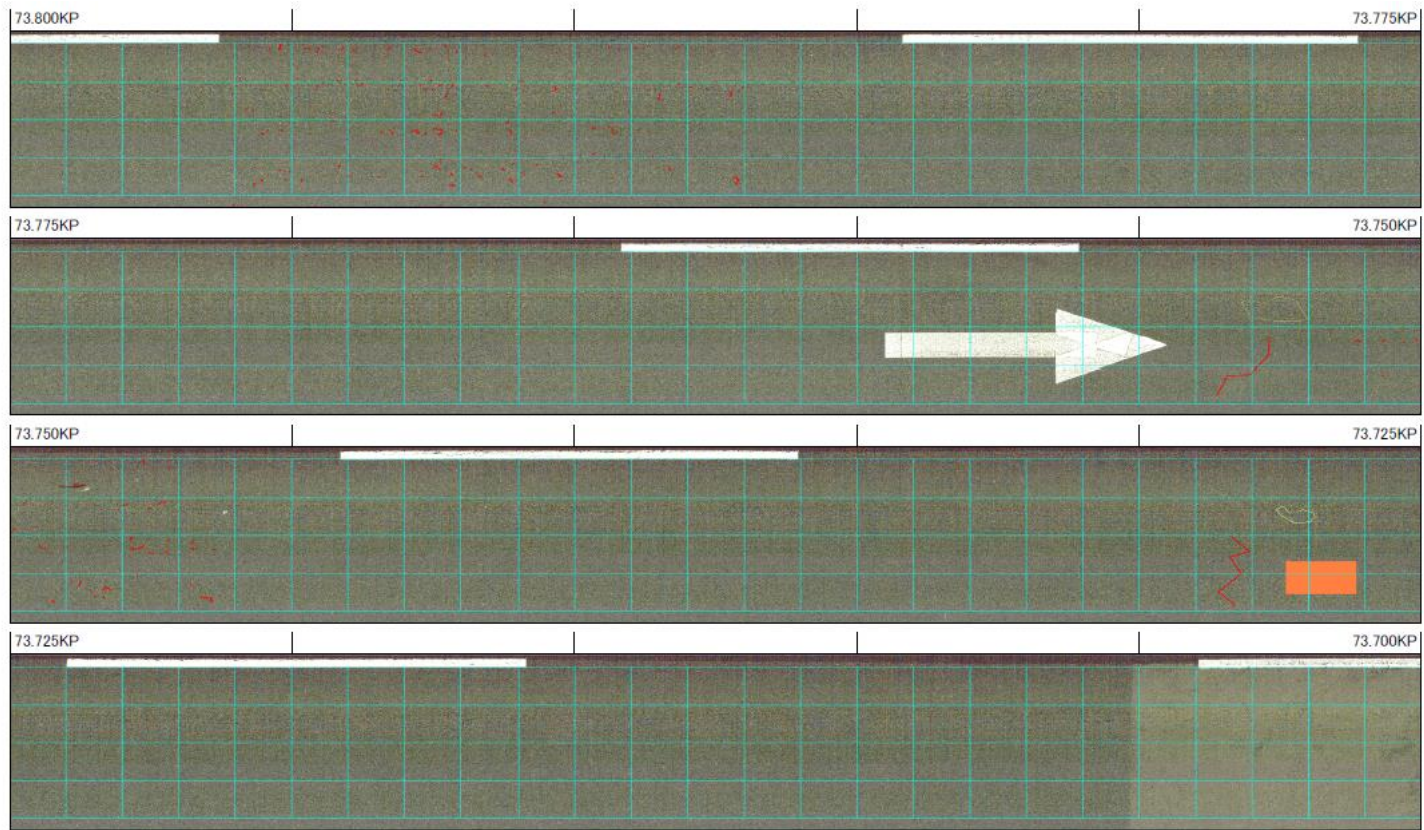
Line (Horizontal)



Area



Report



KP	Crack Evaluation (25m) %					Crack Evaluation (100m) %				
	Cracks		Potholes (sqm)	Patching (sqm)	%	Cracks		Potholes (sqm)	Patching (sqm)	%
	Crocodile	Line				Crocodile	Line			
73.800 – 73.775	24	10	0.000	0.000	27.000	36	20	0.034	0.965	10.786
73.775 – 73.750	2	4	0.016	0.000	3.218					
73.750 – 73.725	10	6	0.018	0.965	12.924					
73.725 – 73.700	0	0	0.000	0.000	0.000					

Features

Anytime measurement

2D camera



A shadow of pole

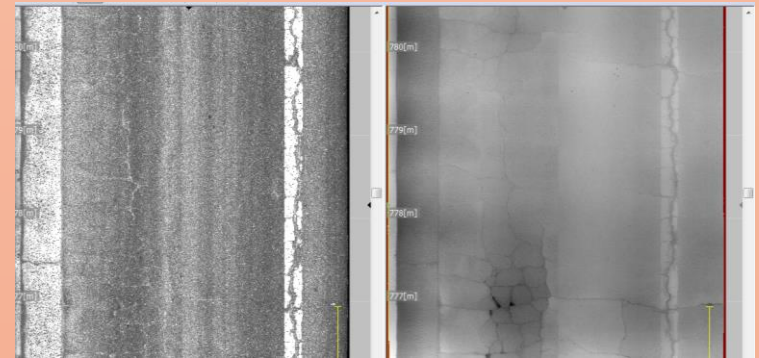
3D camera

In the market, most of the 3D cameras Product are influenced by ambient light such as sunlight, etc.

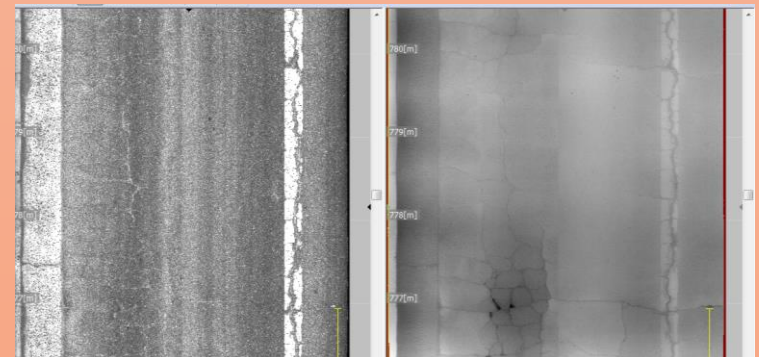
KURABO camera

Intensity

Height

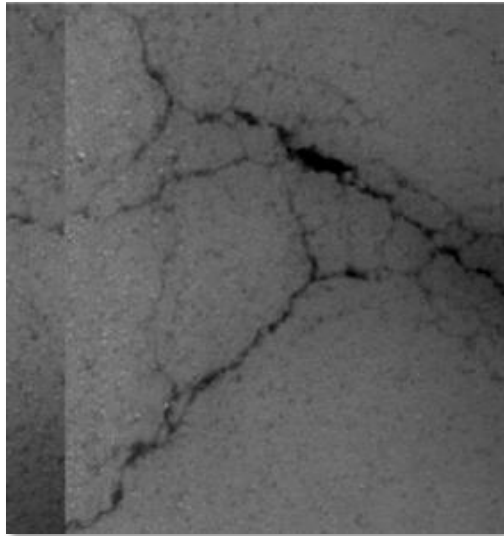


Daytime



Nighttime

Quantitative evaluation



Crack image



Human error



Same result by a computer

Other features

- Open source hardware makes user easier to do maintenance
- Available to handle raw data for your evidence of the report
- No annual license fee



Thank you...