AIRLINE + UNIVERSITY: AN INNOVATION FACTORY

Eurowings Group

Example I
Example II
Example III

About me…

Michael Stamm

NDT researcher &
MSCA Fellow

brussels airlines

NDT Researcher
- Development of a water & ice detection system
- Project management

KU LEUVEN

PhD Candidate in material sciences
- Supervising thesis
- Perform scientific experiments and publish papers

MARIE CURIE ACTIONS

MSCA Fellow
- 100% EU funded position und Horizon 2020

Flemish funded R&I project partner
- Coordination of DETECT-ION project

UNIVERSITÄT BONN

M.Sc. in Physics
- B.Sc. thesis in Detector physics
- M.Sc. thesis in Geophysics

Example I

Example II

Example III

Photo: Samir Patel

Corroded floor beams

brussels airlines

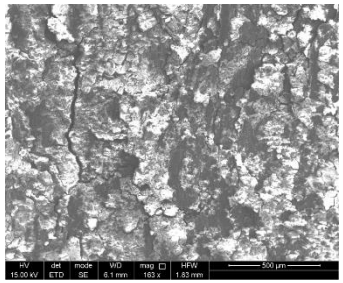
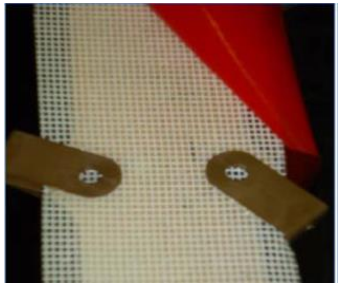
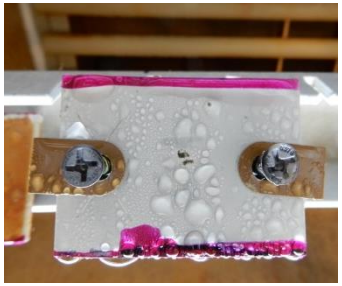
Cooperation since 2008

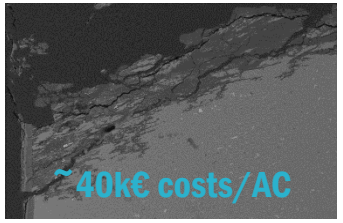
KU LEUVEN

Student project about corroded floor structures

Corroded floor beams

Problem	Investigation	Action	Test	Implementation
corr. floor beams	Fractography chem. analysis	Av-DEC HI-TAK®	Repetitive tests	~ 8 k€/AC



brussels airlines

KU LEUVEN

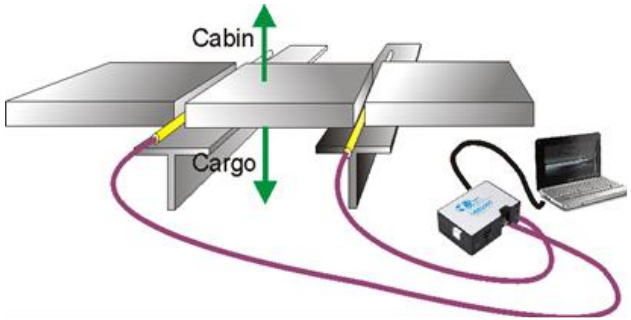
KU LEUVEN

KU LEUVEN

brussels airlines

Work performed by KU Leuven, student project by Ruben Windey, Helge Pfeiffer, Prof. Martine Wevers

Percolation sensor



Implementation by LHT

- D-ABIX (B737)
- D-ABVX (B747)
- D-ABVM (B747)

brussels airlines → KU LEUVEN → Lufthansa Technik

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Example I

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Photo: Samir Patel

NDTonAIR

Problem

Water and Ice
in fuel tanks

NDTonAIR

EU funded (H2020)
research project

250 k€

NDTonAIR

MARIE CURIE ACTIONS

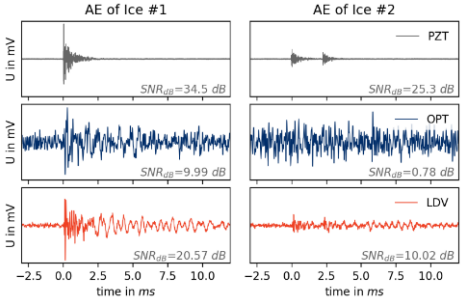
brussels airlines

KU LEUVEN

Achievements

Scientific conference
presentation

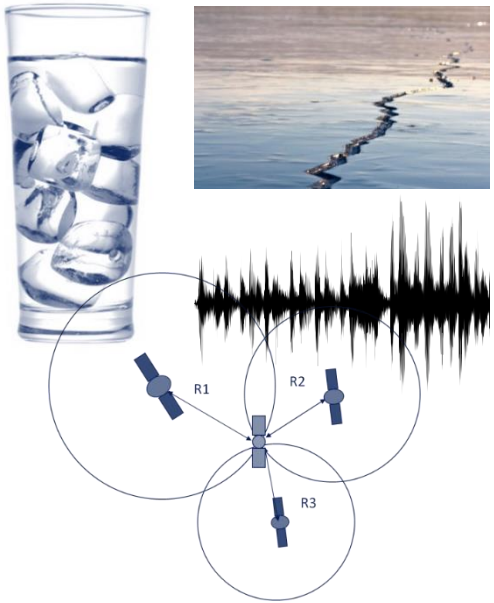
12th ECNDT
GOTHENBURG·SWEDEN·2018



NDTonAIR

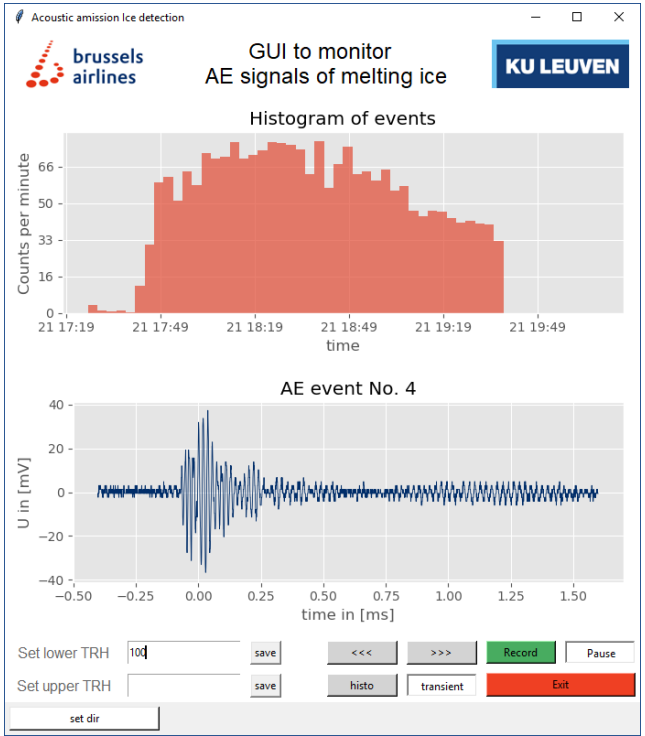
Approach

Acoustic Emission



Current status

Up to three signals/second



Goal

Ready to use measurement tool

Better understanding of ice in fuel tanks

Example I

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DETECT-ION

Until now:

Problem | Investigation | Action | …

Proactive innovation:

Technology | Application | Development | Prototyping | …

Development of DIC tool as a
standard aircraft maintenance tool.

KU LEUVEN

brussels airlines

MatchID
Metrology beyond colors

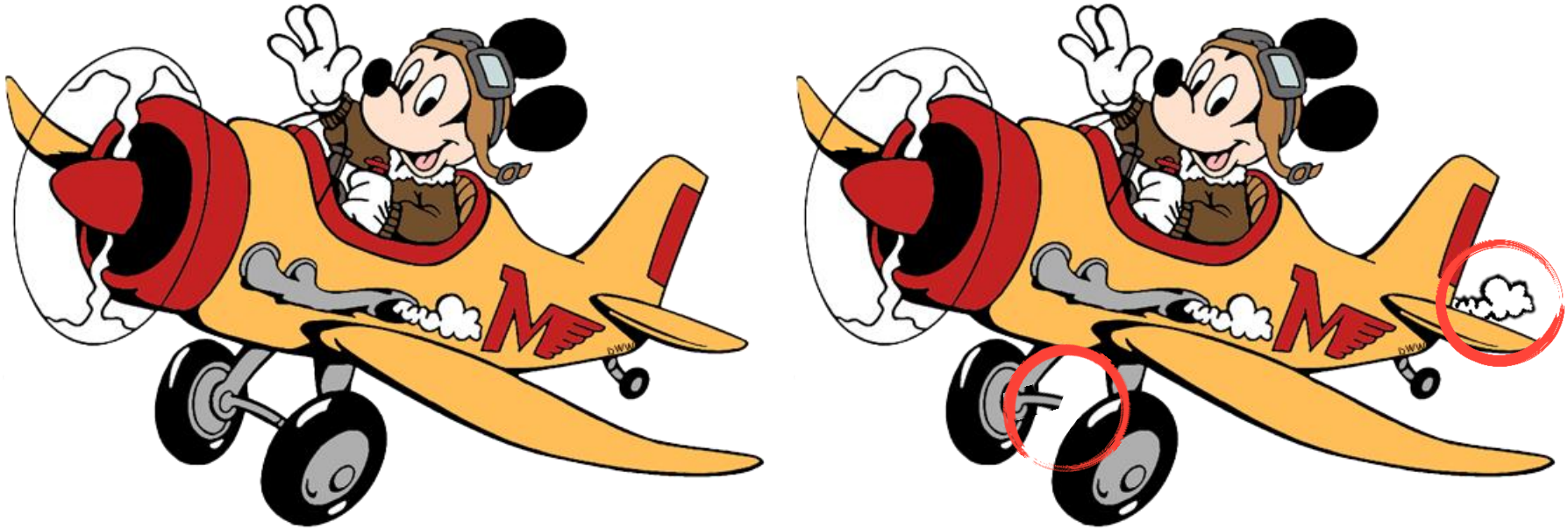
220 k€

SIEMENS

Eurowings Group

DIC principle

Digital Image Correlation



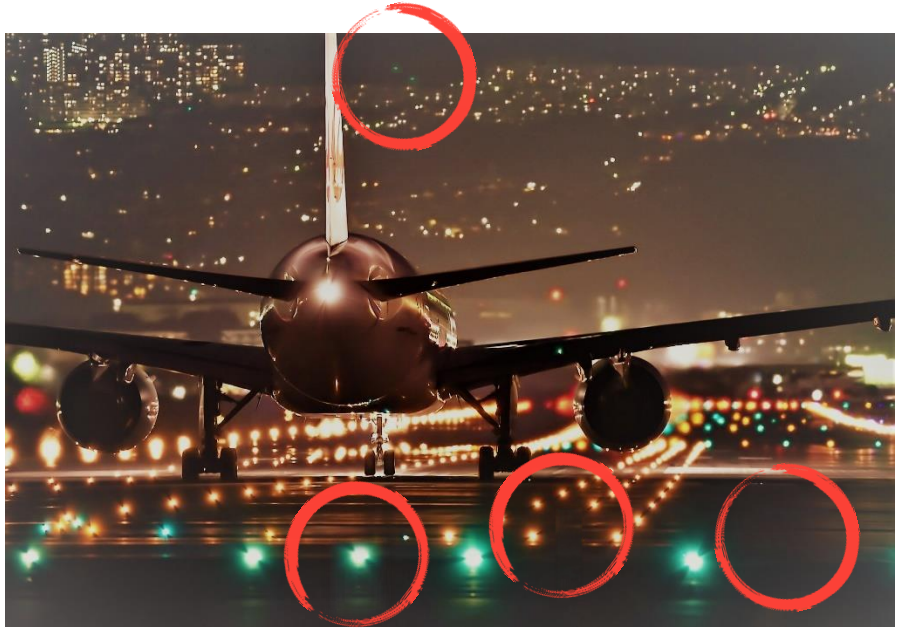
DIC principle

Digital Image Correlation

pixabay.com

DIC principle

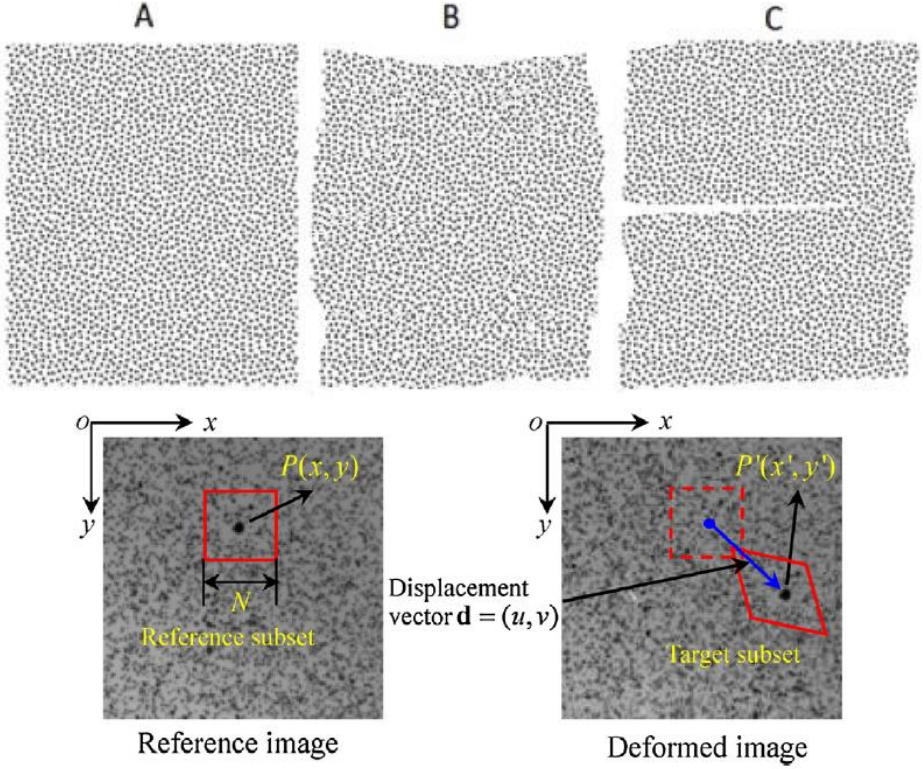
Digital Image Correlation



pixabay.com

DIC principle

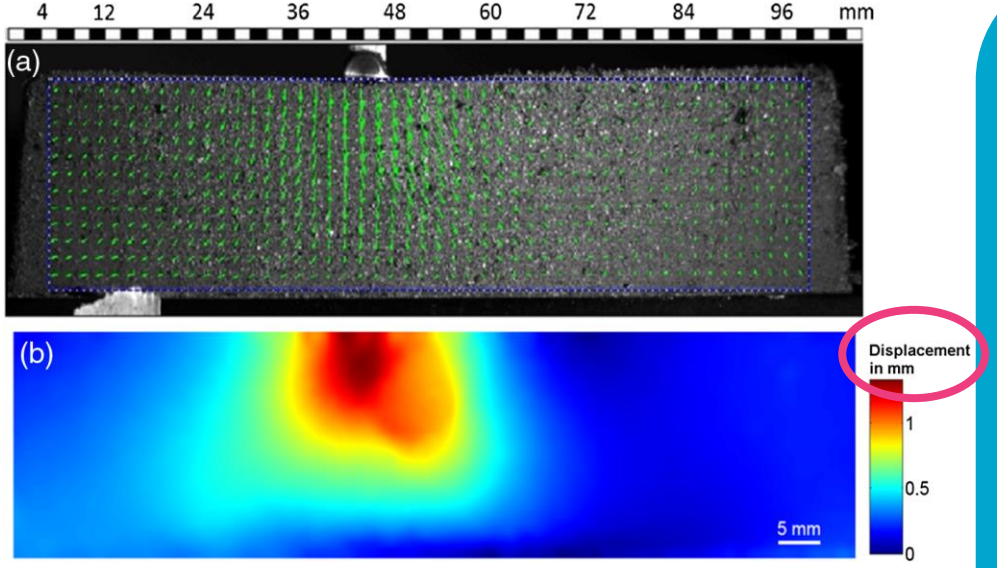
Digital Image Correlation



- Compare reference image with actual image

DIC principle

Digital Image Correlation



- Compare reference image with actual image
- Calculate displacement

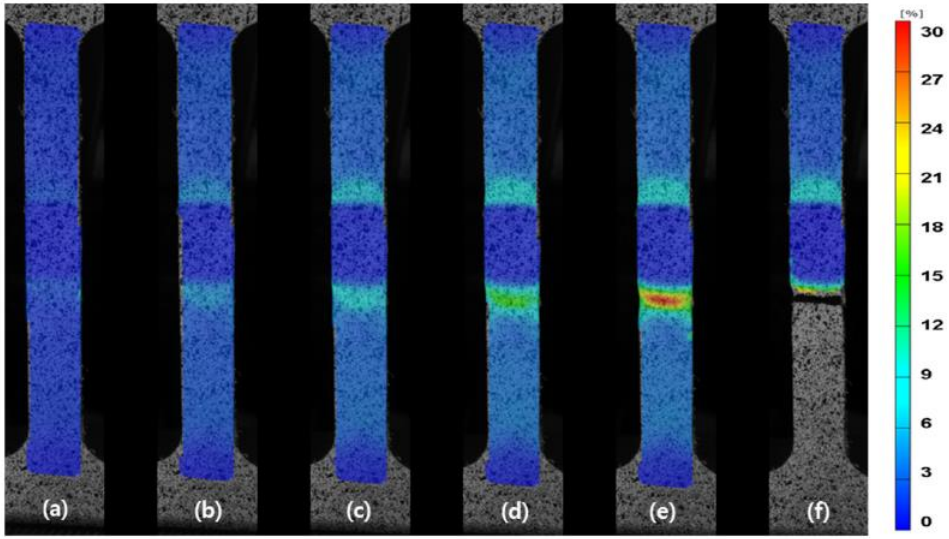
Until now:

2D displacement + reference image!

DIC principle

Digital Image Correlation

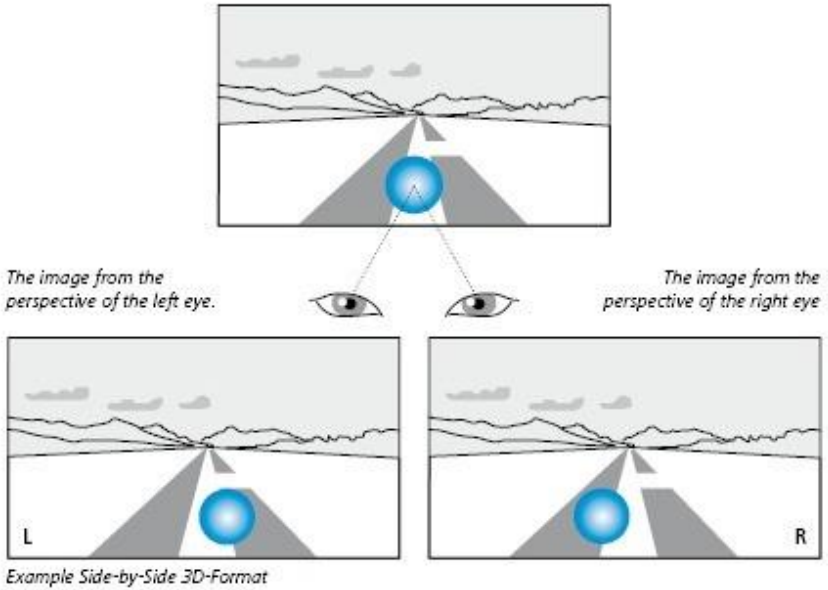
Strain calculated using material properties
(thickness, strength, length…)



- Compare reference image with actual image
- Calculate displacement
- With material properties: Calculate strain and stress

From 2D to 3D…

3D image reconstruction

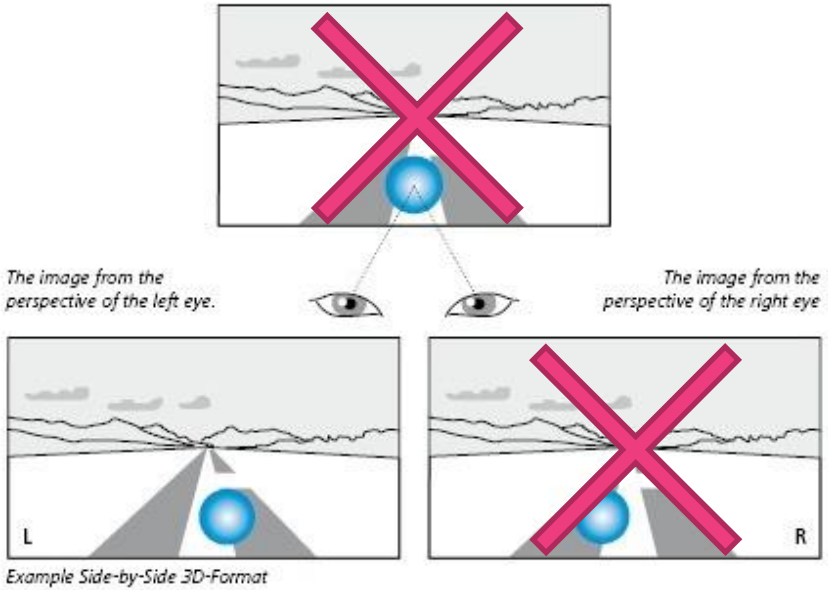


Example Side-by-Side 3D-Format

thetechjournal.com

From 2D to 3D…

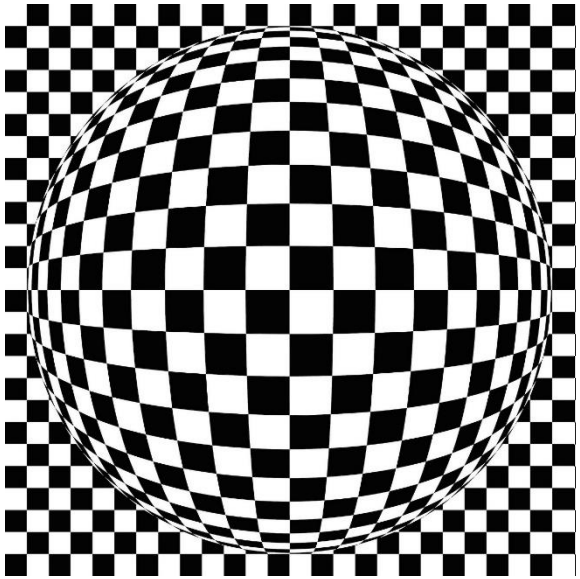
3D image reconstruction



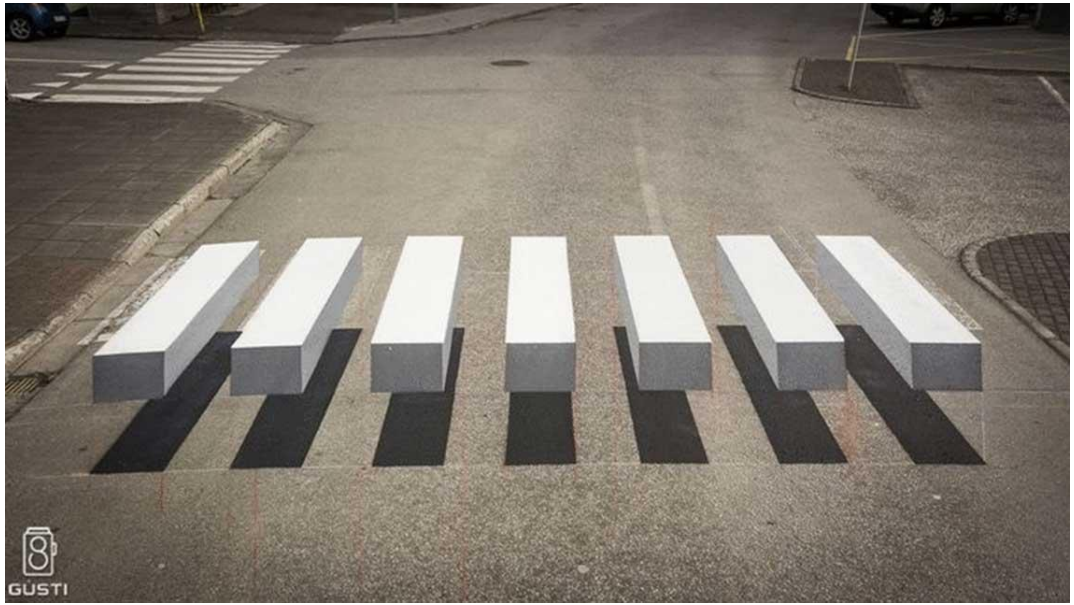
Example Side-by-Side 3D-Format

- Two eyes/cameras required

From 2D to 3D…



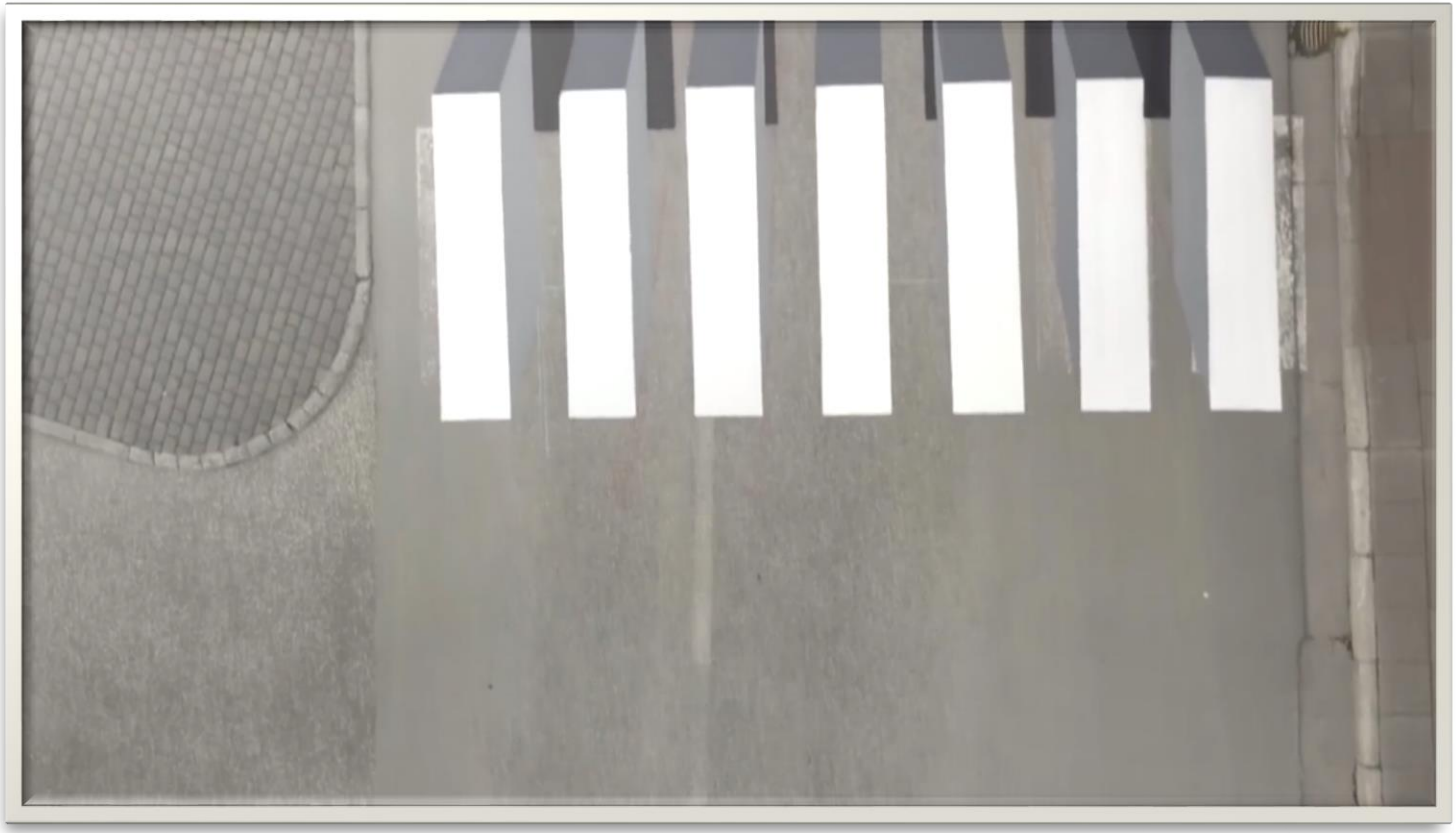
pixabay.com



Gústi Productions

3D only with two images/eyes?

From 2D to 3D…



From 2D to 3D…

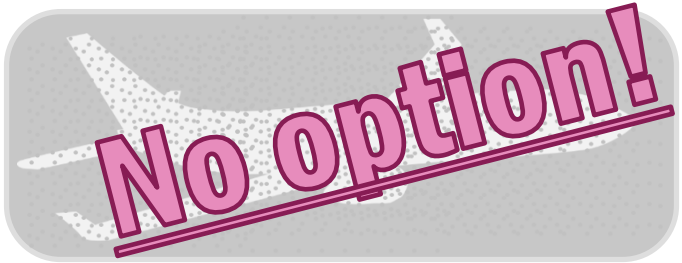
3D image reconstruction

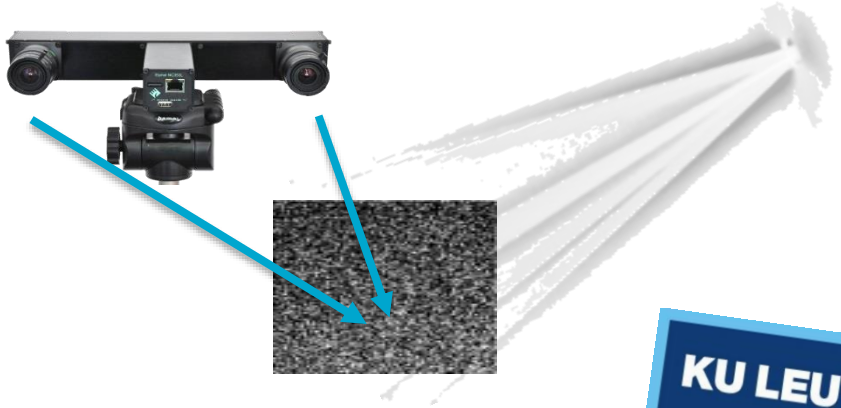
pixabay.com

- Two eyes/cameras required
- Otherwise: (good) illusion!
- Known patter helps for 3D reconstruction!

Application in aviation…

Speckle pattern and reference image?!



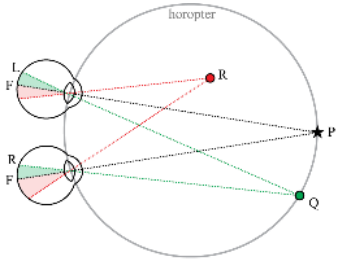


KU LEUVEN

Projection of KNOWN pattern
+ stereo camera
+ reconstruction software

3D surface shape reconstruction

Learn from nature…



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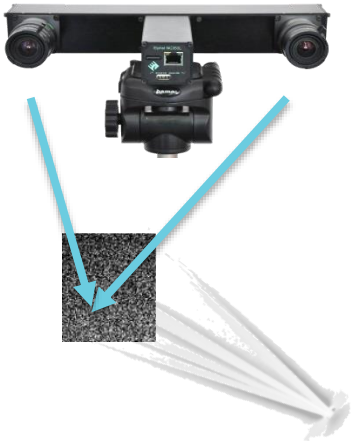

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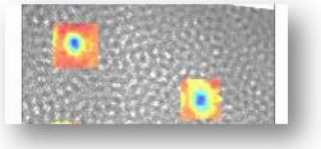

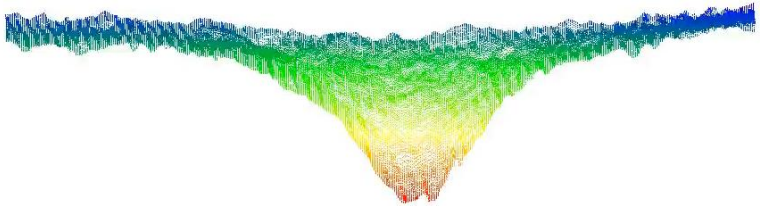

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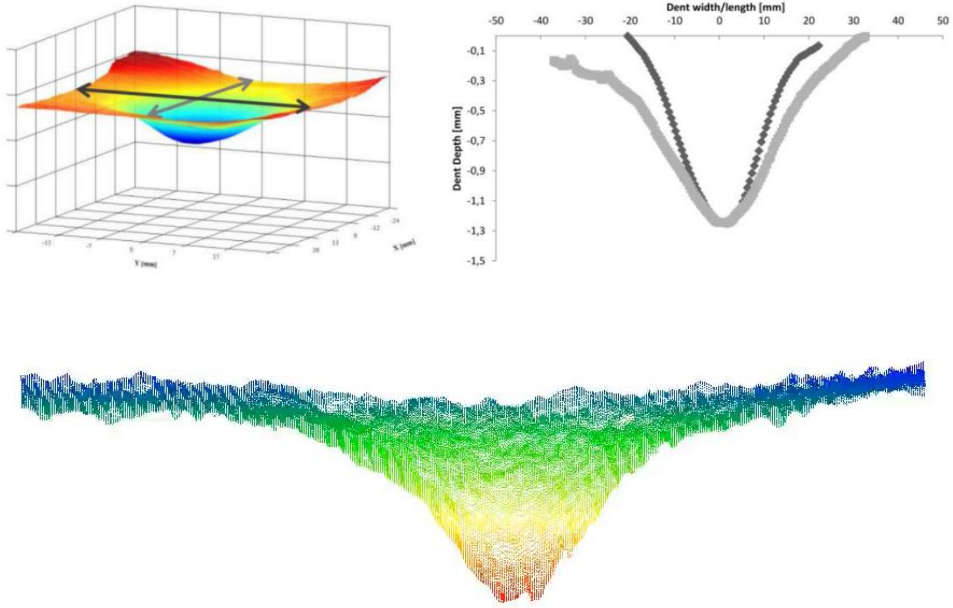
Advantage of DIC system

Resolution of 3D reconstruction
1/100 pixel → **0.02 mm**

- High accuracy
- Large field of view

Advantage of DIC system

Full 3D surface reconstruction…



- High accuracy
- Large field of view

Advantage of DIC system

MatchID
Metrology beyond colors
KU LEUVEN

Case study : July 2015

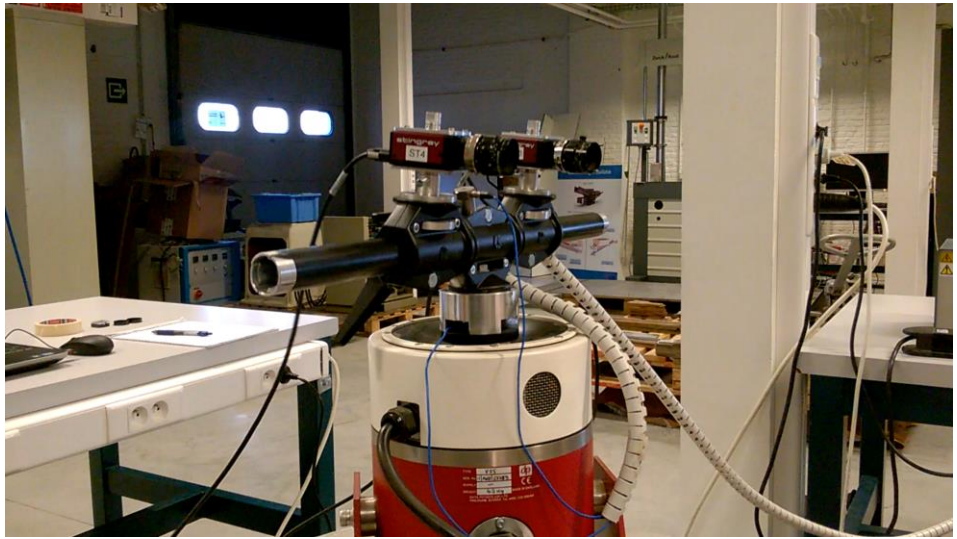
- High accuracy
- Large field of view
- Easy to use

Eurowings Group

Work performed in cooperation with KU Leuven and MatchID, Dimitri Debruyne & Pascal Lava

Advantage of DIC system

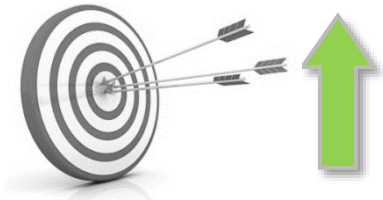
Drone inspection possible?



Work performed by KU Leuven, Ruben Balcaen

- High accuracy
- Large field of view
- Easy to use
- Fast image capturing

Advantage of DIC system



Drone inspection possible?

Yes!

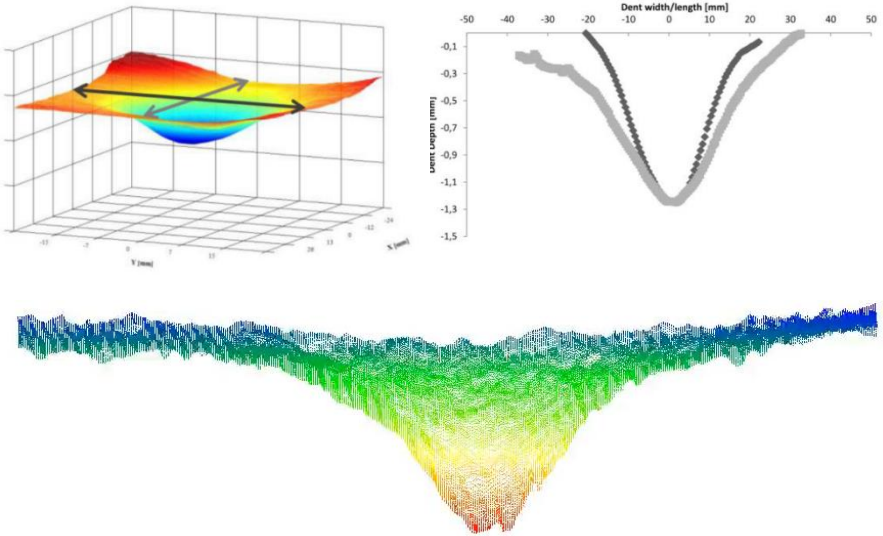
AIRBUS

- High accuracy
- Large field of view
- Easy to use
- Fast image capturing

“The future depends on what you do today…”

- Mahatma Gandhi

- Single dent inspection
- Not fully atomized
- Estimate depth, size and position



- Full A/C screening
- Zonal inspection
- Fully automated – with drone?!

Eurowings Group

Thank you…

Michael Stamm
NDT researcher &
MSCA Fellow

brussels airlines

Johan Reynaert
Danny Vanspringel
M&E department

KU LEUVEN

Helge Pfeiffer, Martine Wevers
Dimitri Debruyne
Ruben Balcaen

MatchID
Metrology beyond colors

Pascal Lava

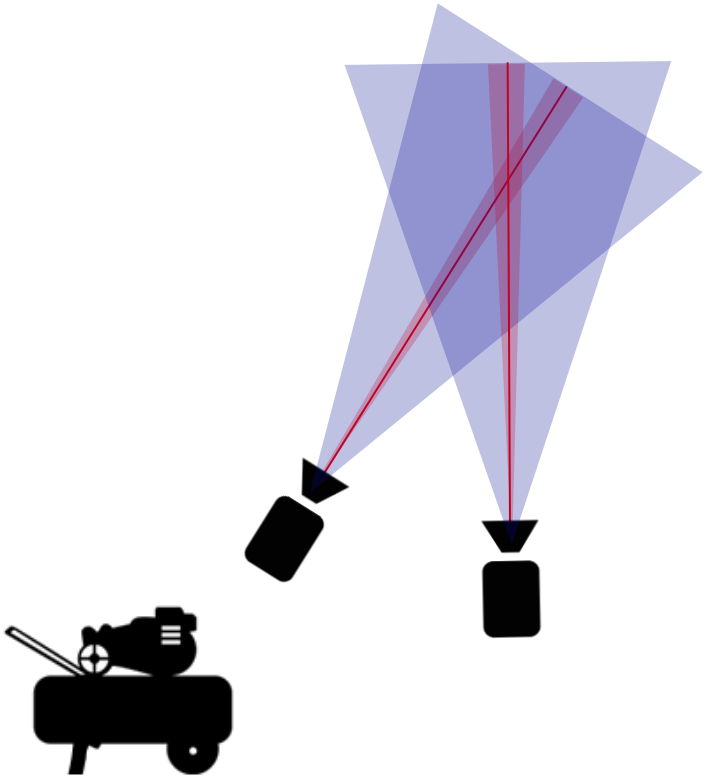
NDTonAIR

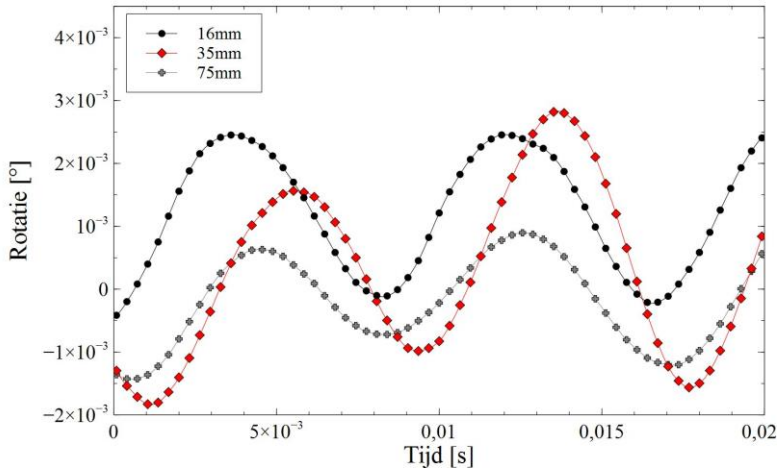
Marco Ricci
Stefano Laureti
Pietro Burrascano

This project has received funding from the H2020-MSCA-ITN-2016 under grant agreement No 722134.

ADD-ON

VIBRATING CAMERA SYSTEM





Work performed by KU Leuven, Ruben Balcaen

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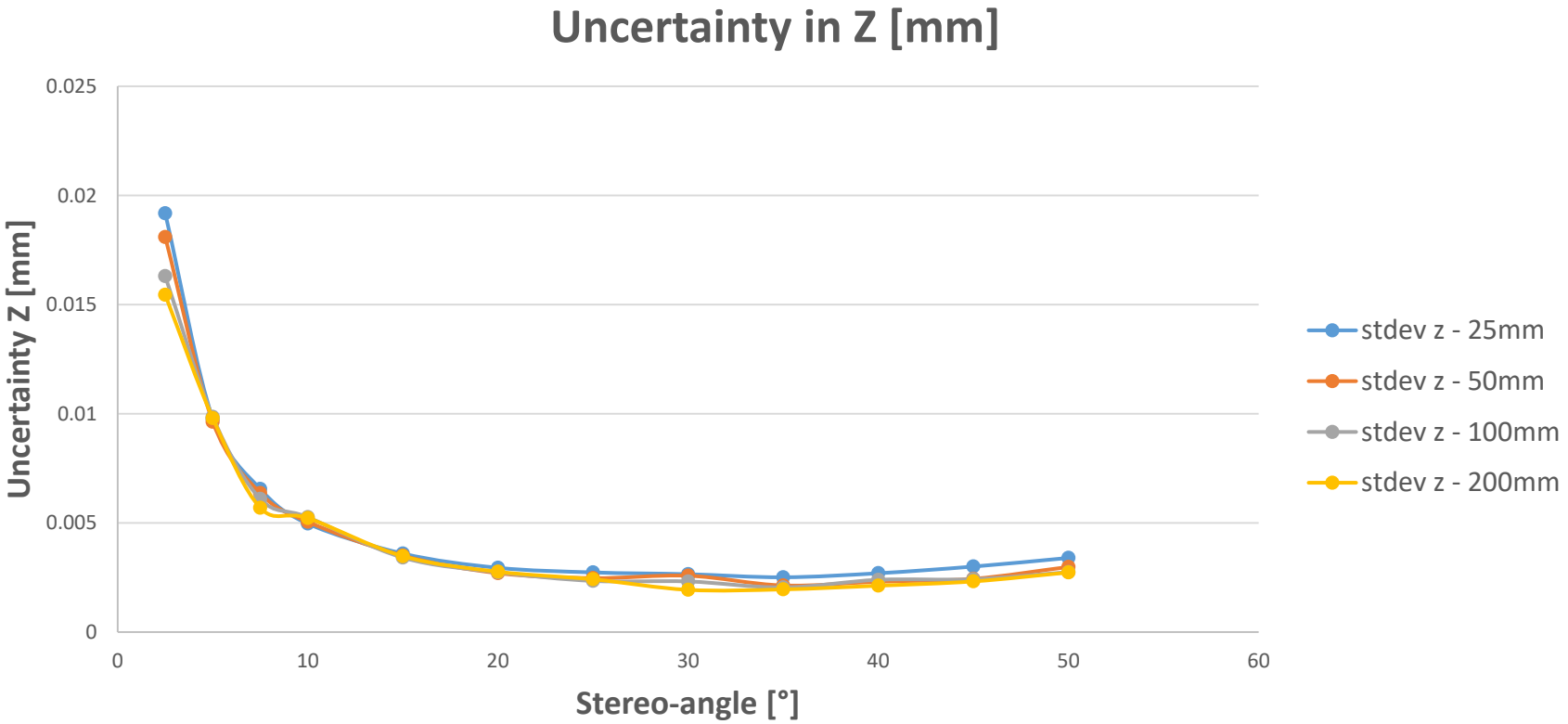
CAMERA SYSTEM CONFIGURATION



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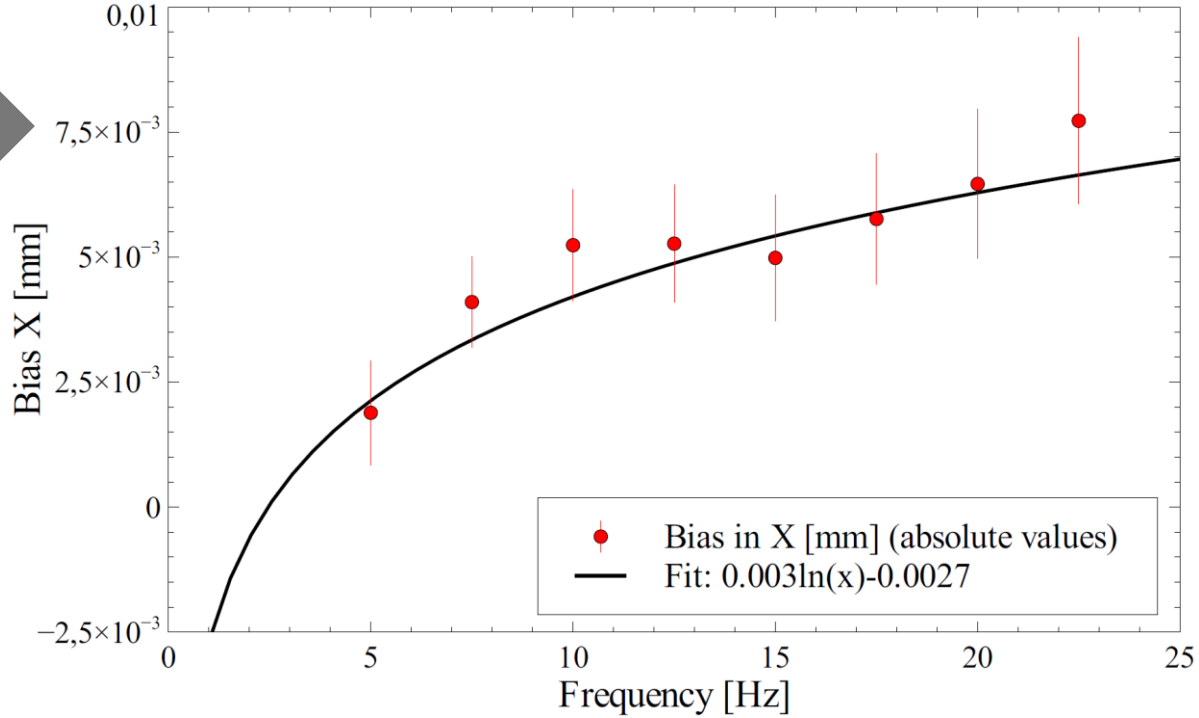
VIBRATING CAMERA SYSTEM

0.0075 mm



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SINGLE DENT INSPECTION