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Intelligent Automation

Automatic Surface Defect Quantification in 3D

Mitul Tailor, Jon Petzing, Michael Jackson, Rob Parkin
Wolfson School of Mechanical and Manufacturing Engineering, Loughborough University

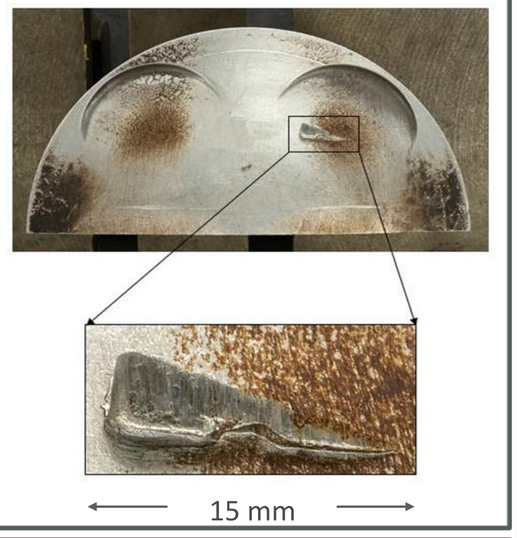
Introduction

Automated surface defect inspection is growing in demand and requires better measurement and automated analysis systems

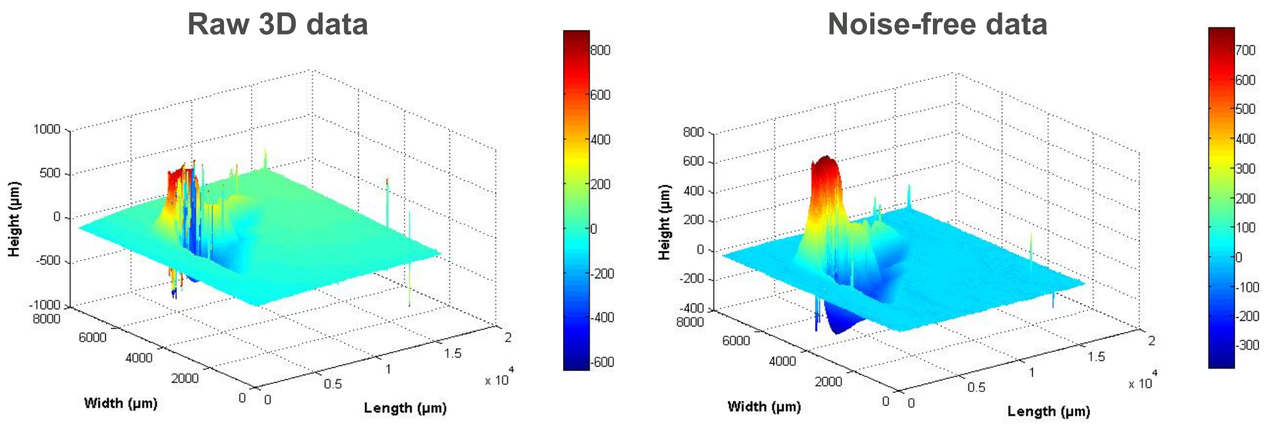
- Automotive manufacturing industries may reject parts with small surface features that are considered as defects
- Small surface defects may cause operational failure at later stage
- Surface feature measurement is a key element in Quality Assurance
- 3D analysis should a provide quantitative approach

Problem Statement - Defects

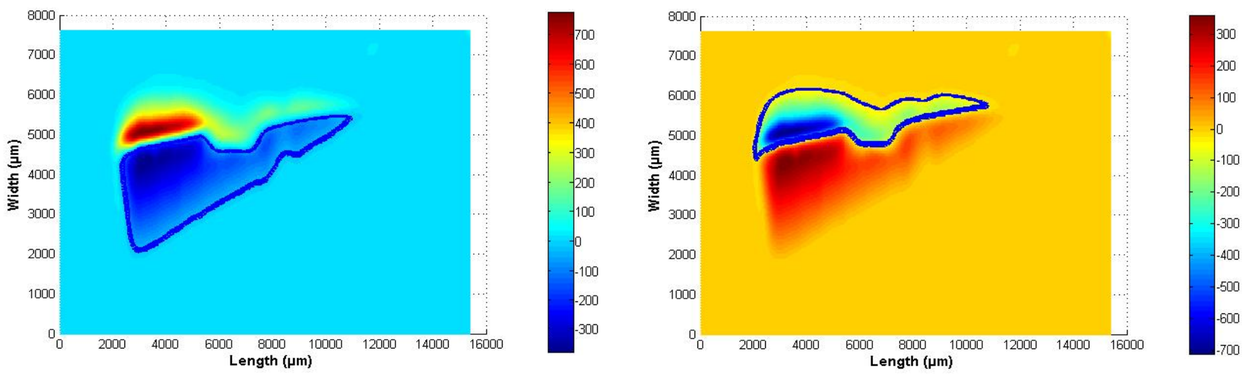
- No standards to isolate and quantify surface defects
- Existing manual solutions are subjective, qualitative and exhibit issues of repeatability
- Issues of traceability can influence confidence in data



Novel Solution



Raw Data → Noise removal → Surface fitting → Defect Isolation → Quantification

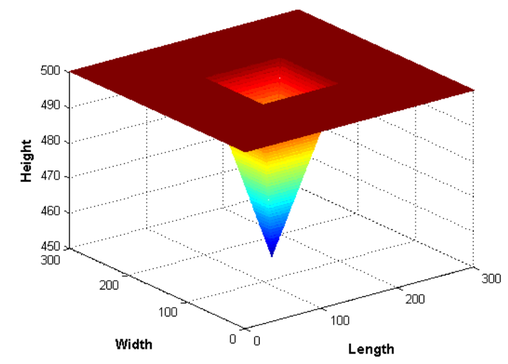


Surface fitting | Isolated defect

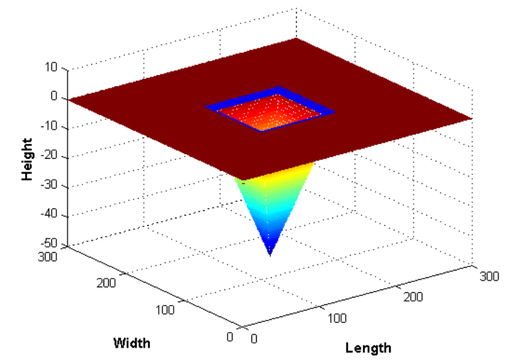
- 3D data acquired using Alicona InfiniteFocus
- Measurement time : 60 s – 80 s
- Computational time: 18 s – 20 s

Quantification	Negative defect	Positive defect
Depth (mm)	0.4	0.7
Area ()	12.7	7.2
Volume ()	1.4	1.5

Confidence in Novel Solution



Traceability



Isolated defect softgauge

Quantification	True Value	Measured Value
Depth	50	49.9
Area	10,000	9,980
Volume	166,666.67	165,670

Results

Demonstrated the confidence in high speed, repeatable, traceable and automated defect quantification system in 3D.

- Realised a novel defect quantification algorithm.
- Created a novel known size defect Softgauge.

Future Work

- Develop a feature based classification system
- Investigate other methods to deliver even faster solutions
- Develop an algorithm for multiple defects quantification
- Investigate different 3D measuring techniques
- Integrate 3D measuring instrument with 6 axis robot

Contact Details: Mitul Tailor, M.Tailor@lboro.ac.uk