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Similarity Evaluation of Topography Measurement Results by Different Optical Metrology Technologies

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Introduction

- Compared two 3D scanners Structured Light System (SLS) and Focus Variation Microscopy (FVM)
- SLS is a real time, live 3D scanner
- FVM is an industry standard scanner
- Sample used: Additive manufactured (AM) part with varying topographies
- Objective: Quantitatively determine the significant correlation of the surface scanned by two 3D scanners using Pearson's Correlation Coefficient (PCC)

Techniques



Structured Light System (SLS)



Focus Variation Microscopy (FVM)

Methodology



SLS Original Scan

Scan the entire sample with SLS Scanner Units: mm



SLS Cropped Scan

Crop the windows from each scan to match FVM's one window view Units: mm



Align the SLS window and FVM window for comparison Units: mm



FVM Original Scan Scan a single window of the sample with FVM scanner

Units: mm



FVM Down Sample

Scale down the number of data points in the FVM sample to increase efficiency in data comparison Units: mm



Alignment

Perform Statistical Analysis - PCC

1 represents exact match, 0 represents no correlation, -1 represents inverse correlation

Results





Discussion

- We have proved quantitatively that the same surface scanned by different systems have a higher PCC value
- If the experiment were to be replicated, a better alignment algorithm should be considered and more data should be collected
- After proving SLS is comparable to FVM, SLS could be applied to other applications such as: pot-hole recognition, art work, forensics, and in-situ monitoring of 3D printing process



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Same surface: High PCC value: 0.8

Different surface: Low PCC value: 0.4

