New Image Registration Code Yields Improved Throughput for NIF Flaw Detection System

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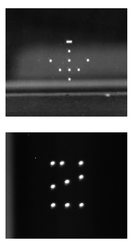
During the past year the NIF Optics Inspection (OI) team designed a custom algorithm that significantly improved the time required to image optics on the Flaw Identification and Characterization Station (FICS). The new method leverages a variance filter and a two-stage adaptive threshold to detect fiducial marks in diffusely-lit optics. Using this algorithm has saved an average of 20 minutes per optic over nearly 2000 inspections to date.

Most Final Optics Have Fiducials

Fiducials are marks on the optic surface, outside of the NIF beam's footprint, that serve as anchors for mapping sites on the optic and tracking them over time and across different types of inspections.



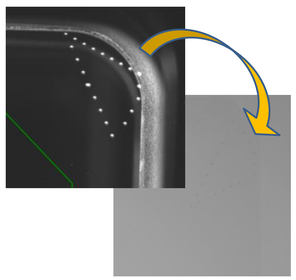
Registration is the process of finding and identifying these fiducial patterns.

FADLiB Fiducials are Hard to Find

A FADLiB (Full Aperture Diffused Light Box) inspection illuminates the fiducials, and any surface flaws, with a diffuse light.

The Optics Inspection software could not find fiducials in these images.

Registering FADLiB Optics Was Slow

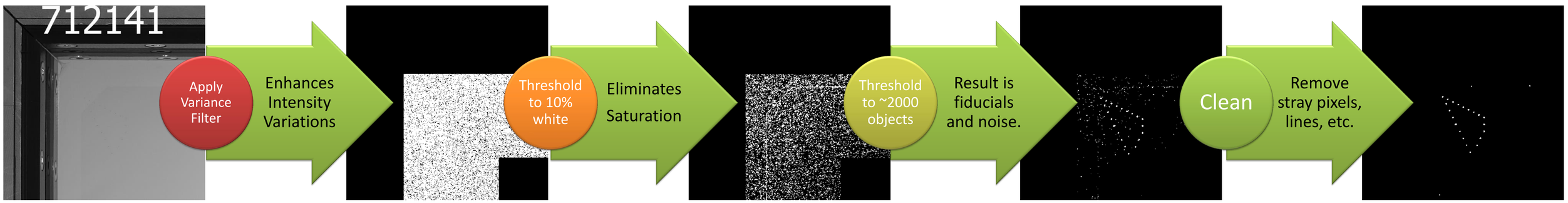


The previous method for registering FADLiB imagery involved acquiring an additional image of the optic using more direct illumination, obtaining a registration solution for the additional image, and applying the solution to the FADLiB image.

Taking the extra image added a significant amount of time to the imaging process.

Can We Register FADLiB Images Directly?

A Statistical Variance Filter And Two-Stage Adaptive Threshold Reveal Diffusely-Lit Fiducials



Start with a FADLiB image (upper-right corner shown).

Threshold T = 0.00001, image masked.

T = 0.000052.

T = 0.0024

The fiducial cluster, ready for registration.

This new code eliminates the extra image, saving the FICS station operators 20 minutes per optic.

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