

Zone-Based Interim Verification Method for 2D Vision Measurement Systems Using Non-Calibrated Artifacts: Performance, Spatial Consistency, and Future Applications

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Abstract-

This paper presents a zone-based method for the interim verification and spatial metrological characterization of a 2D vision measurement system. The approach relies on a system calibrated along a single axis and employs a stable yet non-calibrated artifact, demonstrating that spatial performance assessment can be achieved without the need for fully calibrated artifacts distributed across the entire field of view. To enable this process, a custom-designed reference standard was developed, providing a straightforward, robust, and cost-effective solution for performing interim verification tasks. The proposed method provides a structured framework for evaluating both precision and spatial consistency across the measurement surface, even in the absence of fully calibrated standards distributed across the surface. The method is applicable to a wide range of vision-based measurement systems, including those supporting industrial Optical Character Recognition (OCR), while maintaining alignment with established metrological principles. When combined with complementary optical performance tests, the approach supports robust and repeatable interim verification strategies in advanced manufacturing metrology.

Index Terms- manufacturing metrology; 2D vision measurement systems; interim verification; zone-based characterization; non-calibrated artifact; optical dimensional inspection; measurement uncertainty; vision-based metrology; industrial inspection; OCR systems

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