FULL-FIELD 3-D TOPOGRAPHY OF TRANSPARENT SURFACES UTILIZING LOW COHERENCE INTERFEROMETRY

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ABSTRACT: In this study, a rapid full-field surface profile measurement system for objects with transparent surfaces is developed. The measurement is executed with a Mirau type microscopic interferometer accompanied by a single vertical scanning stage and an auto-focusing algorithm. Based on the idea of shape from focus and the characteristic of interference forming only when the optical path of two beams of low coherent light is close, it enhances the high-frequency signal at the focusing position of transparent surfaces and achieves the purpose of high precision positioning. Experiments were carried out with both micro profile evaluation for a small part of objects and full-field macro profile inspection via an X-Y stage. The scope for horizontal measurement is defined within the travelling range of X-Y stage and the maximum vertical scanning stroke is 20 mm offered by the adopted Z stage. Dependent on the sampling spacing and travel range in vertical scanning, the positioning time for a single measurement is usually 0.1~1.5 seconds. Conducting the measurement with a 20X Mirau interferometric objective lens the current measuring accuracy has reached sub-micrometer level.

Keywords: mirau type microscopic interferometer, low coherence interferometry, transparent surfaces, profile measurement, auto-focusing .