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Multi-surface wavelength-tuning phase-shifting interferometry

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Measurement methods represented by phase-shifting interferometry can profile surface shape with high accuracy and are widely used for the measurement of optical elements. These methods for the optical elements with a single surface have been extensively developed, but for transparent optical flats with highly parallel front and rear surfaces, the superposition of the reflected harmonic signals corresponding to the separate surfaces leads to a challenging reconstruction of the surface shapes. The wavelength-tuning phase-shifting interferometry (WPI) achieves phase-shifting by tuning the wavelength of the light source, so the corresponding interference harmonics of measured surfaces have different phase-shifts (frequencies), which lays an important foundation for the simultaneous reconstruction of multiple surfaces. Using the frequency difference as a basis for measurements, in general, multiple surfaces WPI can be decomposed into three steps: the design of sampling schemes, the solution of harmonic frequencies and the demodulation of harmonic initial phases. It will introduce the proposed techniques for these steps. The simulations and experiments comprehensively validate the effectiveness of the proposed techniques. Meanwhile, the above techniques have been applied to the prototype wavelength-tuning phase-shifting interferometer.

Short Bio:

Yingjie Yu graduated from Harbin Institute of Technology in China with a doctoral degree. Now she is a professor and the dean of the School of Mechatronic Engineering and Automation of Shanghai university (SHU), and the leader of the laboratory of applied optics and metrology at SHU. She is also the vice chair and secretary-general of the precision machinery branch of China instrument and control society(CIS). Her research areas include optical interferometry, digital holography, computational Imaging.