

Phase-shifting Deflectometric MoirAC Topography

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Summary

It is an urgent need in engineering to measure the three-dimensional (3-D) shape of an object with specular surfaces by using optical techniques, despite some attempts for performing this task. This paper presents a moirAC-based technique for measuring the three-dimensional shapes of specular surfaces. In it, a Ronchi grating is closely located before the measured object and illuminated by a diffusive light source. When we observe the measured object through this grating, moirAC fringes are generated by the superposition of this grating and its virtual image produced by the measured specular surface. With this scheme, the movements of the grating along the vertical direction introduce phase shifts in these moirAC fringes so that their phases can be recovered by use of a self-calibrating phase-shifting algorithm. From the phases, the three-dimensional shape of the specular surface is further reconstructed. In so doing, some restrictions and limitations of the existing techniques are eliminated, and the validity of this technique has been demonstrated by experimental results.

