Toward the generation of reproducible synthetic surface data in optical metrology

Abstract

The implementation and generation of synthetic data for testing algorithms in optical metrology are often difficult to reproduce. In this work, we propose a framework for the generation of reproducible synthetic surface data. We present two study cases using the Code Ocean platform, which is based on Docker and Linux container technologies to turn source code repositories into executable images. i) We simulate interference pattern fringe images as acquired by a Michelson interferometric system. The reflectivity changes due to surface topography and roughness. ii) We simulate phase maps from rough isotropic surfaces. The phase data is simultaneously corrupted by noise and phase dislocations. This method relies on Gaussian-Laplacian pyramids to preserve surface features on different scales. The proposed framework enables reproducible surface data simulations, which could increase the impact of algorithm development in optical metrology.