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3D image reconstruction with Fourier transform

To detect the roughness and texture morphology of a surface, the optical profilometry is an usual technique based in Fourier transform analysis and interfeometry of light reflected by objects.

The application of the Fourier transform to projected fringe patterns provides a robust method for three-dimensional surface reconstruction. When sinusoidal fringes are projected onto an object, their deformation encodes the local geometry as phase variations. Through spectral analysis in the Fourier domain, the carrier can be isolated, unwanted harmonics filtered, and the phase map accurately extracted. The recovered phase show the surface profile details using the system's sensitivity function and the acquisition geometry.

In this work, we explain the experimental setup details of camera and projector calibration for data images acquisition. For data images processing, we use only two images of an object with a periodic pattern over and two images of a periodic pattern only, from which we obtain the Fourier transform in reciprocal space and we select the order filter to finally, we process the Fouier inverse tranformation for 3D image reconstruction.

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