MULTIVIEW PROFILOMETRY FROM TOMOGRAPHIC DIFFRACTIVE MICROSCOPY

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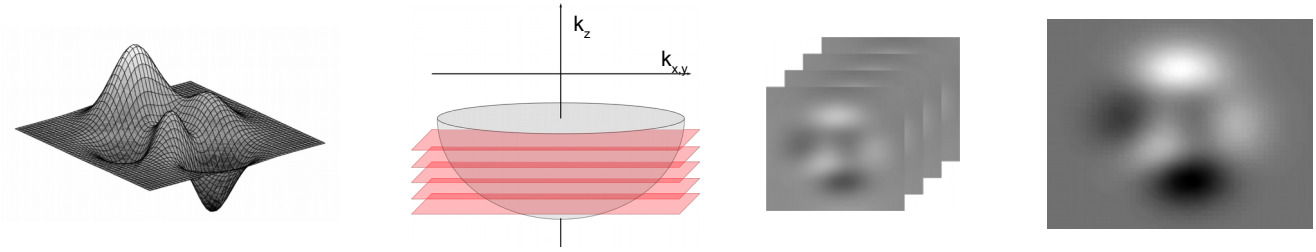
Tomographic Diffractive Microscopy (TDM) is a technique, which permits to image unprepared specimens by numerical recombination of the measured scattered field, according to the diffraction tomography theorem [1]. TDM can be implemented in transmission [2], as well as in reflection [3], and in both cases, resolution can be doubled [3-7], compared to conventional microscopy.

For corrugated surfaces, a TDM setup can also be used to perform profilometry, with only the rugosity or shape of the surface of the sample to be retrieved [4]. The main drawback of this approach is its limitation to small angles of illumination or soft slopes samples.

Starting from the work of Wombell and DeSanto [5], we have extended their approach to full 3D, thus enhancing its applicability to a TDM setup. First results based on simulations are presented.
From a numerical surface model, a collection of diffraction patterns in Fourier space are first generated from multiple illumination angles. For each angle of illumination, the simulated image is then retropropagated onto the reflection OTF according to the Fourier diffraction tomography theory.
The frequency support is then simply sliced, and for each data set obtained at constant k_z, a surface reconstruction is performed by inverse FFT.
All intermediary surface reconstructions are then processed, to obtain a final, improved version of the original test surface, as a combination of all the intermediary retrieved images.



From left to right. 3-D surface to be reconstructed. Reflection OTF sliced along k_Z axis. Ensemble of intermediary reconstructed surfaces obtained by inverse FFT of each slice. Reconstructed final surface as a combination.

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