MM 34 Symposium Tomographic Methods in Materials Research

Zeit: Montag 17:00–18:00 Raum: TU H1058

MM 34.1 Mo 17:00 TU H1058

Application of discrete tomography to multi-level images and real projection data — •Zoltán Kiss[1], Attila Kuba[1], Antal Nagy[1], and Márton Balaskó[2] — [1]Dept. of Image Processing and Computer Graphics, University of Szeged, Hungary, H-6701 Szeged, Hungary, P. O. Box 652. — [2]KFKI Atomic Energy Research Institute, H-1525 Budapest 114, Hungary, P.O. Box 49.

Discrete tomography is an imaging technique to reconstruct discrete images from their projections using the knowledge that the object to be reconstructed contains only a few homogeneous materials characterized by known discrete absorption values. By this assumption the reconstruction can be done from relatively few projections and efficiently used in industrial non-destructive material examination. In previous research a stochastic reconstruction technique was successfully applied to binary phantom images, which considers the reconstruction as an optimization task. Now an extension of this method is introduced, which reconstructs multi-level phantom images from a few noisy projections and additionally we discuss the effect of several reconstruction parameters. We provide our experiments based on real measured projections including the possible improvements, reduction of the noise effect, building in a priori information, and a comparison with the classical FBP reconstruction method.

MM 34.2 Mo 17:20 TU H1058

Asymmetric Bragg Reflection As Magnifying X-Ray Optics — •Peter Modregger, Peter Schäfer, Daniel Lübbert, and Rolf Köhler — HU - Institut für Physik

Generally, the resolution limit for x-ray images is determined by available detectors (few $10\mu m$). The x-ray image magnification with asymmetric Bragg reflection is a promising way to overcome this resolution limit, simultaneously providing a high detector efficiency and a strong phase contrast. However, the imaging process is currently not understood in detail. With a theoretical description of the imaging process and numerical simulations we have shown that the resolution limit is in the sub-micrometer regime for pure absorption objects and that it even improves for the more realistic case of phase objects. In the latter case, it turns out that the resolution limit depends on the phase object itself. This technique of x-ray imaging can be combined with tomographic reconstruction and we have demonstrated the practicability using an object with almost absent absorption contrast.

MM 34.3 Mo 17:40 TU H1058

3-D X-ray imaging: Current status and future developments at HGHG-FELs — •Gerd Schneider — BESSY m.b.H., Albert-Einstein-Str. 15, 12489 Berlin

The full-field x-ray microscope installed at the 3rd generation electron storage ring BESSY II is dedicated for applications in life, environmental and materials sciences. It covers the photon energy range between 250 - 750 eV. Currently, the spatial resolution is about 20 nm. Due to the small numerical aperture of zone plates, X-ray objectives have a depth of focus on the order of several microns. By treating the X-ray microscopy images as projections of the sample absorption, computed tomography can be performed.

3-D x-ray microscopy - pioneered at the BESSY I electron storage ring - has found numerous applications worldwide. To further improve 3-D x-ray imaging towards 10 nm spatial resolution and to increase the usable photon energy range into the hard x-ray region, progress has to be made in nanotechnology of the x-ray optics, the instrumentation and the theory for recovering the full 3-D information of an object at this resolution level. In the talk, the current status at synchrotron sources and future aspects of x-ray imaging with fs-pulses from Free Electron Lasers will be discussed.