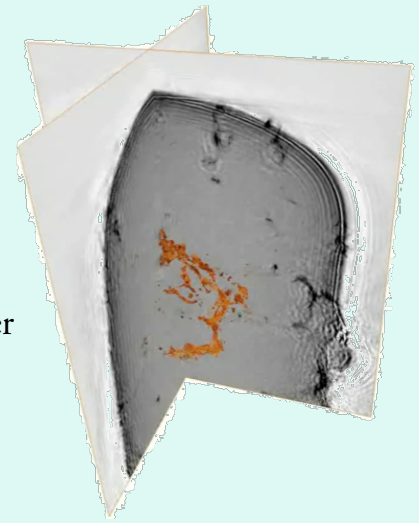
MASTER STUDENT PROJECT (30HP)

Tailoring algorithms of Synchrotron X-Ray image processing for metallic materials



Nowadays, X-Ray imaging may be well familiar to everyone who ever visited hospital even for ordinary fluoroscopic examination. A more advanced version of this providing information in 3D is X-Ray tomography. The very best clinical equipment for both these techniques can provide the spatial resolution of a few hundreds of micrometers. The most advanced laboratory-scale commercial machines for X-Ray tomography can resolve features slightly smaller than 1 µm. At the same time, top synchrotron based facilities may go as high as 50 nm in spatial resolution. This makes them comparable by the latter parameter to electron microscopy, while maintaining the big advantage of probing much larger volumes.

At the Division of Materials Engineering in LTH, we are collaborating with world-leading team in developing such facilities from Institut für Röntgenphysik, Universität Göttingen (Germany). They designed and built an Instrument for Nano-Imaging with X-rays at DESY synchrotron in Hamburg. It is used for a full field coherent imaging in phase contrast without the need of scanning, which makes it particularly well suited for time resolved studies thus providing extra dimensions to multiple fields relevant to materials engineering. This instrument has been utilised for the analysis of biological materials, and now we are extending its application for work with metallic materials. A major difficulty in such extension is algorithms for image processing. As demonstrated our first successful experiments, algorithms used in the analysis of weak-contrast images of biological tissues cannot be directly applied to high-contrast images of metallic materials. Therefore, new algorithms should be implemented.

In this master project you will elaborate existing or develop new algorithms of X-Ray image processing for phase retrieval. These algorithms will be applied for the analysis of real experimental data and linked to the results of other investigations using electron microscopy.

The work is suitable for 1-2 students from the following programs: Mechanical Engineering, Engineering Physics, Engineering Mathematics or Engineering Nano Science. Start 2016.

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