

Segmentation of straight fibers based on 3D Radon transform

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Introduction

The segmentation of crossing fibers is one of the most important problems of processing 3D images taken by micro-CT from dense fiber systems such as fleeces or felts. In the case of straight fibers a segmentation based on a discrete 3D Radon transform has been proven very useful, where the fibers are represented in the transformed image as well separated spots. Problems to be solved are the implementation of a fast 3D Radon transform and the development of a segmentation procedure of the spots.

Methods

In the literature one can find various approaches for the 2D Radon transform using Fourier methods [1, 4]. These approaches are closely related to the projection-slice theorem of Fourier transform. It is well known that the 3D Radon transform can also be speed up considerably by fast Fourier transform. We follow the approach presented in [3, 2], which is adapted to the problem of segmenting fibers by modifying the representation of the Fourier transformed image in spherical polar coordinates. The segmentation of the spots is based on modelling the shape of the spots.

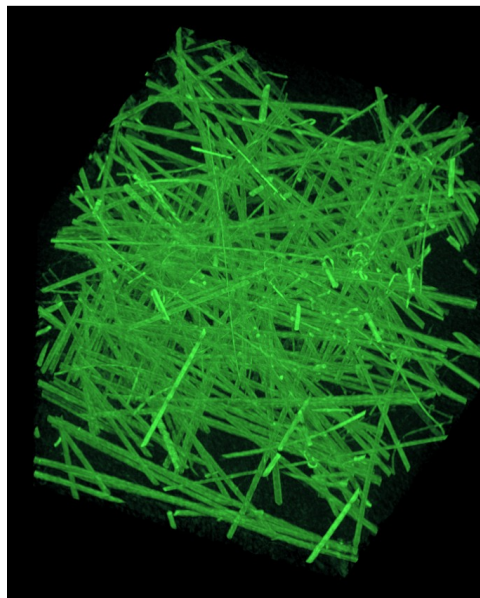


Figure 1. μ CT image of a fiber system taken at the European Synchrotron Radiation Facility (ESRF), resolution 0.325 μ m, laminography, provided by Lukas Helfen

Results and Discussion

Our method allows a save detection of straight fibers also in cases of extremely dense fiber systems. The applicability is tested for simulated data as well as micro-CT images.

References

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