

Jens Randel Nyengaard

Implementation of volume tensors in microscopy for estimating particle shape and orientation

Recent statistical publications have shown how to estimate the shape and orientation of arbitrary three-dimensional particles using volume tensors. Volume tensors are used to approximate the average particle shape and orientation in three-dimensions by creating an ellipsoid, the Miles ellipsoid. In our practical implementation of the volume tensors using optical microscopy, cells are visualized by several optical planes. Cells are sampled by the optical disector and the stereological sampling design estimating the volume tensors is based on the optical rotator. The practical use of the developed methods is shown in two examples comprising neurons from the rat brain and the human brain. In order to study the efficiency of the developed methods, a simulation study was performed on the lengths of the axes of the Miles ellipsoid, and the results showed that CVs were less than 5