Automated axon length quantification for populations of labelled neurons.

Abstract:

Virus-based methods for labelling populations of cortical neurons, when combined with cell-type specific recombinant promoters and techniques allowing temporal control of gene expression, provide neuroscience with new opportunities to examine the connectivity between brain regions and how this connectivity is modified by experience or disease. However, to take full advantage of these technical advances, it is necessary to develop new methods for quantification of the axonal projections revealed. Here we describe a method for quantitative analysis of axonal projection patterns emanating from populations of labelled cells, using transmitted light bright field microscopy. A single high resolution image of an area to be analysed is first acquired using mosaic extended focus image microscopy. This image is then analysed by specifically developed image processing algorithms that identify and track axon segments present. For quantitative analysis, measurement grids consisting of a user-defined number of individual elements are placed over an area of interest, with the computer-based method then returning the summed length of the axon segments in each element. Axon density plots can thus be generated. We present an example from rat brain showing, over a whole coronal section, axon densities emanating from a population of layer 2/3 somatosensory neurons.

Zeitschriftentitel / Abkürzung:

J Neurosci Methods
Jahr: 2008
Band: 169
Heft / Issue: 1
Seiten: 43-54
Sprache: eng
Print-ISSN: 0165-0270
TUM Einrichtung: 
  r Neurowissenschaften
Occurences:
  · Einrichtungen > Fakultäten > Fakultät für Medizin > Kliniken und Institute > Institut für Neurowissenschaften > 2008
entries: