Probabilistic Tracking of Multiple Rodent Whiskers in Monocular Video Sequences

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Abstract

The interest in studying rodent whiskers has recently seen a significant increase, particularly in the field of neurophysiology. As a result, there is a need for automatic tracking of whisker movements. Currently available commercial solutions either are extremely expensive, restrict the experiment setup, or fail when whiskers cross or overlap. A cheap, reliable solution to the tracking problem is needed.

This thesis proposes a proof-of-concept implementation of a probabilistic tracking system. This solution uses a technique known as the *Particle Filter* to propagate a whisker model between frames of high speed video. In each frame, the next state of the model is predicted by searching a pre-trained database, and filtering the results through the Particle Filter. The implementation is written in Python using NumPy and an SQLite3 database.

There are two main strengths of the proposed solution. First, it successfully tracks multiple whiskers at once, even when they cross or overlap. Second, being a standalone program operating on pre-recorded video, it does not notably restrict the experiment.