

plusTipParamSweepGUI

This document explains how to choose optimal tracking parameters by doing a parameter sweep.

plusTipParamSweepGUI allows the user to choose a range of values for each tracking parameter that should be tested, leaving all others constant at their user-set defaults.

After project setup and particle detection (see plusTipGetTracks), select a project containing a representative movie for which you would like to determine the optimal tracking parameters.

Fill in the frame rate and pixel size.

For each tracking parameter, there is a field called "Default" and a field called "Range to Test." The function will test each parameter independently, using the range specified, and use the default values for all other parameters. Leave the range blank if you do not want to test a parameter. The format for a range is `s:i:e`, where `s` is the starting value, `i` is the increment to increase by during each round, and `e` is the ending value.

A new folder called "paramTest" will appear under the project folder. In it will be figure (fig) folders, one for each parameter and one called `figs_allData`. The latter contains summary plots for how a number of tracking statistics vary as a function of parameter value. The individual parameter folders (e.g. `figs_fluctRad`) contain two kinds of .tif images:

- `gapLifetimes_XXXXX.tif`: histogram of the lifetime of all gaps (fgaps and bgaps) in frames. The maximum gap length provides the upper bound.
- `linkingDistance_XX.tif`: histogram of the frame-to-frame linking distance, which is how far the actual linked particle is from where it was projected to be, given the previous time points of the track. The max search radius provides the upper bound.

A Matlab cell array called "dataIndivTest" is also saved in the fig folder, which contains the statistics calculated during post-processing for each value in the range to test.

In addition, a cell array called "allData" is saved in the paramTest folder. This contains the "dataIndivTest" in one convenient matrix that can be copied into an Excel spreadsheet for further analysis.

Optimal parameter selection requires visual inspection of the allData figures and the two kinds of histograms, e.g. good min/max radii will produce a linking distance histogram where the exponential does not cut off abruptly at the max radius value. Visual inspection of tracks containing gaps is a good way to check whether the parameter settings are appropriate (see plusTipSeeTracks). In general, the max gap length and the max shrinkage factor are the most sensitive parameters.