

PyLDTracker Quick Guide

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1 About

PyLDTracker is a program for localization and detection and tracking of single particles in two-dimensional greyscale TIFF images and videos.

2 Installation

PyLDTracker is available at <https://github.com/MarkusRose/ParticleTracker> under the GPL. It requires a python interpreter, as well as some additional packages listed below. It can be run from the command line, or with a GUI.

2.1 Getting Python

PyLDTracker is written in Python 3.6. The distribution that was used during development and testing is Anaconda Python 3 (<https://www.anaconda.com/>).

2.2 Required Packages

- numpy
- scipy
- pandas
- matplotlib
- tkinter

2.3 Running PyLDTracker

PyLDTracker is a python 3.6 program. Running it in the interpreter will start the GUI.

```
python main.py
```

3 Using PyLDTracker

3.1 The Graphical User Interface

PyLDTracker comes with a graphical user interface (GUI) written entirely in Tkinter.

3.1.1 The Main Window

The main window shows all available operations than can be performed. Each button opens a new window with the specific option required for the wanted task. The available choices are

Simulation A simulation of diffusing particles, which outputs both track files and frame files, as well as a TIFF stack file.

Detection With a TIFF stack (video) as input file, the fluorescent particles are detected and displayed.

Tracking Tracking is performed on the file "foundParticles.txt". A TIFF stack can be included, if a visualization is wanted after tracking is complete.

Detect and Track This option performs the two previous steps with one click. As input file, only a TIFF stack is required.

Visualize Here either just the TIFF stack, the detections or the full tracks can be displayed. A TIFF stack is required.

Analysis With a track file as input, various useful analysis tools are located here.

Quit Exits the program.

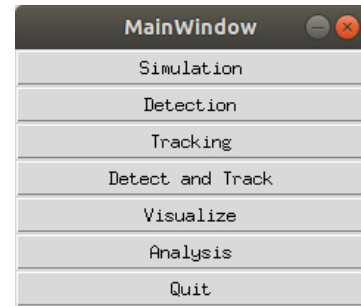
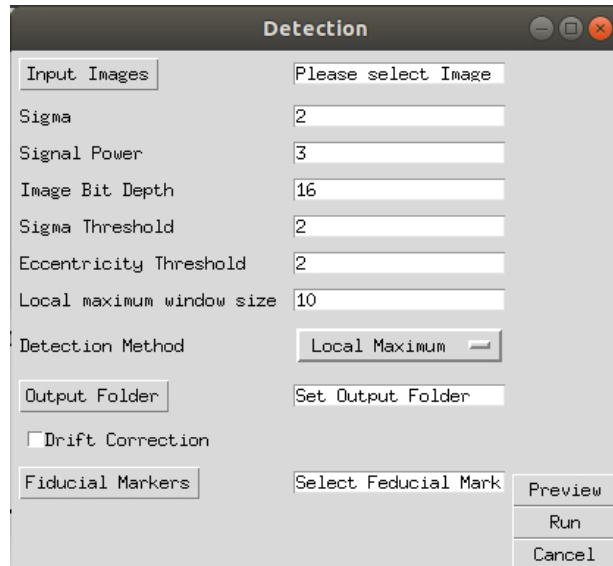


Figure 1: Main Menu

3.1.2 The Simulation Menu

3.1.3 The Detection Menu

3.1.4 The Tracking Menu

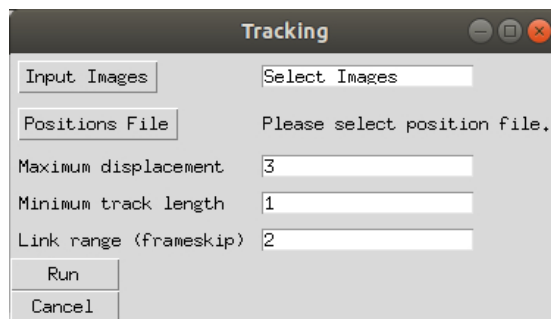


The Detection Menu dialog box contains the following fields and controls:

- Input Images: Please select Image
- Sigma: 2
- Signal Power: 3
- Image Bit Depth: 16
- Sigma Threshold: 2
- Eccentricity Threshold: 2
- Local maximum window size: 10
- Detection Method: Local Maximum
- Output Folder: Set Output Folder
- ☐ Drift Correction
- Fiducial Markers: Select Fiducial Mark
- Buttons: Preview, Run, Cancel

Figure 2: Detection Menu

3.1.5 Detect and Track in one Window

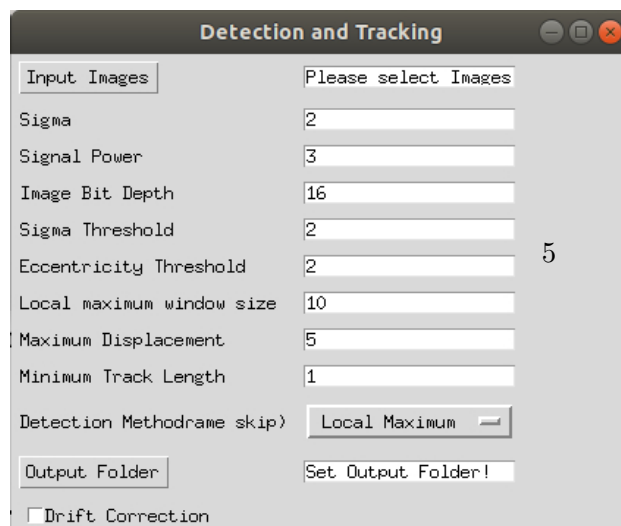


The Tracking Menu dialog box contains the following fields and controls:

- Input Images: Select Images
- Positions File: Please select position file.
- Maximum displacement: 3
- Minimum track length: 1
- Link range (frameskip): 2
- Buttons: Run, Cancel

Figure 3: Tracking Menu

3.1.6 Visualization of Images, Detections and Tracks



The Detection and Tracking dialog box contains the following fields and controls:

- Input Images: Please select Images
- Sigma: 2
- Signal Power: 3
- Image Bit Depth: 16
- Sigma Threshold: 2
- Eccentricity Threshold: 2
- Local maximum window size: 10
- Maximum Displacement: 5
- Minimum Track Length: 1
- Detection Method: Local Maximum
- Output Folder: Set Output Folder!
- ☐ Drift Correction
- Buttons: Preview, Run, Cancel