# LTOS Quick Guide

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## **Contents**

Contents									
1	Abo		1						
2	Installation 2.1 Getting Python								
3	2.3	Running g LTOS	; LTOS	2 <b>2</b>					
	3.1	The Gra 3.1.1 T 3.1.2 T 3.1.3 T 3.1.4 I 3.1.5 V 3.1.6 S 3.1.7 A	Aphical User Interface  The Main Window  The Detection Menu  The Tracking Menu  Detect and Track in one Window  Visualization of Images, Detections and Tracks  Simulation Window  Analysis Tools for obtained Tracks  Tracks	2 3 4 4 5 5 6					
4		ram Out		7					

## 1 About

LTOS is a program for localization and detection and tracking of single particles in twodimensional greyscale TIFF images and videos.

### 2 Installation

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

### 2.1 Getting Python

LTOS 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 LTOS

python main.py

## 3 Using LTOS

### 3.1 The Graphical User Interface

#### 3.1.1 The Main Window

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

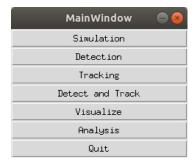


Figure 1: Main Menu

#### 3.1.2 The Detection Menu

Well

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

This is the second paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this



Figure 2: Detection Menu

place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

After this fourth paragraph, we start a new paragraph sequence. Hello, here is some text without a meaning. This text should show what a printed text will look like at

this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"?

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### 3.1.3 The Tracking Menu

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift—not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the

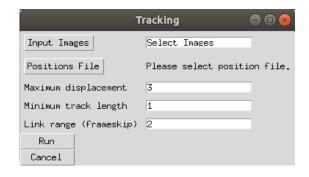


Figure 3: Tracking Menu

look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

#### 3.1.4 Detect and Track in one Window

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no infor-

Detectio		
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 Methodrame skip)	Local Maximum —	
Output Folder	Set Output Folder!	
□ Drift Correction		
Fiducial Markers	Select Feducial Mark	

mation? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift — not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

# 3.1.5 Visualization of Images, Detections and Tracks

Hello, here is some text without a meaning. This text should show

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#### 3.1.6 Simulation Window

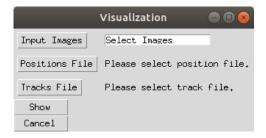


Figure 5: Visualization Menu

Hello, here is some text without a meaning. This text should show what a printed text will look like

		Sim	nulation		•	
Number of Sta	1	=				
Set Diff.Const. I	)1 =	3.0	um^2/s p12 =	0.0	p23 =	0.0
	)2 = )3 =		um^2/s p21 = um^2/s p13 =		p31 = p32 =	1.0
Number of Fra	ames		10			
Number of Part	icles		10			
Acquigition Ti	me [s]		0.1			
Frame height and wic	512					
Wavelength [	nm]		700			
Pixelsize [	um]		16			
Numerical Aper	rture		1.45			
Magnificati	ion		100			
Background m	nean		500		Save &	Run
Background no	oise		100		Cano	el
Intensity	j .		1000			
Output Location						

at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

#### 3.1.7 Analysis Tools for obtained Tracks

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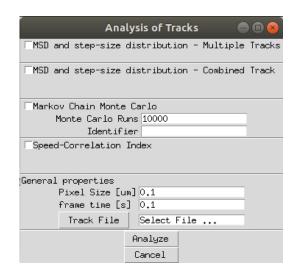


Figure 7: Analysis Menu

- 3.2 Working from Command Line
- 4 Program Output