Tracking

Master the ancient art

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Tracking is for you

If you want to know about the behavior of an object over time

- Absolute position of an object
- Relative position of objects
- Speed of a travelling object
- Direction an object is travelling in
- Other information (e.g. spectral,shape) of an object

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Information needs to be Trackable

Trackability is dependent on

- Who is tracking (human observer, software)
- Are the objects clearly visible (contrast, field of view, binary image)
- Can the objects be identified throughout the frames (density of objects, temporal sampling)
- The behaviour of the objects (movement patterns, spectral intensity)

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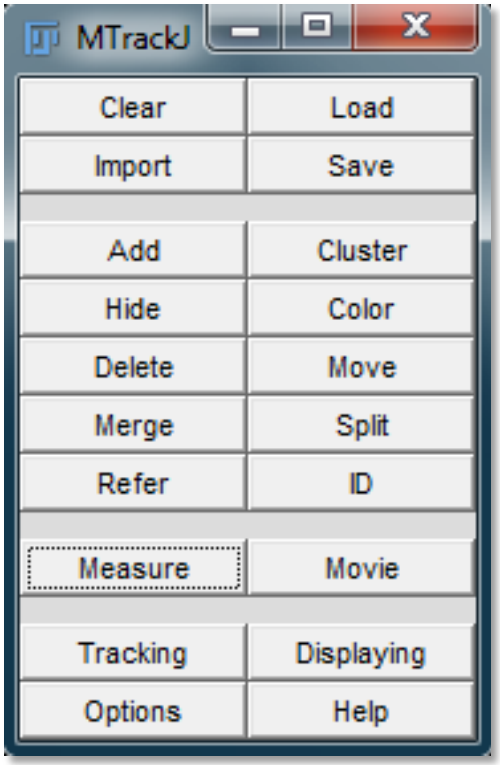
Manual Tracking

Task: Manual Tracking of Objects in ImageJ
Plugin: MTrackJ

Action:
Open File Exercise_stack_1
Open Module MTrackJ
Find Objects and track by clicking

Synopsis:
What you can see is what you can track
Risk of human bias
Little Setup time
Potentially high expenditure of time



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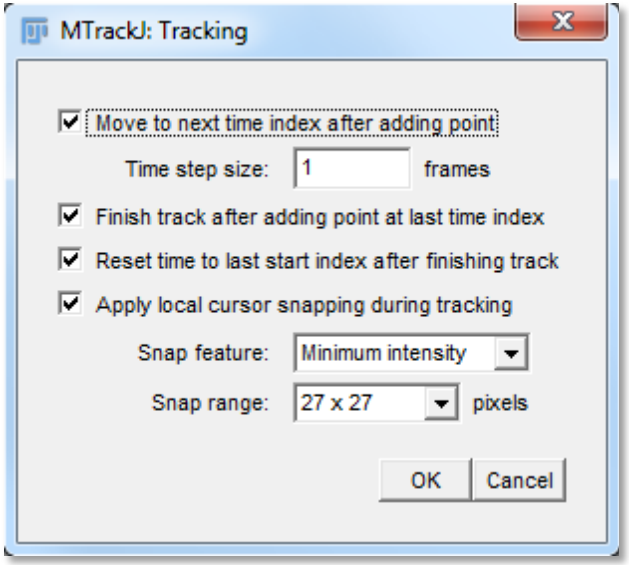
Semi-Automatic Tracking

Task: Semi-automatic Tracking of Objects in ImageJ
Plugin: MTrackJ

Action:
Open File Exercise_stack_1
Open Module MTrackJ
Configure Tracking Options
Find Objects and track by clicking

Synopsis:
Faster and more precise tracking
False placement of links is possible



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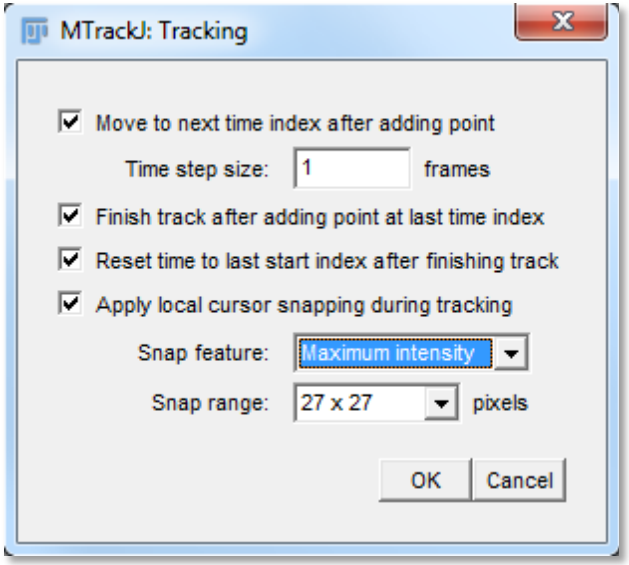
Semi-Automatic Tracking

Task: Semi-automatic Tracking of Objects in ImageJ
Plugin: MTrackJ

Action:
Open File Exercise_stack_2
Open Module MTrackJ
Configure Tracking Options
Find Objects and track by clicking

Synopsis:
Chance of false link placement increases as data clarity decreases



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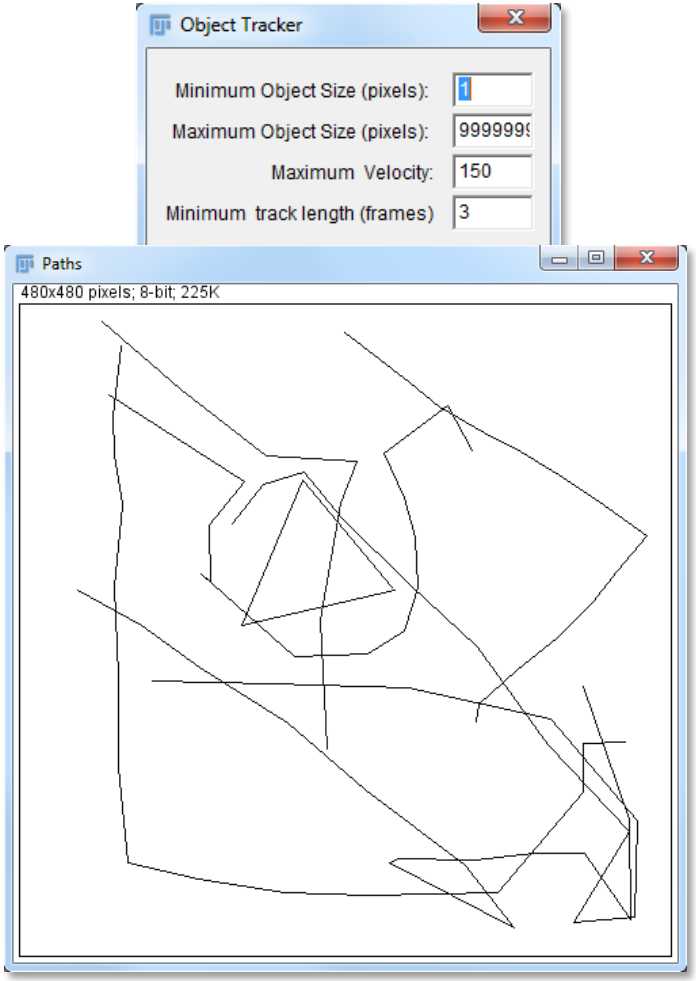
Automated Tracking

Task: Automated Tracking in ImageJ
Plugin: MTrack2

Action:
Open File Exercise_stack_3
Open Module MTrack2
Configure Parameters

Synopsis:
Very fast Tracking
Indirect control over tracking links



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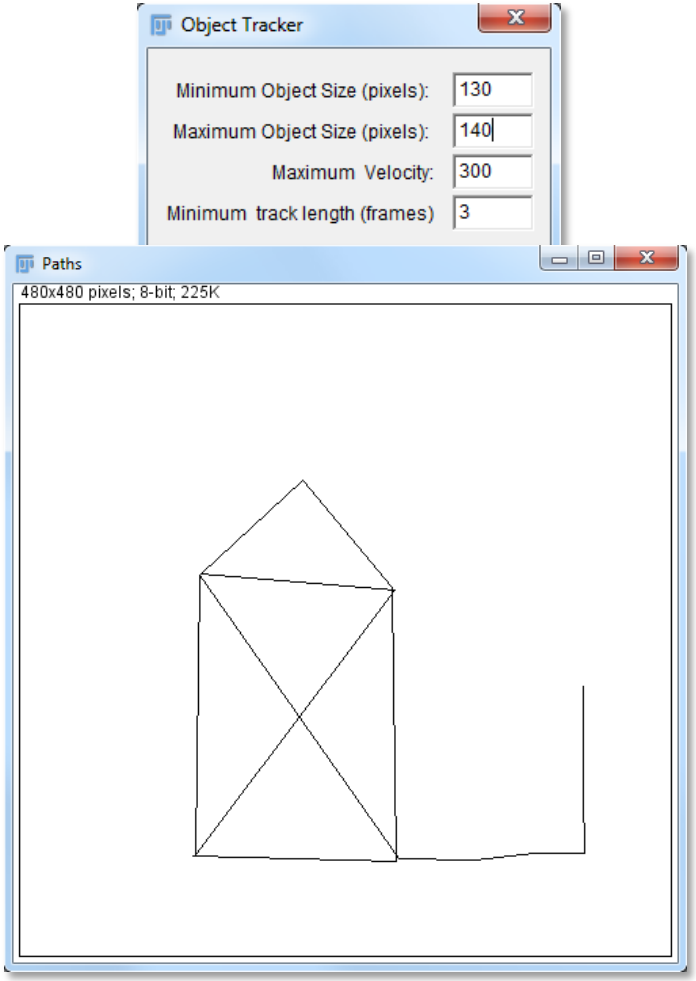
Automated Tracking

Task: Automated Tracking in ImageJ
Plugin: MTrack2

Action:
Open File Exercise_stack_3
Open Module MTrack2
Configure Parameters again

Synopsis:
Correct Parameters give correct results
Objects may be indinstinguishable by Parameters



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Automated Tracking

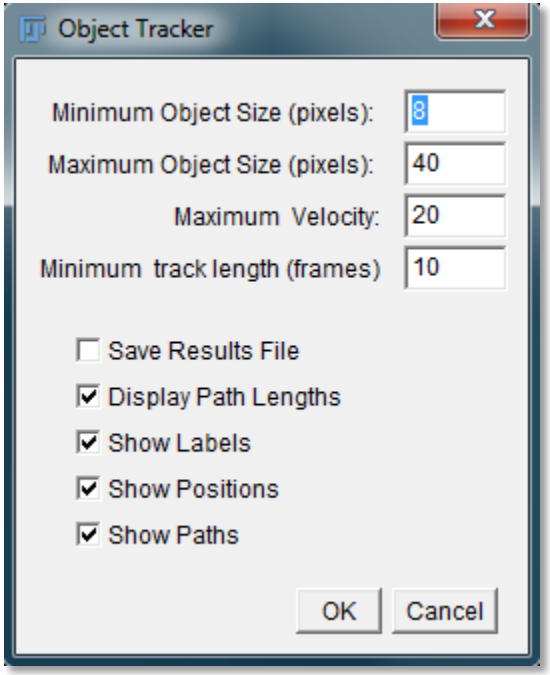
Task: Automated Tracking in ImageJ
Plugin: MTrack2

Action:
Open File Exercise_stack_2
Open Module MTrack2

Error:
Incorrect Data Input

Action:
Adjust Image; Binary Data
Image > Adjust > Threshold 165

Synopsis:
Objects can be made trackable by
Sufficient Temporal Sampling
Correct Thresholding
Additional Image Processing



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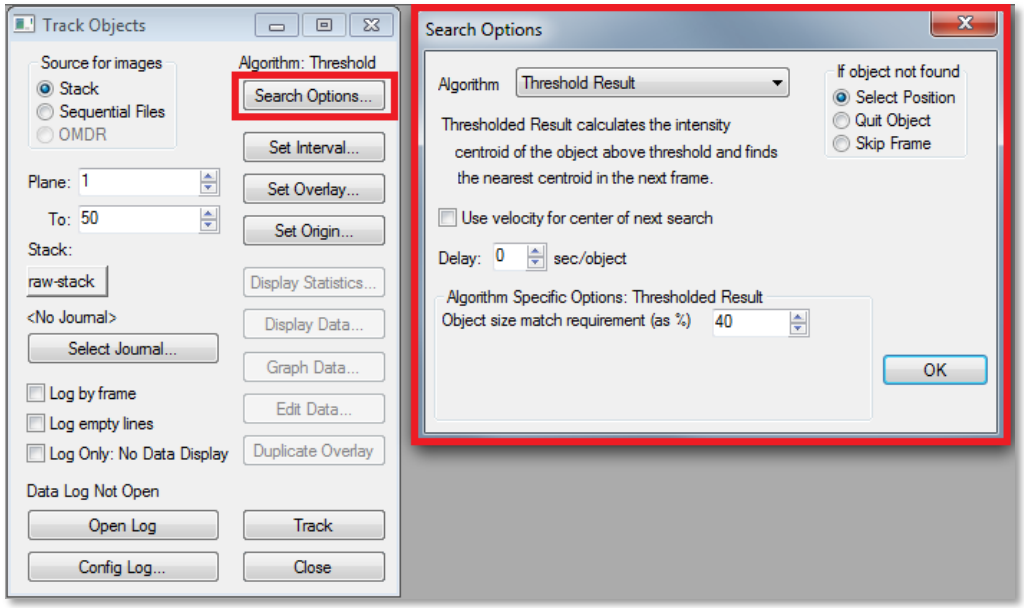
Automated Tracking

Task: Automated Tracking in Metamorph
Application: Object Tracking

Action:
Open File Exercise_stack_2
Launch Object Tracking
Configure for „Treshold Result“

Synopsis:
MM is similar to what we know
From ImageJ
Additional configuration Options



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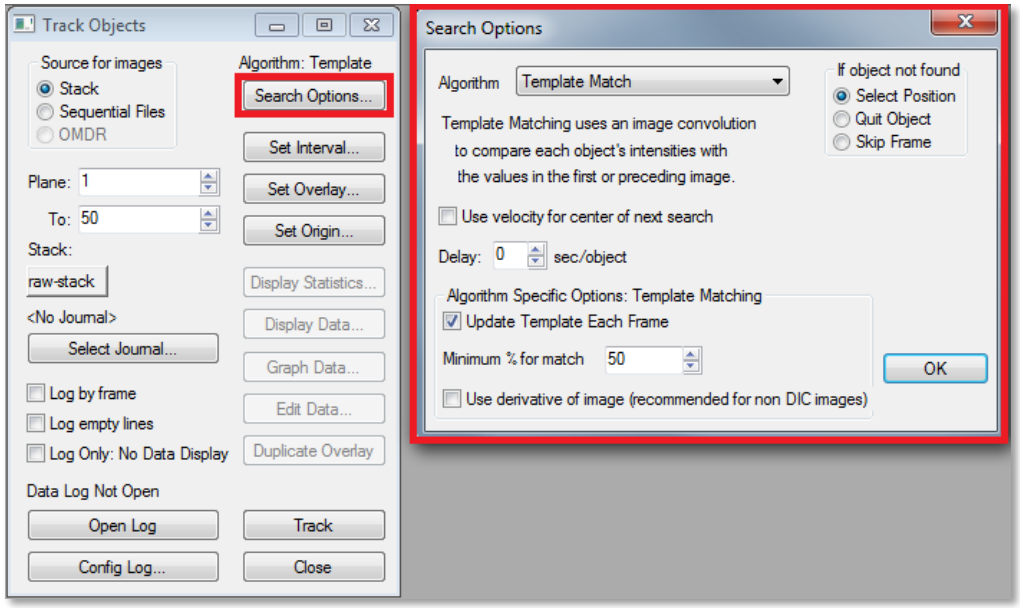
Automated Tracking

Task: Automated Tracking in Metamorph
Application: Object Tracking

Action:
Open File Exercise_stack_2
Launch Object Tracking
Configure for „Template Match“

Synopsis:
MM is similar to what we know
From ImageJ
Additional configuration Options



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Automated Tracking

Automated Tracking in Metamorph

- Spot Tracking – similar to MTrackJ

- Object Tracking
  - Threshold Result – similar to binary Image Method
  - Template Match
  - ➢ autoregressive search option

- Running a Journal for Data readout on the tracked object

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Automated Tracking

Advantages of Tracking in Imaris

- Advanced Object Shaping
- Autoregressive Motion (expert mode)
- Connected Components
- 3D Rendering

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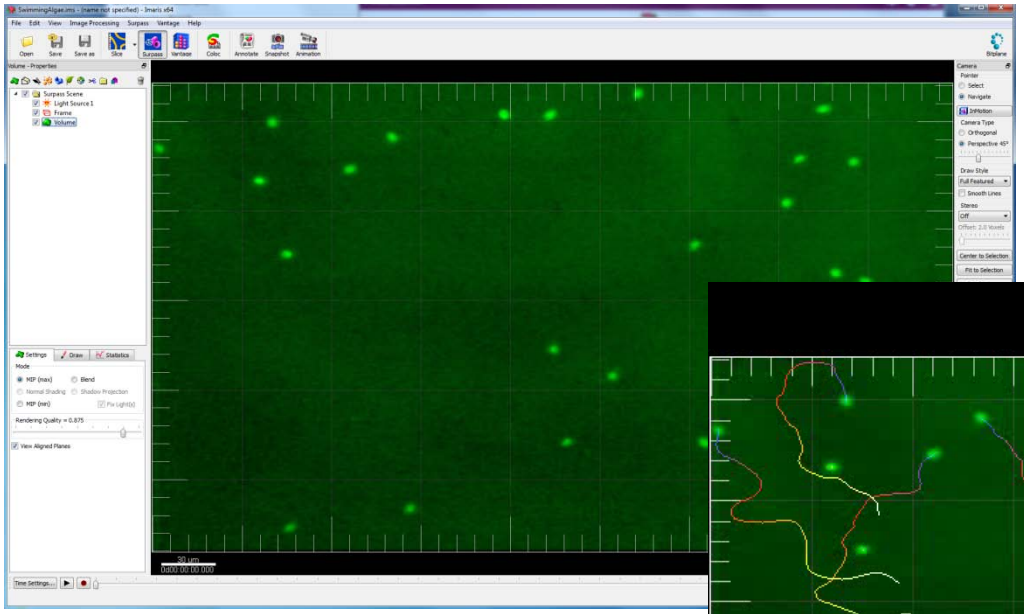
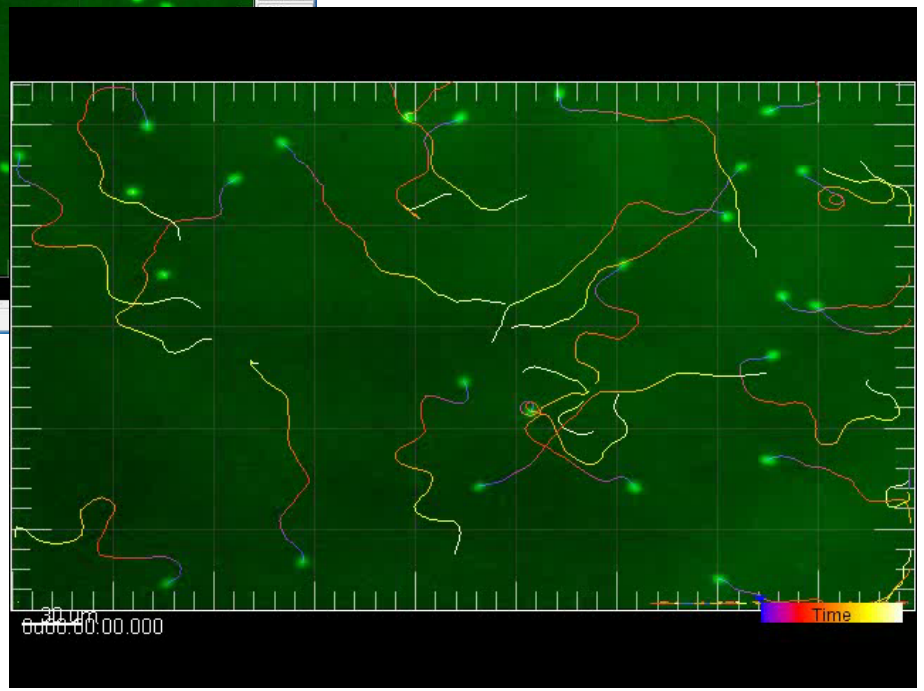
Automated Tracking



Imaris



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Resources

- http://www.imagescience.org/meijering/software/mtrackj/
- http://valelab.ucsf.edu/~nico/IJplugins/MTrack2.html
- http://www.moleculardevices.com/products/software/meta-imaging-series/metamorph.html
- http://www.bitplane.com/go/products/imaris
- http://cellimagelibrary.org/

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