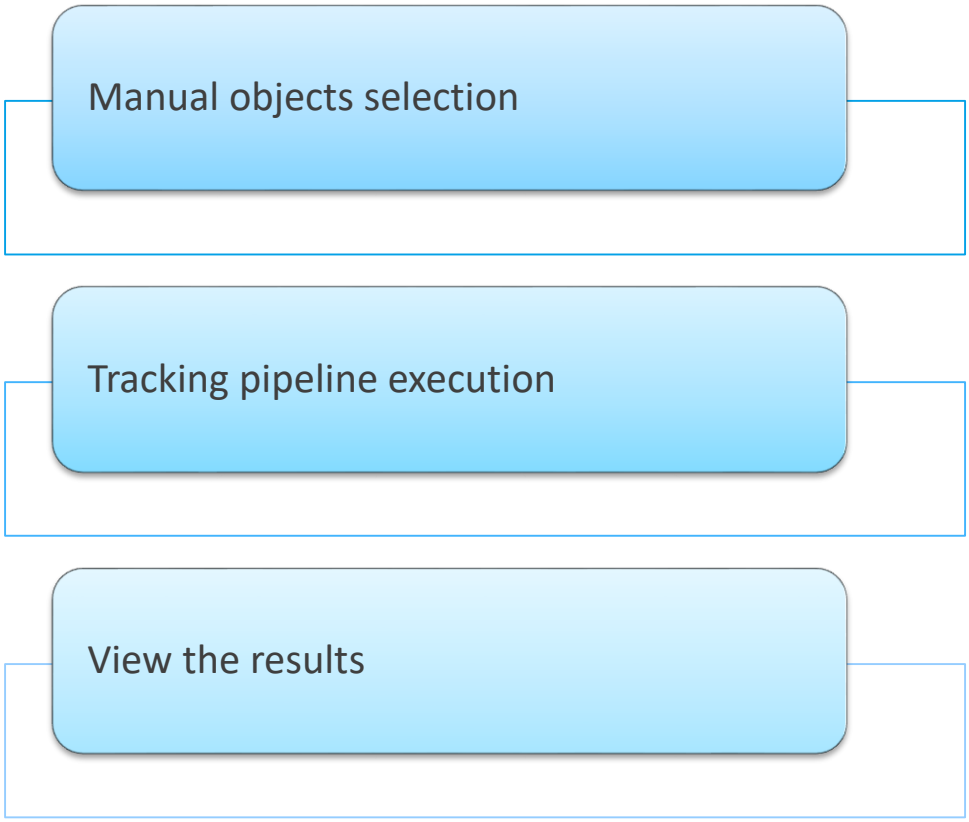
Application Note #24

How to perform :
«Manual tracking on existing segments»

The application-note purpose is to guide the user in performing the objects tracking using existing segments (previously detected).
The segments belonging to the track must be manually selected before applying the pipeline to generate the track.

Vision4D 3.4/Vision4D 3.5

Application Flowchart



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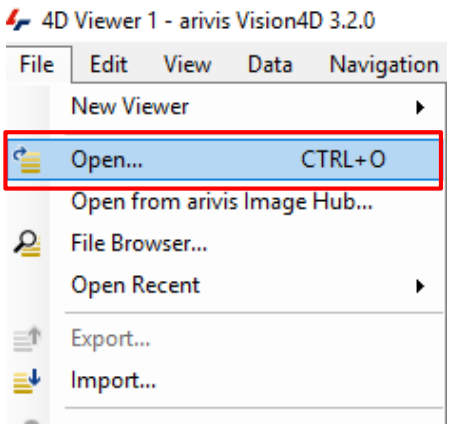
Application Flowchart:

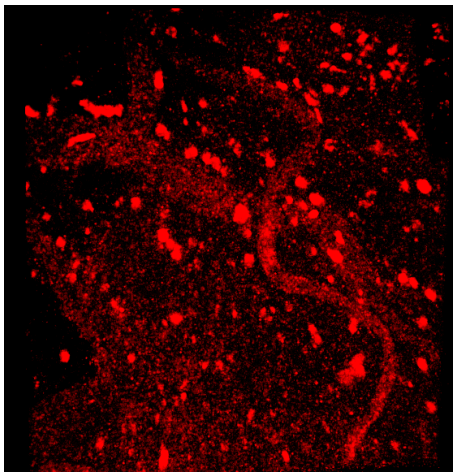
1. Open the working dataset on Vision4D

Step 1.1
Select the *Open..* item from the file menu.

Step 1.2
Select the dataset from the file browser.



TIPS :
The dataset is visualized according to the current rendering setting parameters. Please refer to the (arivis Vision4D Help) for more details



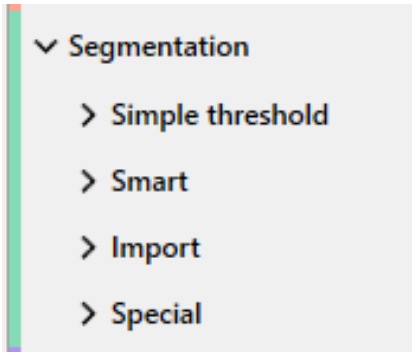
DETAILS:
The dataset is a multi dimensional, discrete, representation of your real sample volume. It can be structured as a Z series of planes (Optical sectioning) of multiple channels (dyes) in a temporal sequence of time points (located in several spatial positions).
Usually the dataset shows a single experimental situation (a complete experiment can be composed by several datasets). The datasets are available as graphic files saved in plenty of file formats (standard formats as well as proprietary formats)

Application Flowchart:

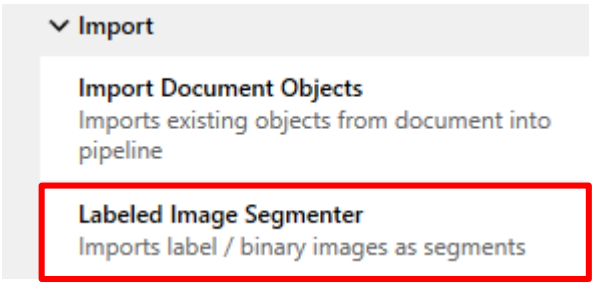
2. Detect the objects

Step 2.1
Run the appropriate pipeline to detect the segments over time.
If required, apply the pre-processing steps followed by the segmenter tools.

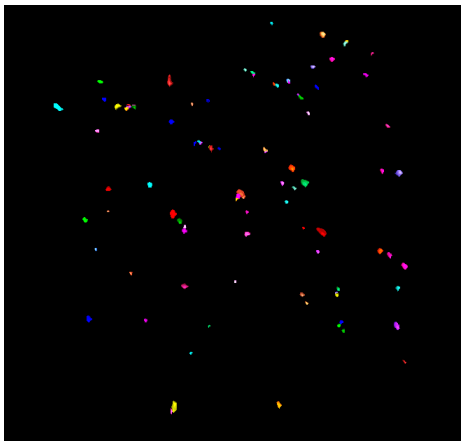
DETAILS:
Any segmentation operator can be used to generate the segments.
Blob Finder, Watershed, Machine learning tools are available and applicable accordingly to the dataset features.



The segments can also be generated importing labeled images



The segments must be detected over time, therefore all the time points should shows the found objects.



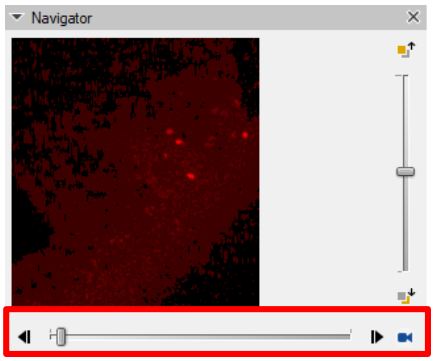
Application Flowchart:

3. Manual objects selection

Step 3.1

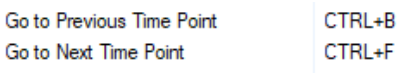
Set the active time point as time#1.

TIPS :
The time points can be manually selected in the following ways:



- Using navigator pane scroll bar.

- Using the time tools on the main icon bar (It must be set in the preferences)



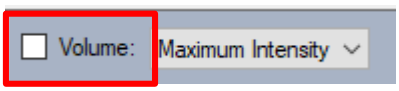
- Using the short keys. By default, the time changes are assigned to the CTRL + B / Ctrl + F keys (the keys assignement can be changed in the preferences).

The short key method is the suggested one.

Step 3.2

Set the active cursor mode as:
(This is mandatory working with the 3.4 release).
Switch back to the white arrow if you need to interact with the volume.

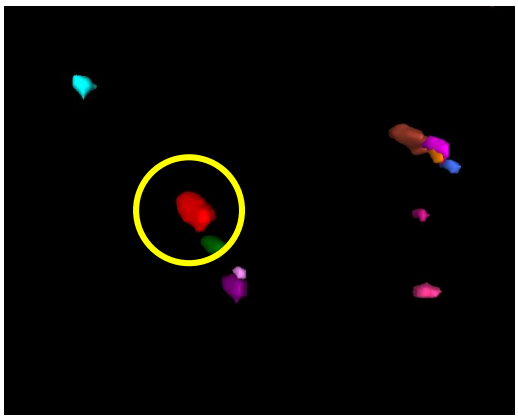
Note:
The volume visualization can be disabled if necessary (only in 4D view mode)



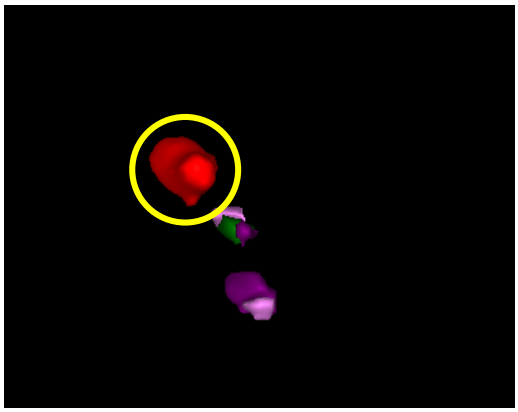
Application Flowchart:

3. Manual objects selection

Step 3.3
Identify the segment to be tracked. Click on it. The segment will be highlighted either on the image and in the object table



Step 3.4
Go to the next time point (Ctrl + F). Identify the same segment and click on it. **Keep the Shift key pressed while click on the object.**
The segment will be highlighted either on the image and in the object table



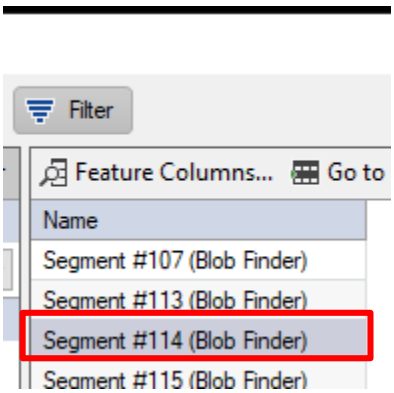
Step 3.5
Repeat the selection until the segment path is completed.

Important!!:
From the second time point up to the end of the segment selection (over time), the* Shift key *MUST be kept pressed while click on the object.

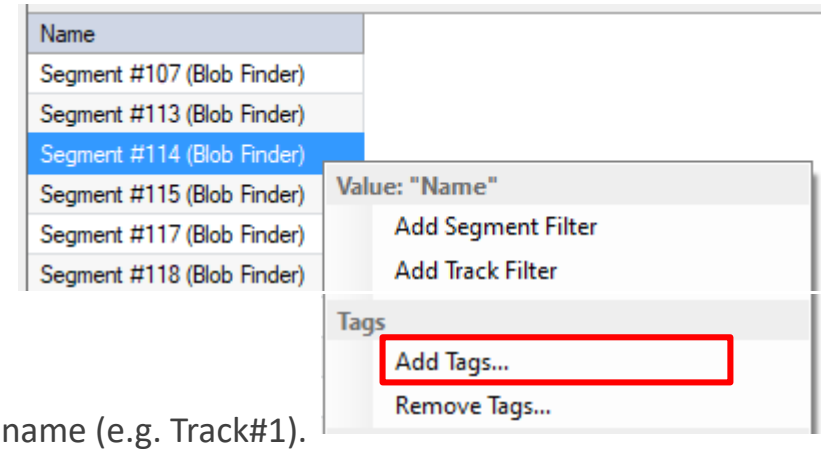
Application Flowchart:

3. Manual objects selection

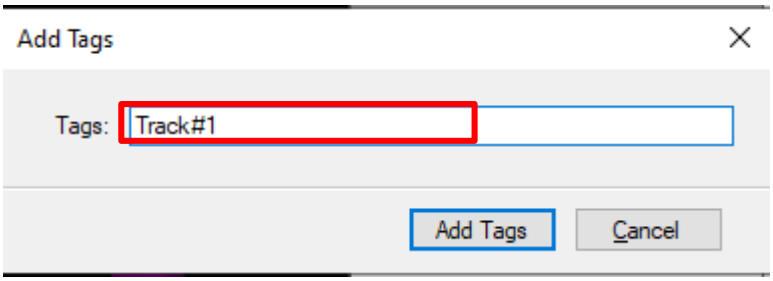
Step 3.6
On the object table, Identify one of the selected segments (grayed), right mouse click on it



Step 3.7
From the pop up menu, select the ***Add Tags...*** item



Step 3.8
Type the new TAG name (e.g. Track#1). Press the Add Tag button.

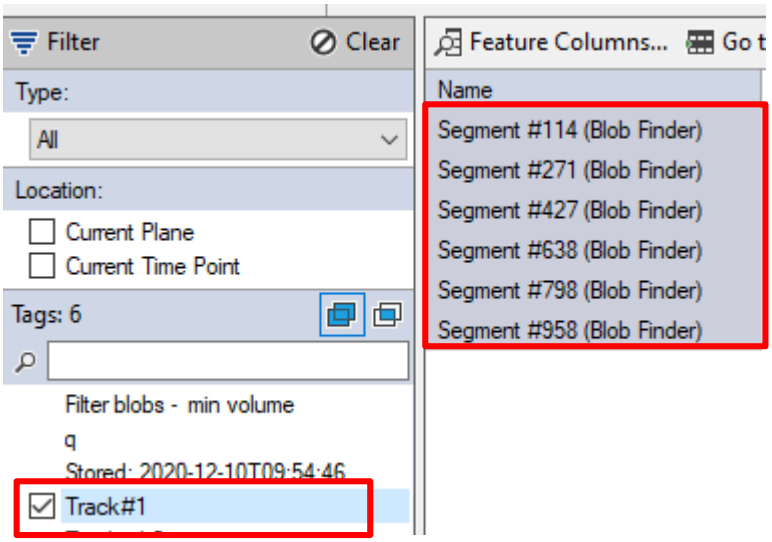


Important!!:
Don't click any where else. This will deselect all the segments.

Application Flowchart:

3. Manual objects selection

The new TAG is shown in the object table. It should collect all the selected segments (please check)



Note:
Multiple segments can be groupped in different tags following the described procedure.

Application Flowchart:

4. Tracking pipeline execution

Step 4.1

The tracking pipeline must be created. Here below an example of it.

Input ROI

ROI : Sets the processing and analysis target space.

Current Image Set : The complete dataset (XYZ and time) is processed.

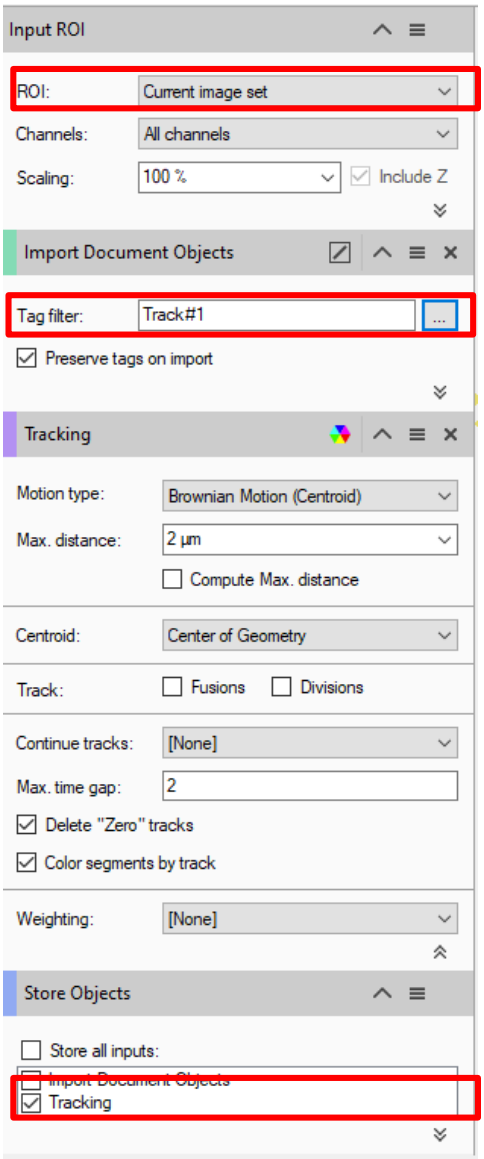
Channel: Non important for this task. Select All Channels

Import Document Objects

Tag Filter : Sets the TAG(s) previously created (Track#1 and so on) from the manual objects selection procedure

Tracking

Set the parameters to track the selected segments accordingly to the objects behavior



Store Objects

Set the data to be transferred to the objects table

Note:

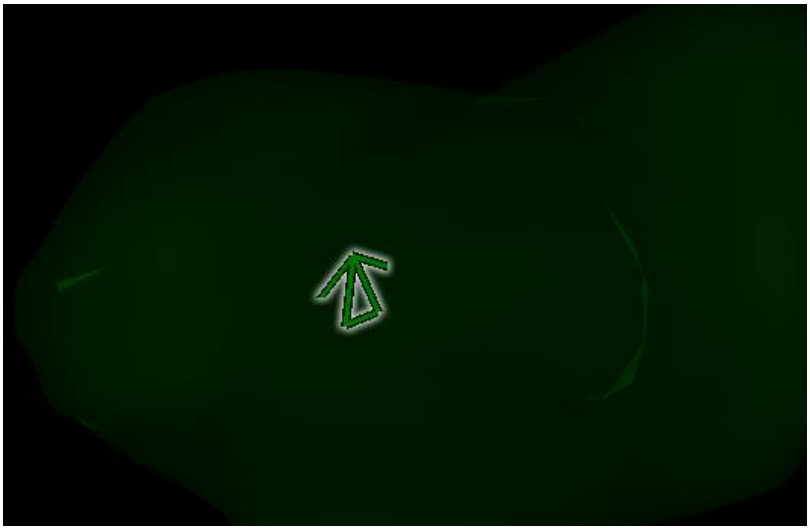
The Tag Filter can import multiple TAGS, each one will generate a single track

Application Flowchart:

5. View the results

Step 5.1

The track is computed and the data transfered to the object table.
Using the Feature Columns tool, the needed features can be selected.



Objects

Document | Analysis | Filter

Feature Columns... | Go to | Σ Summary | Im/Export...

Name
Track #001 (Tracking #1)

Items: 1

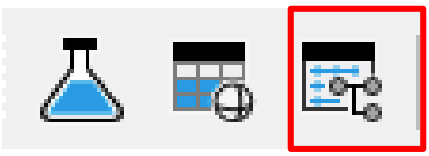
Feature Columns... | Go to | Σ Summary | Im/Export...

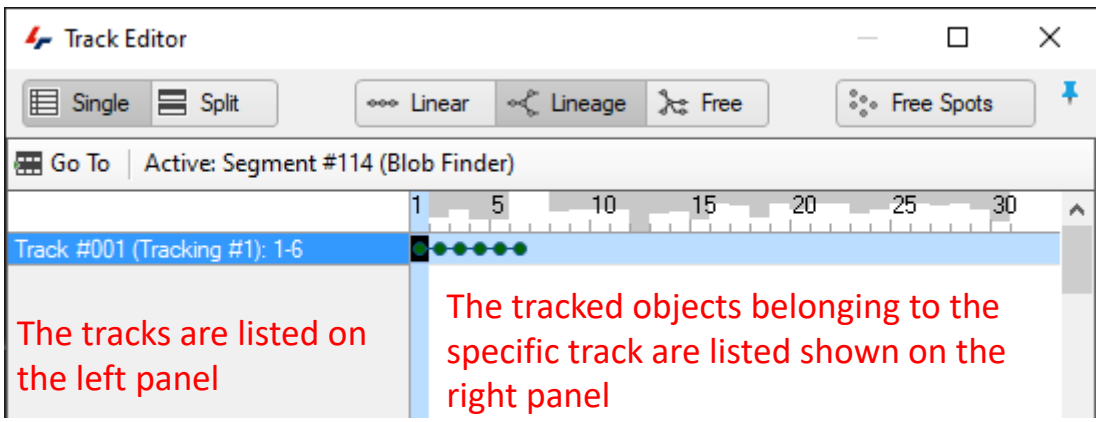
Name	Speed, Speed (µm/s)	Acceleration, Speed (µm/s²)
Segment #114 (Blob Finder)	0,000	0,000
Segment #271 (Blob Finder)	0,332	0,083
Segment #798 (Blob Finder)	0,394	0,020
Segment #958 (Blob Finder)	0,332	-0,015
Segment #427 (Blob Finder)	0,237	-0,024
Segment #638 (Blob Finder)	0,314	0,019

Application Flowchart:

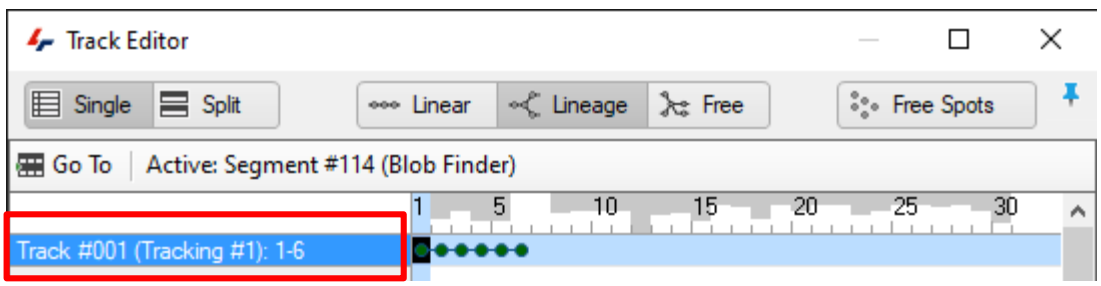
6. Editing tracks

Step 6.1
The tracks can be modified.
Open the track editor

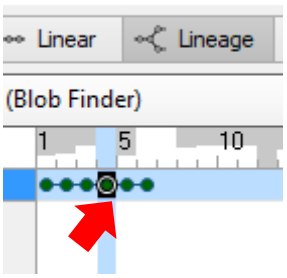




Step 6.2
Click on the track.



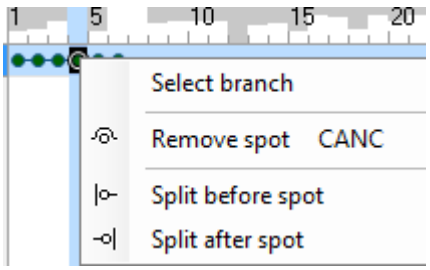
Step 6.3
Select the time point and the segment to be edited. The related frame is shown in the viewing area. The track and the segment are highlithed.



Application Flowchart:

6. Editing tracks

Step 6.4
Right mouse click on the selected time point, a pop up menu is displayed.



The track can be splitted, merged with another one, the segments in the track path can also be deleted.

Contact the arivis application support to receive additional technical details about the topic described in the application note, or how to adapt the application workflow to your requirements.

"The quantitative analysis of the images represents the art of transforming a visual sensation into its schematic and discrete form allowing its univocal description, classification and mathematical and logical interpretation of its spatial and temporal components"

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