

readDiaSessions.R Script Guide

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Date: July 5, 2017

readDiaSessions

This script aims to take in a Diatrack .mat session file as input, along with several other user-configurable parameters, to return a track list of all the trajectories found in the session file. The naming scheme for each track is as follows:

[Last five characters of the file name].[Start frame #].[Length].[Track #]

(Note the last five characters of the file name, excluding the extension, cannot contain “.”)

Input Parameters:

- *file* = file path to session file if known
- *interact* = option to interactively open window to select a file, by default set to TRUE
- *censorSingle* = option to remove and censor trajectories that do not have a recorded next/previous frame (trajectories that appear for one frame), by default set to TRUE
- *frameRecord* = option to add a fourth column to the track list after the xyz-coordinates for the frame that coordinate point was found (especially helpful when linking frames), by default set to TRUE
- *rowWise* = option to call to the *outputRowWise* function (see below), by default set to FALSE
- *colWise* = option to call to the *outputColWise* function (see below), by default set to FALSE
- *timer* = option to time the computation duration of the script

Sample Output:

<pre>> track11 <- readDiaSessions() Reading Diatrack session file: HTZ1Halo_frl0ms_120mW_5.mat ... Session file read and processed. > track11[1:5] \$`0mW_5.1.7.1` x y z frame 1 26.90 84.34 1 1 2 26.75 84.15 1 2 3 25.97 84.31 1 3 4 26.64 84.10 1 4 5 27.31 84.04 1 5 6 25.93 84.37 1 6 7 26.06 84.33 1 7</pre>	<pre>\$`0mW_5.1.4.2` x y z frame 1 62.97 95.19 1 1 2 63.25 94.90 1 2 3 63.77 94.81 1 3 4 62.96 94.77 1 4 \$`0mW_5.1.13.3` x y z frame 1 90.26 70.80 1 1 2 90.29 70.88 1 2 3 90.64 71.04 1 3 4 90.21 72.96 1 4 5 89.98 73.37 1 5 6 89.73 73.24 1 6 7 90.20 72.09 1 7 8 89.70 71.09 1 8 9 89.38 70.96 1 9 10 89.69 72.88 1 10 11 89.77 72.91 1 11</pre>	<pre>12 89.97 73.60 1 12 13 89.72 73.20 1 13 \$`0mW_5.3.2.4` x y z frame 1 45.13 64.20 1 3 2 45.82 64.13 1 4 \$`0mW_5.6.10.5` x y z frame 1 45.28 64.08 1 6 2 45.05 64.33 1 7 3 45.81 64.24 1 8 4 45.33 64.15 1 9 5 45.80 63.97 1 10 6 45.32 64.06 1 11 7 46.01 64.67 1 12 8 45.15 64.80 1 13 9 45.08 64.91 1 14 10 45.14 64.90 1 15</pre>
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removeFrameRecord

This helper script aims to make track lists with a fourth frame record column backwards compatible with other smt functions that rely on track lists with only three columns for the xyz-coordinates. The fourth column is simply removed from the given track list.

Input Parameters:

- *track.list* = a track list output from readDiaSessions.R

Sample Output:

```
> track11.removed <- removeFrameRecord(track11)
> track11.removed[1]
$`0mW_5.1.7.1`
      x      y z
1 26.90 84.34 1
2 26.75 84.15 1
3 25.97 84.31 1
4 26.64 84.10 1
5 27.31 84.04 1
6 25.93 84.37 1
7 26.06 84.33 1
```

getStartFrame

This helper script simply returns the starting frame of a track/trajectory (using its name) at a given index for a track list.

Input Parameters:

- *track.list* = a named track list output from readDiaSessions or readDiatrack
- *index* = index of the track in the track list (track number)

Sample Output:

```
> getStartFrame(track11, 5)
[1] 6
```

outputColWise

This script takes in a track list from readDiaSessions or readDiatrack (with or without the fourth frame record column) and transposes it into a .csv column-wise output, similar to a Diatrack output, in the home directory.

Input Parameters:

- *track.list* = a track list output from readDiaSessions or readDiatrack

outputRowWise

This script takes in a track list from readDiaSessions (with the fourth frame record column) and creates a .csv row-wise output, similar to an ImageJ output, in the home directory.

Input Parameters:

- *track.list* = a track list output from readDiaSessions with *frameRecord* set as TRUE

linkSkippedFrames

This script aims to link trajectories that seem to have skipped (or do not appear for) a number of frames. Given user input for a tolerance level (measured in pixels) to limit how far the next skipped point can deviate from the last point in each xy-value and a maximum number of frame skips possible, all trajectories falling within these parameters are automatically linked, renamed, and ordered accordingly. The naming scheme for each linked track is as follows:

[Last five characters of the file name].[Start frame #].[Length].[Track #].[# of links]

(Note the last five characters of the file name, excluding the extension, cannot contain “. ”)

Input Parameters:

- *track.list* = a named track list output from readDiaSessions or readDiatrack (Note: although not required, in order for the output to have a frame record column, the input must have one as well)
- *tolerance* = tolerance level for each xy-coordinate measured in pixels
- *maxSkip* = maximum number of frames a trajectory can skip (eg. if the *maxSkip* for a trajectory ending in frame 7 was 3, the next linked trajectory can start up to a maximum frame of 11)

Sample Ouput:

<pre>> trackll.linked <- linkSkippedFrames(trackll, tolerance = 5, maxSkip = 10) Linking trajectories with a tolerance of 5 and a maximum frame skip of 10 ... 1123 links found. > trackll.linked[1:3] \$`OmW_5.1.7.1.0` x y z frame 1 26.90 84.34 1 1 2 26.75 84.15 1 2 3 25.97 84.31 1 3 4 26.64 84.10 1 4 5 27.31 84.04 1 5 6 25.93 84.37 1 6 7 26.06 84.33 1 7</pre>	<pre>\$`OmW_5.1.20.2.4` x y z frame 1 62.97 95.19 1 1 2 63.25 94.90 1 2 3 63.77 94.81 1 3 4 62.96 94.77 1 4 5 63.87 94.37 1 12 6 64.95 94.15 1 13 7 65.05 93.65 1 17 8 64.80 93.93 1 18 9 63.80 94.90 1 19 10 64.15 94.36 1 20 11 64.17 94.10 1 21 12 64.04 94.65 1 23 13 62.80 95.71 1 24 14 63.90 94.98 1 25 15 63.58 94.96 1 26 16 63.80 94.74 1 27 17 63.80 94.75 1 28 18 65.04 94.20 1 30 19 64.77 94.14 1 31 20 64.81 94.02 1 32</pre>	<pre>\$`OmW_5.1.13.3.0` x y z frame 1 90.26 70.80 1 1 2 90.29 70.88 1 2 3 90.64 71.04 1 3 4 90.21 72.96 1 4 5 89.98 73.37 1 5 6 89.73 73.24 1 6 7 90.20 72.09 1 7 8 89.70 71.09 1 8 9 89.38 70.96 1 9 10 89.69 72.88 1 10 11 89.77 72.91 1 11 12 89.97 73.60 1 12 13 89.72 73.20 1 13</pre>
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Testing (readDiaSessions)

readDiaSessions takes Diatrack .mat files as input, and returns a list of data frames (a track list) of all the particle trajectories. The aim is to optimize and un-censor this process, instead of having to use MATLAB to extract a large .txt file which is then fed into readDiatrack in R. Unlike the previous MATLAB script, this script has an option to un-censor, but is censored by default. Either way, this script resulted in slightly faster computation time (depending on the system) in testing.

A .mat session file with 10117 frames was used to test both scripts.

Using the previous MATLAB script, a 272.6MB .txt file was first created and was then fed into the readDiatrack() script to output track lists. Automating this process using "matlabr" resulted in **4488 censored tracks** (should be 4487 tracks since the script does not censor first frame) **in 3:48 mins.**

Using readDiaSessions, the intermediate .txt file was no longer needed to be created and the session file directly results in track lists. This script resulted in **4487 censored tracks in 2:00 mins** and **34689 uncensored tracks in 2:01 mins.**