

# WimTaxis

## Analysis results in detail

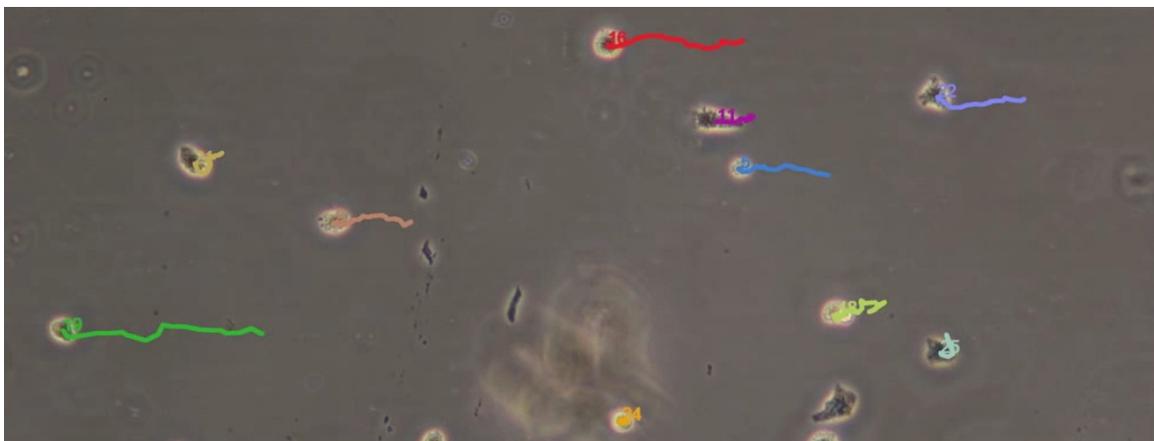
For every videos that you upload to WimTaxis, you will receive the following data files, bundled inside a zip file:

- A Track Video, which is a copy of the uploaded video with the trajectories of each tracked cell/bacterium and its track ID drawn in different colors.
- A Track Chart, which shows all the normalized cell/bacterium trajectories, illustrating the movement trends.
- A Tracking Results Summary, a document with the main tracking metrics.
- The Track Position Data, a spreadsheet with coordinates of each track in each frame.
- Video Summary 1, a spreadsheet with the detailed metrics of each detected track.
- Video Summary 2, a spreadsheet with center of mass statistics of each video frame.
- Order Summary, a spreadsheet listing all the processed videos.

Additionally, you will receive an extra CSV format Order Summary with a listing of all the videos analyzed in the upload. Let's check each file in detail.

### 1. Track Video

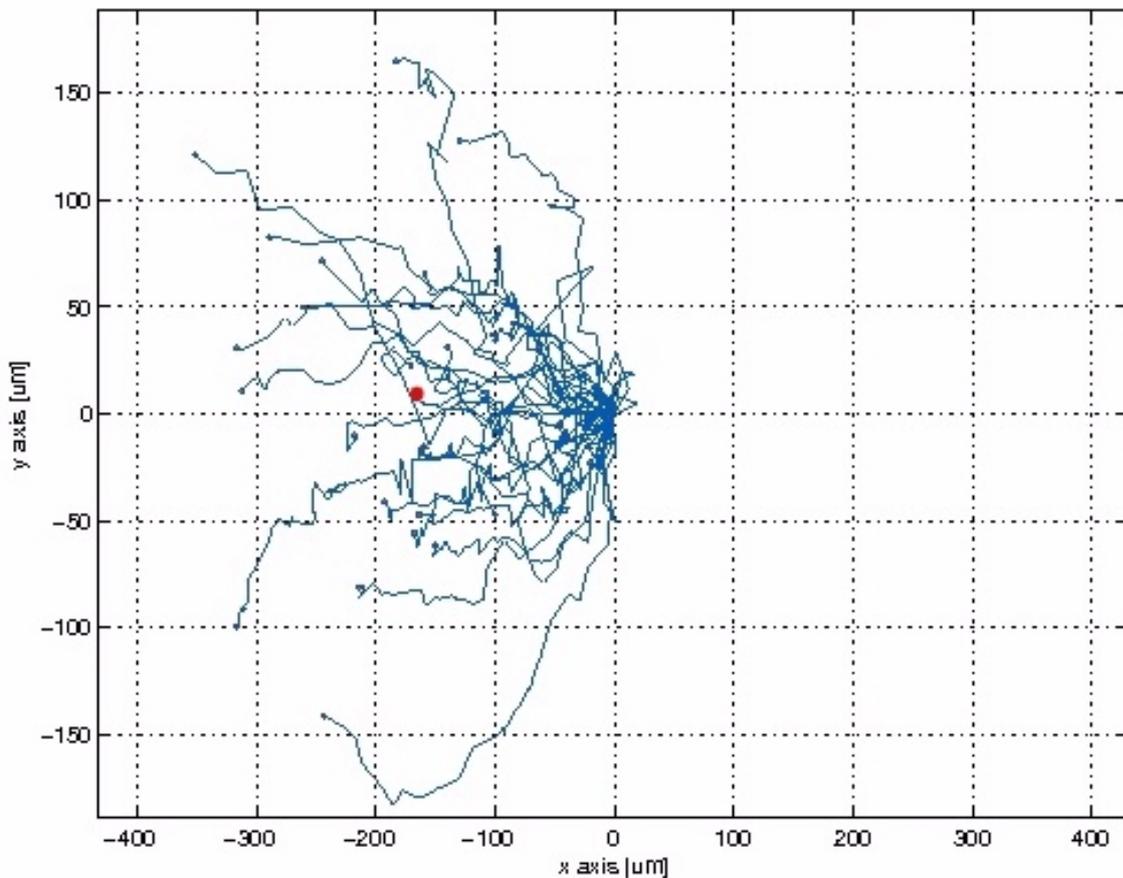
The Track Video is a copy of the uploaded video with an overlay of the trajectories of each tracked cell/bacterium drawn in different colors and the ID of the track annotated next to the tracked cell/bacterium. The different colors of the tracks do not have any meaning, they are randomly chosen to distinguish one track from another.



It is an avi file named as videoName\_track.avi, in which videoName is replaced by the name of your original video file.

## 2. Track Chart

The chart video shows the evolution of all the cell/bacterium trajectories throughout the video, normalized as if all began in ( $x=0$ ,  $y=0$ ). The red dot is the center of mass of all normalized tracks. This chart helps to visually understand the tendency in the directionality of the culture's migration movement. The timing of this video is the same as the timing for the Track Video.



It is an avi file named as `videoName_chart.avi`, in which `videoName` is replaced by the name of your original video file.

## 3. Tracking Results Summary

The Tracking Results file is a document with the following overall information about the tracking:

- **Slice length in dataset:** list of analyzed video frames.
- **Number of current used tracks:** number of detected tracks

- **Forward Migration Index (X,Y):** Quotient between the position of the tracks' ends and the tracks' lengths.
- **Directionality:** Quotient between the tracks' displacement and length, meaning how straight the displacement of the cells/bacteria is from track's origin to end.
- **Center of mass (X,Y):** The center of mass' coordinates for the tracks endpoints.
- **Center of Mass Length:** Distance of the center of mass to the video's geometrical center.
- **Mean/Min/Max/STD Accumulated Distance:** Statistical metrics of the total lengths of the detected tracks.
- **Mean/Min/Max/STD Euclidean Distance:** Statistical metrics of the euclidean distance from track's origin to end ( also known as displacement) of the detected tracks.

It is a txt file, whose name is composed as follows videoName\_results.txt. One file is provided per uploaded video

#### 4. Track Position Data

A spreadsheet that contains information about the position of each track in each frame where it appears. This file has the same format as the track info file of ImageJ plug-in "Manual Tracking", which means that it can be used as input for this plug-in and get the charts, results, etc. provided by it. This way, WimTaxis results can be compared and completed with the ImageJ plug-in results.

It is a xls file, whose name is formed as follows videoName\_trackInfo.xls. One file is provided per uploaded video.

#### 5. Video Summary 1

It is a spreadsheet listing the following information of each detected track:

##### General Metrics:

- **Scale used [um/px]:** conversion factor, provided by the user, to convert spatial information in pixels into micrometers. When provided, all spatial data will be displayed in micrometers.
- **Frames per second:** time between frames in the video, provided by the user. When provided, time results will be displayed in seconds. If not, time results will be calculated in "frames" units.
- **p-Value:** Rayleigh Test for homogeneous distribution on the endpoints.
- **Total-Tracks:** number of detected tracks along the video.

- **Active Tracks:** number of tracks with significant movement. The significance is defined by the object radius value. If the total movement of one track is bigger than its radius size, the track is considered in movement.
- **Non-active tracks:** number of tracks with non-significant movement. If the total movement of one track is less than its radius size, the track is considered still, so it will not be included in the measurements.
- **Activity ratio:** ratio between Active Tracks and All Tracks.

#### Individual Track Metrics:

- **(X,Y)-Start:** X and Y image coordinates of the cell/bacterium center at the beginning of the track.
- **(X,Y)-End:** X and Y image coordinates of the cell/bacterium center at the end of the track.
- **Track Length [px/um]:** total accumulated length of the track.
- **Displacement [px/um]:** linear distance between the start and end points of the track.
- **Track Velocity [(px/um)/(image/seg)]:** speed of the track, that is length covered divided by the time invested in it.
- **Track Acceleration [(px/um)/(image/seg)^2]:** track velocity divided by the track time length.
- **First/Last/Total Frames:** information about the first frame of the video in which the track began, the last frame in which it was detected and the total number of frames in which the track was detected.

It is a csv file, whose name is composed as follows `videoName_Summary.csv`. One file is provided per uploaded video.

## 6. Video Summary 2

It is a spreadsheet listing the center of mass statistics per video frame. The x and y coordinates of the center of mass are calculated using all normalized positions of all the tracks that were found in each frame combined with all the tracks that finished before that frame. The normalization of the tracks means that all tracks are taken as if starting at position  $(x=0, y=0)$ .

#### General Metrics:

- **Scale used [um/px]:** conversion factor, provided by the user, to convert spatial information in pixels into micrometers. When provided, all spatial data will be displayed in micrometers.

- **Frames per second:** time between frames in the video, provided by the user. When provided, time results will be displayed in seconds. If not, time results will be calculated in "frames" units.

#### Individual Track Metrics:

- **Image's order:** ordered frame number inside the video.
- **(X,Y)-Coordinates [px/um]:** X and Y image coordinates of frame's center of mass.
- **Track Length [px/um]:** total accumulated length of the track traversed by the center of mass.
- **Displacement [px/um]:** linear distance between the start and end points of the center's of mass track.
- **Velocity [(px/um)/(image/seg)]:** speed of the center's of mass track.
- **Acceleration [(px/um)/(image/seg)^2]:** acceleration of the center's of mass track.
- **Directionality:** the displacement divided by the track, reflecting how straight the track of the center of mass is.

It is a csv file, whose name is composed as follows `videoName_Summary2.csv`. One file is provided per uploaded video.

## 7. Order Summary

Every uploaded order also produces a CSV file that lists the processed videos. A video that was uploaded and does not appear in this lists had an error during its processing and did not render proper results This file will have the name of the order number followed by “\_Summary”.