



Particle Tracking with ProAnalyst®

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Abstract

The ProAnalyst Particle Tracking toolkit is intended for statistical analysis of particle flows. This toolkit can identify the location, size, orientation, and eccentricity of bright or dark particles in each video frame. A summary of the total particle count, average, minimum and maximum size, orientation, and eccentricity for each frame can be displayed, graphed, and exported.

Files Needed for this Tutorial

Click [here](#) to download these files.

<i>EVT77.avi</i>	<i>EVT77_proc.avi</i>
<i>EVT77.cfg</i>	<i>EVT77_proc.cfg</i>
<i>EVT77.ftk</i>	<i>EVT77_proc.pbr</i>
<i>EVT77.pbr</i>	<i>ev77.mpj</i>

Create a New Project

1. Click **File** and select **New Project**.
2. Right-click on the untitled project and add the video *EVT77.avi* to the project.
3. Click **File** and Select **Save As**. Give your project a name and click **Save**.
4. Double-click the video thumbnail. The Measurement window will appear as shown in Figure 1.

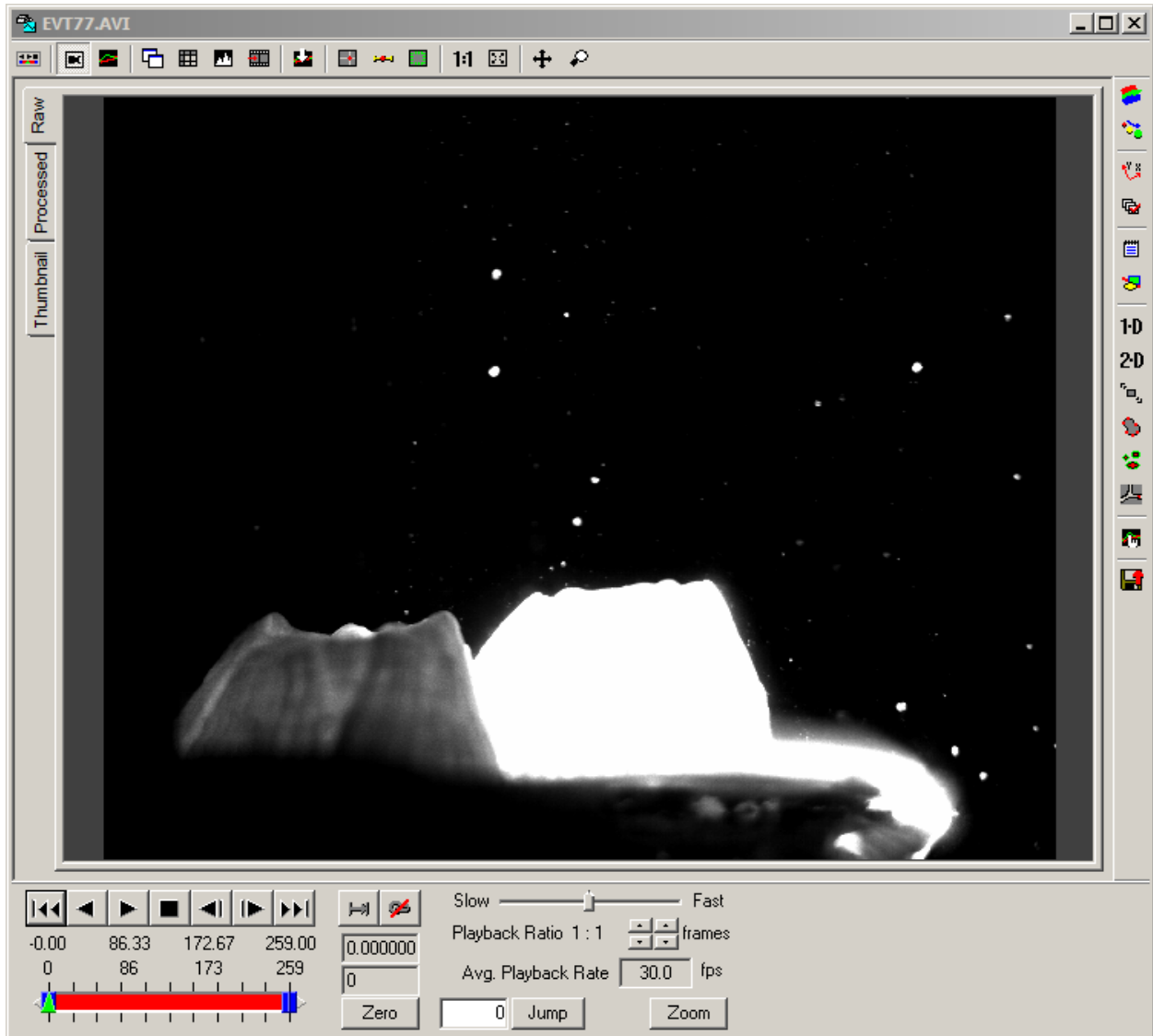



Figure 1. Measurement window

Particle Tracking

1. Click the **Particle Tracking**  button on the toolbar at the right side of the Measurement window. The Particle Tracking control panel is displayed.
2. Click **Enable**.

3. In the Parameters section under Filters: Size, enter **30** for Minimum and **200** for Maximum. Under Eccentricity, enter **15** for Maximum. Under Display, check the box next to **Correspondence Trails**.

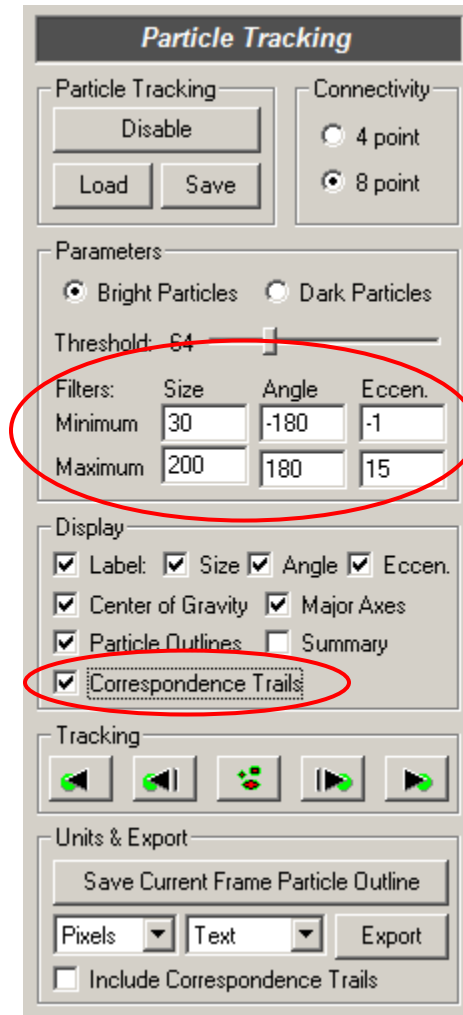





Figure 2. Particle Tracking settings

4. Under **Tracking**, click the **Process Current Frame**  button to see the parameters. If you would like to view the next few frames, use the **Track Step Forward**  button.

5. When you are ready to process the entire video, click the **Track Forward**  button. When the processing is complete, click **Rewind**  to return to the beginning of the video.

Note: Processing may take some time if the frame is large or if there are many particles. A percentage is displayed in the lower left corner of the status bar so that you can monitor the tracking progress.

- From the Play Controls, click **Play**  to view the tracked video. Tracked particles are displayed with brown arrows followed by a question mark (?). The brown arrows represent the correspondence trails. As you view the video, note that some particles disappear, and their trails will end. Also, new particles appear, and new trails begin.

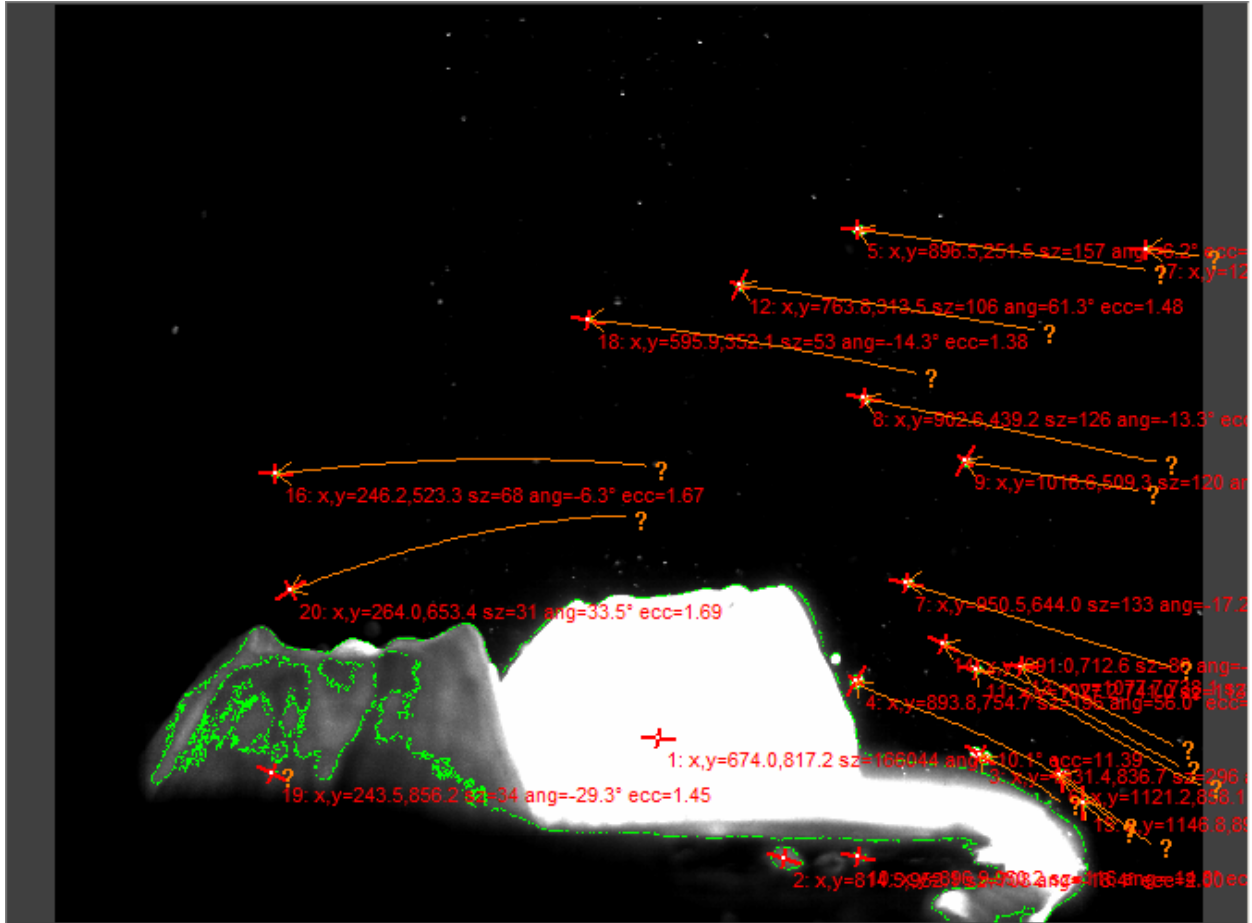


Figure 3. Tracked particles with correspondence trail

Updating Correspondences

ProAnalyst attempts to match all particles in the current frame with particles from the previous frame by using distance and weight calculations. If the correspondence trails do not follow the particles well, there are options that can be set to alter the way correspondences are determined.

1. To configure how correspondences are calculated, right-click and select **Particle Tracking ► Configure Correspondences**. The Particle Correspondence Settings dialog box is displayed.
2. Enter **15** as the value for Maximum Distance Moved (pixels), and click **OK**.

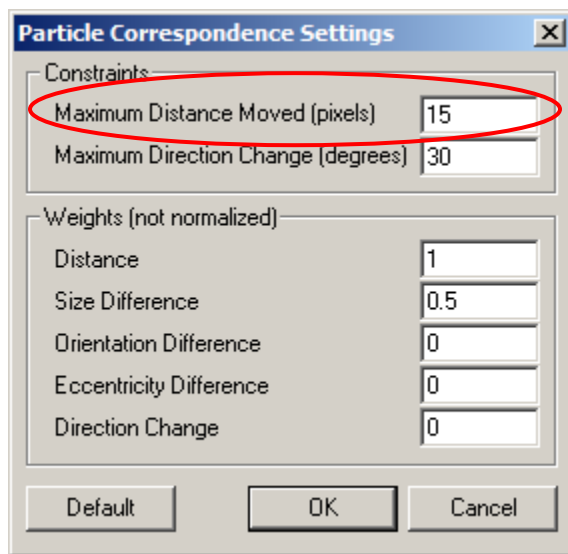



Figure 4. Particle Correspondence Settings dialog

3. Right-click again, and select **Particle Tracking ► Update Correspondences ► All Frames**.
4. A message indicates that correspondences have been updated for all frames. Click **OK**.
5. From the Play Controls, click **Play ►** to view the tracked video again.

Graphing

You can display particle tracking data as a graph by performing the following steps.

1. Click the Graph Configuration  button on the toolbar at the right side of the Measurement window to display the Graph Configuration control panel, shown in Figure 5.

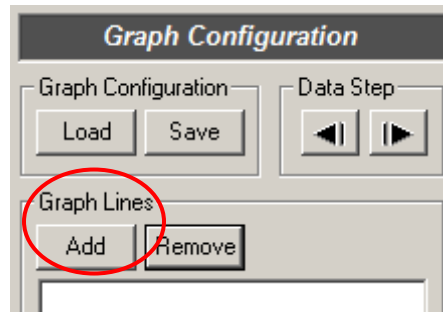


Figure 5. Graph Configuration control panel

2. Click **Add** to configure a line for the graph. The Select Items to Add to Graph window appears, with the entry **Particle**.
3. Click on the **+** icon to expand the list and click to place a checkmark in the box next to **Num Particles**, as shown in Figure 6.

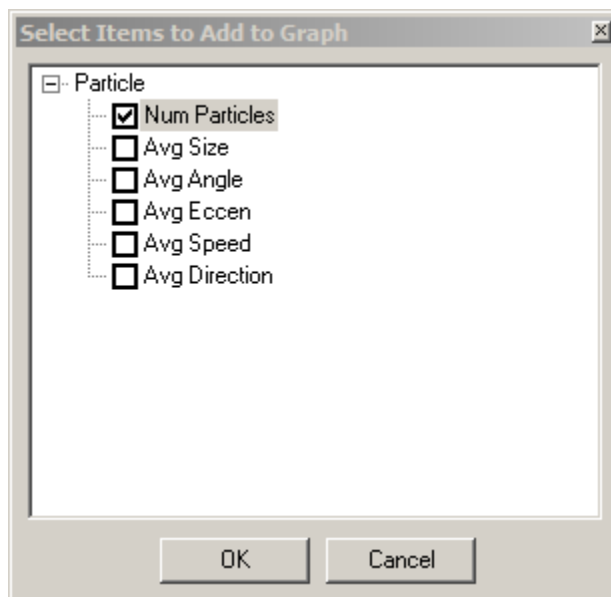



Figure 6. Add items to graph

4. Click **OK**. The graph is displayed in the window below the video image as shown in Figure 7.
5. Click **Play**  to show the video and data motion simultaneously.

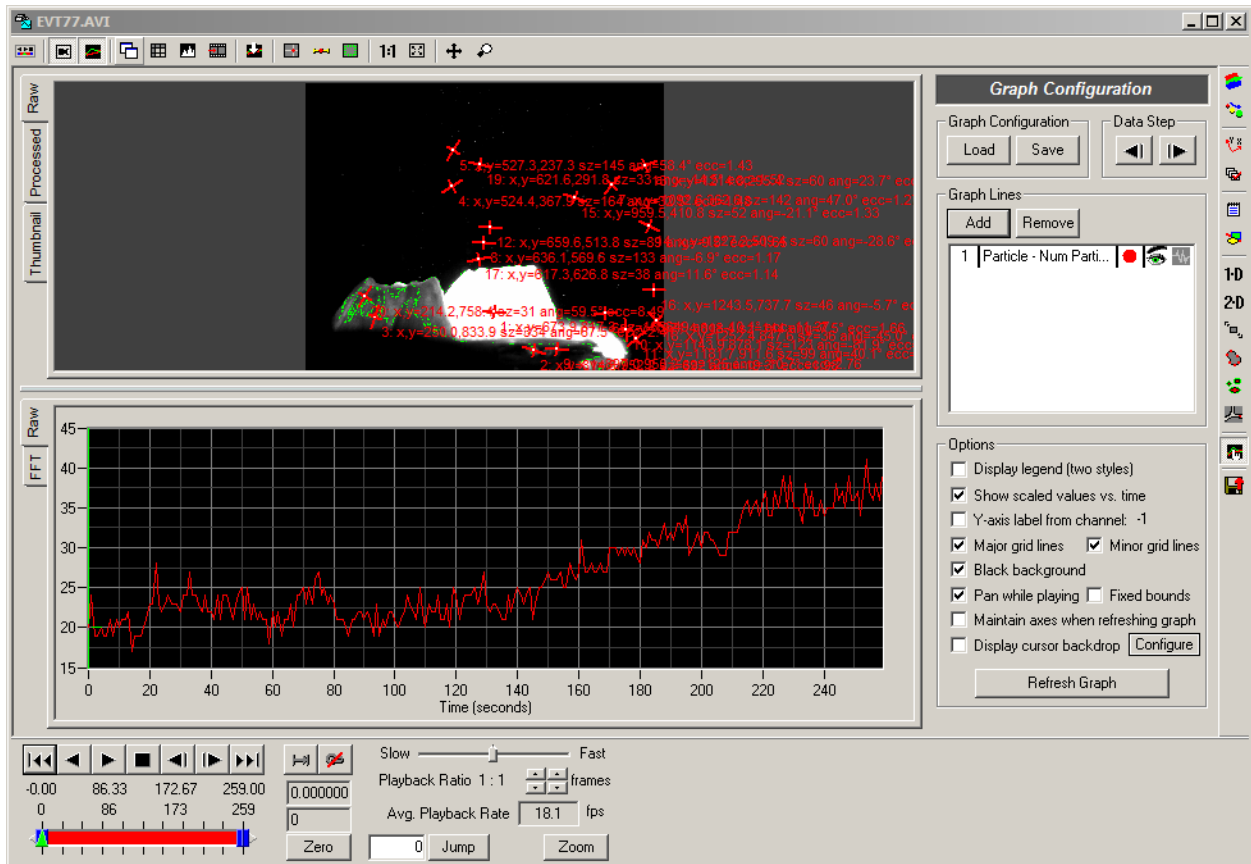




Figure 7. Video and graph display

Exporting the Data

1. Click the **Show Graph**  button on the toolbar at the top of the Measurement window to close the graph window.
2. Click the **Particle Tracking**  button on the toolbar on the right side of the Measurement window to display the Particle Tracking control panel again.

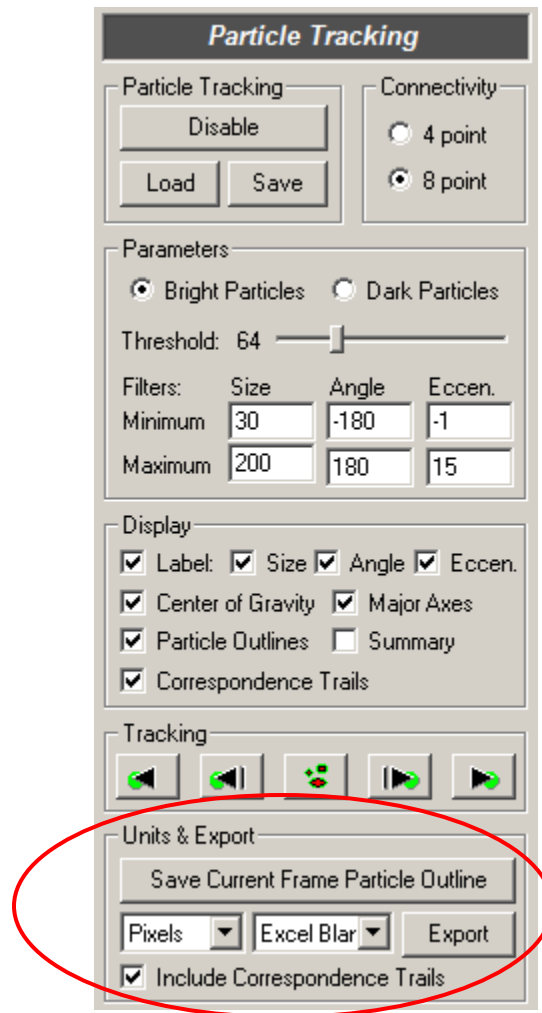
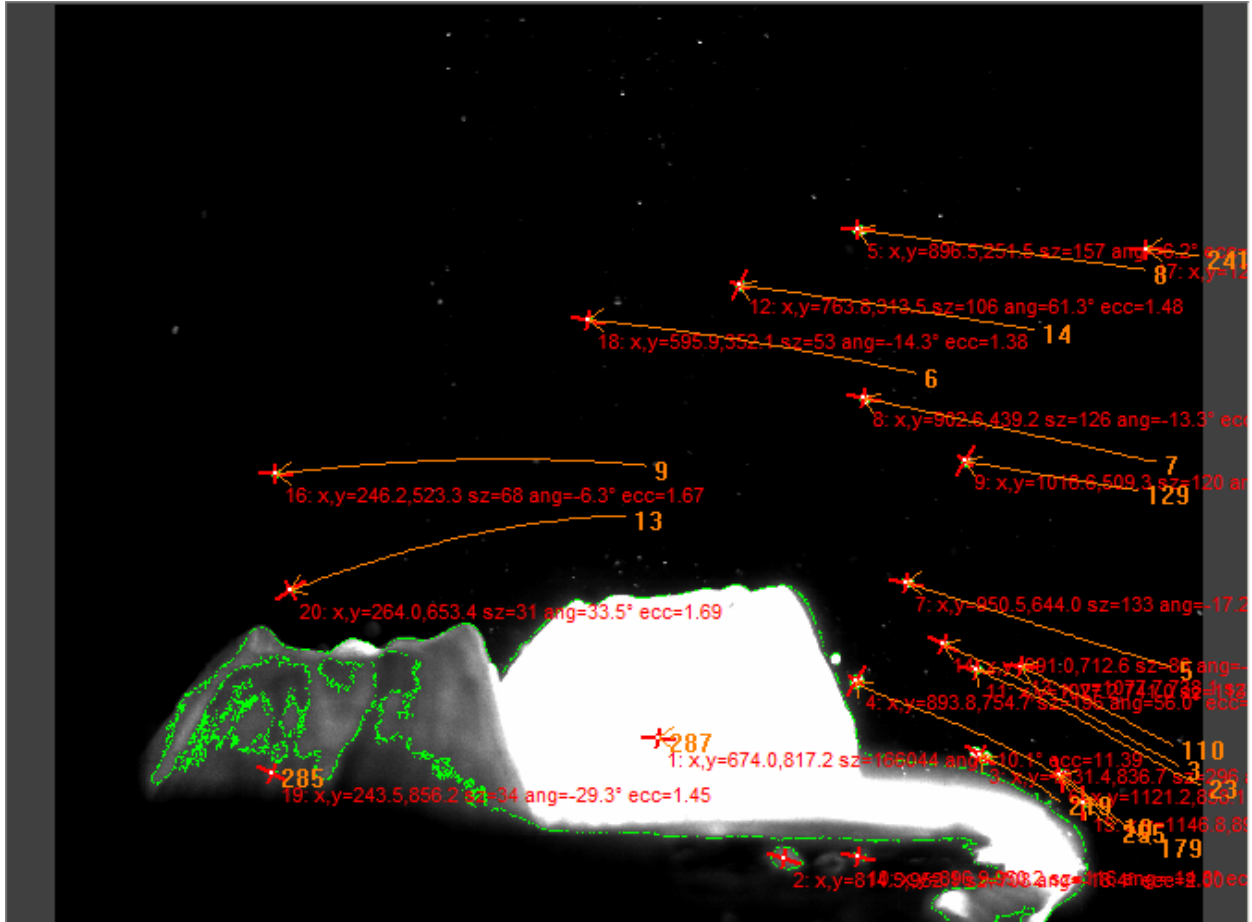


Figure 8. Export data to Excel spreadsheet

3. At the bottom of the panel in the Units and Export section, click the arrow to the right of **Text** and select **Excel Blank** from the dropdown menu.
4. Click the checkbox next to **Include Correspondence Trails**.
5. Click **Export**. A new Excel spreadsheet is launched, and the particle tracking information is written directly into it. In order to save these results, save the spreadsheet within Excel.

- Using the Play controls, view the video again. The question marks next to the correspondence trails have been replaced with the numbers assigned to each particle in the exported particle tracking information that appears in the Excel spreadsheet, as shown in Figure 9 below.



Saving and Loading

All Particle Tracking parameters and results can be saved to a file for later viewing. To save the parameters and results, click **Save** on the control panel. Particle Tracking parameters and results are saved in files with the *.pbr* file extension.

You can select **Save particle outline masks** if you wish. If you choose not to save the particle outlines, the *.pbr* file will be smaller; however, the green outlines will not be shown when the file is loaded unless you process each frame again.

To load a saved Particle Tracking file, click **Load** on the control panel.

More Information

For more information on the Particle Tracking toolkit, please refer to the *ProAnalyst User Guide*.

A complete tracked project file is available with this tutorial. Open *particle.mpj* in ProAnalyst to view it.

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