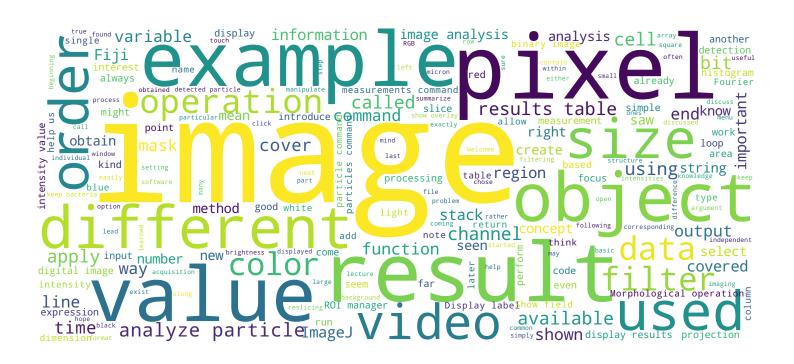# Analyze Particles

Image Processing & Analysis for Life Scientists

Olivier Burri, Romain Guiet & Arne Seitz

Analyze Particles

- Using Analyze Particles

- Displaying Results

- Output to Roi Manager

Hi! In this video, we will cover the analyze particles command, and some of its possible outputs. We will focus on how to use the particle analyzer in different ways. How to display results. And where they come from. As well as introduce the ROI manager.
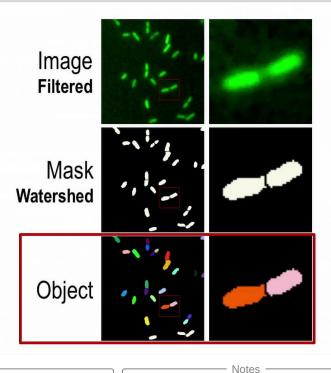
Notes

Summary

0m 05s

Analyze Particles

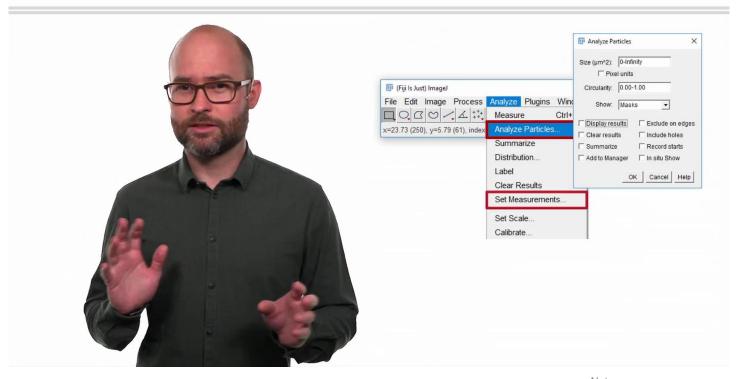**Image** Filtered

Mask Watershed

Object

Now, you have already seen these images before. These steps show us how to get from an image to objects. And we want to cover that last part down there. But to begin, let's apply some of the knowledge we've learned over the previous weeks to improve the quality of our detection. We've seen how filtering can help us remove noise. So in this case, let's apply a median filter to the initial image. Morphological operations in binary images can help us separate the particles further, like the watershed filter that we apply here. And this will lead to our object detection being a lot cleaner. So starting with this mask, let's see how we can get objects using the analyze particle command.

Notes

Summary

0m 21s

In Fiji

The command can be found under the Analyze menu. And the window looks like this. This command is closely linked to the set measurements command as we will see later on. There are many options here.

Summary

1m 05s

5. Segmentation, From Intensities To Objects

In Fiji

For the purpose of this video, we will only focus on the size and the circularity fields that allow us to filter out particles that would or would not meet this criteria. We will cover a few outputs of the Show field, and touch on the Display Results, and Add to Manager check boxes.
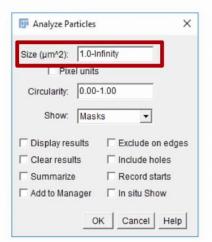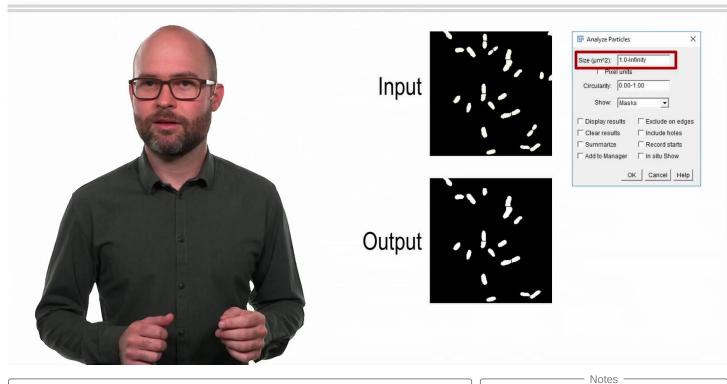
Notes

Summary

Input

The size filter lets a select particle to keep within a certain range. Notice that because our test image is calibrated, the size is shown in calibrated units.

Notes

Summary

Analyze Particles: Filtering

Input

Output

Analyze Particles

Size (µm^2): 1.0-Infinity

Pixel units

Circularity: 0.00-1.00

Show: Masks

☐ Display results ☐ Exclude on edges
☐ Clear results ☐ Include holes
☐ Summarize ☐ Record starts
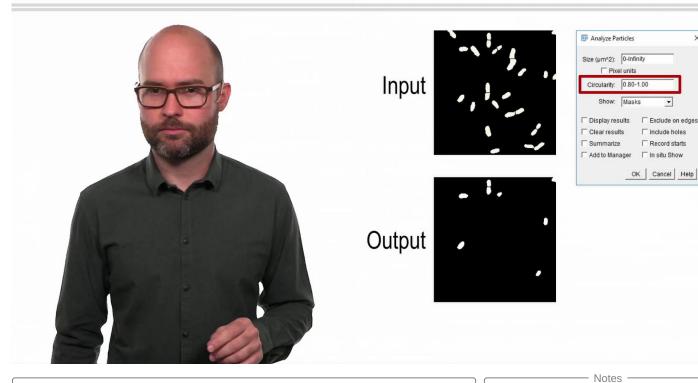☐ Add to Manager ☐ In situ Show

OK   Cancel   Help

So if we only want to keep bacteria above 1 micron, we can do so. To see the results we set the Show field to Masks. This will create a neaw mask image with only the particles that match the the size criteria, ready for further processing.

Notes

Summary

1m 45s

Analyze Particles: Filtering

Input

Output

Analyze Particles

Size (µm^2): 0-Infinity
☐ Pixel units
Circularity: 0.80-1.00
Show: Masks

☐ Display results   ☐ Exclude on edges
☐ Clear results   ☐ Include holes
☐ Summarize   ☐ Record starts
☐ Add to Manager   ☐ In situ Show

OK   Cancel   Help

Similarly, we can chose to only keep bacteria that are round by setting the allowed circularity to be between 0.8 an 1. To get more information on this measurement types, you can see the documentation table on the ImageJ the website. And the link is available below the video.
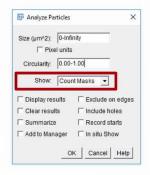
Notes

Summary

2m 01s

Analyze Particles: Filtering

Input

Output
Glasbey Inverted LUT

Analyze Particles

Size (μm^2): 0-Infinity
☐ Pixel units
Circularity: 0.00-1.00
Show: Count Masks

☐ Display results ☐ Exclude on edges
☐ Clear results ☐ Include holes
☐ Summarize ☐ Record starts
☐ Add to Manager ☐ In situ Show

OK Cancel Help

To get the results we showed at the beginning, the option is called Count Masks under the 'Show' field. This will give you an image with each individual particle, numbered with a unique number. And then you can color it using the appropriate color table. In this case we use the inverted Glasbey table.
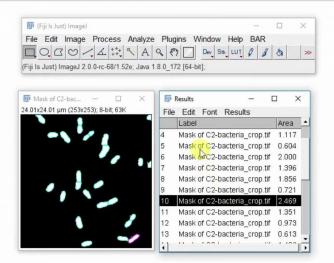
Summary
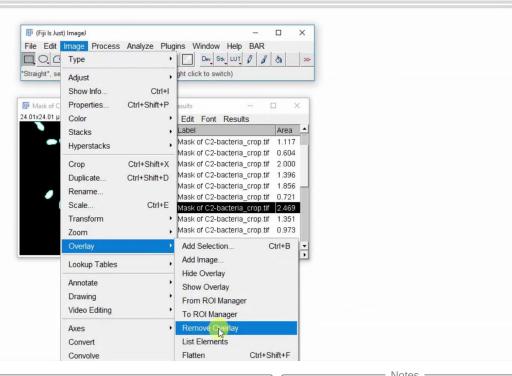
2m 18s

Analyze Particles: Overlay

So far, we did not see any data coming out of this analysis. So, to do that we can use the Display results check box to obtain information on each detected particle. A very useful feature to check the results is to use the show overlay mode. We run Analyze particles and then we select Show Overlay. When we click 'Ok' we get the results table. And if we use the rectangle tool whatever particle we select on our image will give us the corresponding line in the results table. Unfortunately, it doesn't work the other way. You cannot click on a result and then see what particle it corresponds to.

Summary

2m 37s

Analyze Particles: Overlay

If you wish to remove the overlay simply go to image overlay remove overlay.

Notes

Summary

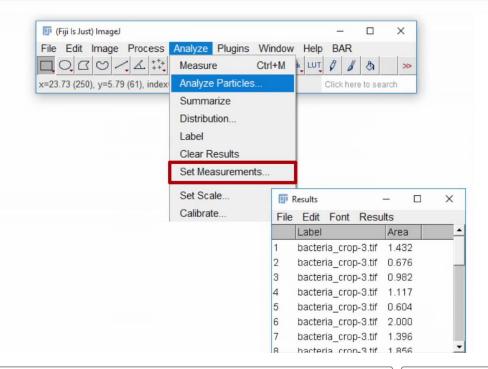3m 16s

The current results table has 2 columns. So let's see where these are coming from. Like we said, the set measurements command dictates what gets measured when analyze particles is run.
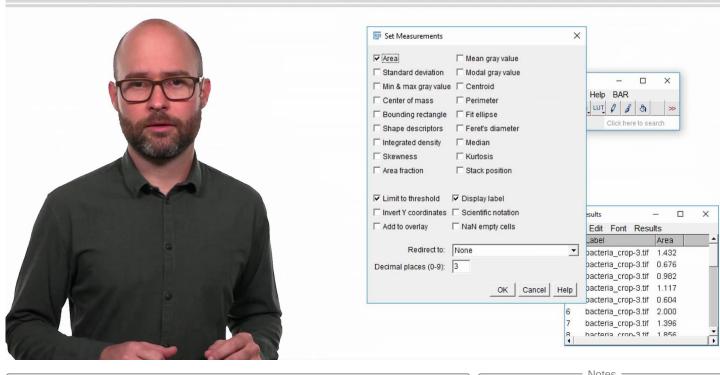
3m 21s

Analyze Particles: Results

Set Measurements

☑ Area	☐ Mean gray value
☐ Standard deviation	☐ Modal gray value
☐ Min & max gray value	☐ Centroid
☐ Center of mass	☐ Perimeter
☐ Bounding rectangle	☐ Fit ellipse
☐ Shape descriptors	☐ Feret's diameter
☐ Integrated density	☐ Median
☐ Skewness	☐ Kurtosis
☐ Area fraction	☐ Stack position

☑ Limit to threshold   ☑ Display label
☐ Invert Y coordinates ☐ Scientific notation
☐ Add to overlay   ☐ NaN empty cells

Redirect to: None
Decimal places (0-9): 3

OK   Cancel   Help

Help BAR
LUT
Click here to search

Results
Edit Font Results
Label   Area
bacteria_crop-3.tif 1.432
bacteria_crop-3.tif 0.676
bacteria_crop-3.tif 0.982
bacteria_crop-3.tif 1.117
bacteria_crop-3.tif 0.604
6 bacteria_crop-3.tif 2.000
7 bacteria_crop-3.tif 1.396
8 bacteria_crop-3.tif 1.856

We see that right now only the Area and Display label are selected. We recommend you always have Display label cheked to make sure you know what image is being analyzed. How to select and manipulate the results will be covered in a subsequent video. But for now, it's good that you note how to obtain it with the analyze particle command.
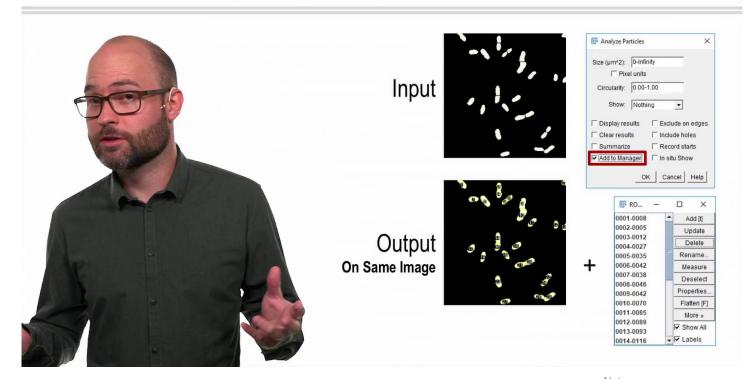
Notes

Summary

3m 31s

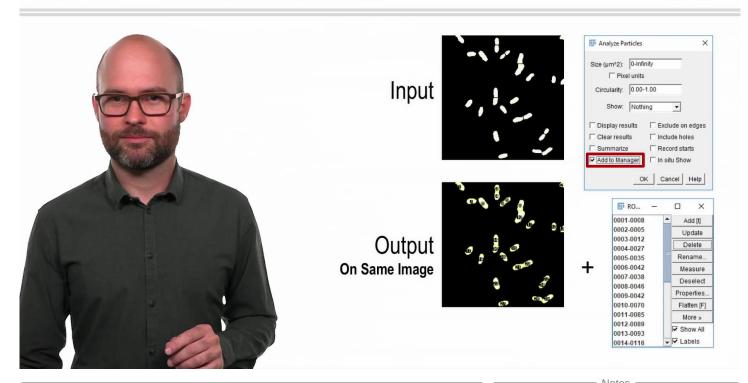# Analyze Particles: ROI Manager

The last option is with regards to sending the detected particles to something called the ROI Manager. This will create ROI (regions of interest) which are overlaid on the original images. These can then be used to visually inspect each particle, and see for example if the detection was correct. Furthermore, these regions are now independent of the masks image and can be to re-applied to other images, or other channels of the same image for example.

Notes

Summary

3m 50s

Analyze Particles: ROI Manager

Input

Output
On Same Image

+

ROI will be covered more extensively later. So don't worry if it seems that we've skipped through it.

Summary

Conclusion

EPFL
ECOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

- Using Analyze Particles

- Displaying Results

- Output to ROI Manager

Alright, that's the end for this video. We saw how to analyze the results for a binary mask. And how to perform filtering based on size and circularity. As well as what kind of outputs are available from the analyze particles command. We touch base on the concept of Results tables and Region of Interest. Both of which can be produced by this command. Goodbye! And enjoy the exercises!

Notes

Summary

4m 21s