

Alpha_Morph makes it possible to test morphological operators acting on Delaunay representations of point sets.

To use the plugins with ImageJ, install imageJ (<http://rsbweb.nih.gov/ij/>) and then copy the plugins/delaunay repertory into the plugins repertory of imageJ before launching imageJ. Copy Image_Extract.class as well.

Short overview of the interface:

Load Point Set: point sets can be loaded in text format as well in serialized format as obtained from the Save Point Set command button (test with the file *cloud.txt* and the Scale parameter 3075).

The **Scale** parameter gives the max coordinates of the point set in order to fit the Canvas display. Do not forget to click Enter to validate the new values of parameters.

The **Density Parameter** parameter gives the ratio of the medium size of the triangles over the Delaunay representation to binarize the mesh.

The **Convert** button should be able to convert a loaded image into a point set based on the color: a sufficient amount of red in the RGB color space is interpreted as a converter trigger. Typically, preprocessing feature extractors should output the points of interest in red (test with the image *franck.png*, *Convert* it and then *Process* it). Once converted, you can save the point set in a serialized format into *franck.data* and then load the point set independently from the image. By binarizing, eroding twice and dilating once, one can get the approximate region of eyes and mouth.

The rest of the commands are quite intuitive according to the paper description.

The digital histopathology example:

How to use the plugins Image_Extract and Delaunay.Alpha_Morph ?

If you get a point set, you can directly work with Delaunay.Alpha_Morph.

If you get an image with interest points as red value pixels, you can directly work with Delaunay.AlphaMorph by using the **Convert** tool. The **Jitter** to 0.01 by default enables to make the Delaunay triangulation computation more robust in case of degeneracy of point configurations.

If you need to extract a point set from an image, we propose to use the Image_Extract plugin which is a basic means of extracting interest points. It provided good results on the Whole Slide Image WSI.jpg of a low resolution digital histopathology sample. Starting from the Init.jpg image obtained as an output of the Image_Extract plugin, you can load it in the Delaunay.Alpha_Morph interface. Then **Convert** into a point set. Then, you can superimpose the original image by loading WSI.jpg.

From there, you can proceed the **Process All** to get the Delaunay_AlphaMorph structures and basically the Delaunay triangulation. You can visualize in either mesh or contour mode.

Then, after the mesh binarization, a dedicated line of morphological filters extracts a rough Region of Interest (ROI) on which to focus the more resolved image processing modules. For instance, you can try an erosion of order two followed by a dilation of order one.

The **Scale** parameter corresponds to the $\max(x,y)$ value in your point set $S=\{(x,y), x>0, y>0\}$ to adapt the visualization area in the interface.