Readme

ConeSegmentation is a software package for segmenting the boundaries of cone photoreceptors in non-confocal adaptive optics images such as split detection. The software GUI interface also allows for manual adjustment or fine tuning of segmented boundaries or fully manual segmentation. Segmentation contours can be exported for further analysis.

If any portion of this software is used, please cite the following paper in your publication:

Jianfei Liu, HaeWon Jung, Alfredo Dubra, and Johnny Tam, "Cone Photoreceptor Cell Segmentation and Diameter Measurement on Adaptive Optics Images Using Circularly Constrained Active Contour Model," Investigative Ophthalmology & Visual Science 59(11): 4639-4652, 2018

After downloading ConeSegmentation-1.0.0-win64.exe, follow the installation steps to install the software in your local machine. Once the software is launched, there are several buttons in the toolbar:

Open: load single/multiple non-confocal split AO images (.tif)

Save: write segmentation and detection results for the current active image

Save all: write segmentation and detection results for all images

Detect: it will start a dialog with a few parameters

* Hessian response: used for extracting cell regions. This value should be reduced if the image contrast is low (such as below 50).
* GAC Iteration #: used for control the iteration number of cell segmentation. If cones are over-segmented, reduce the value; otherwise, increase it.
* Detect current: only segment cones in the current image
* Detect all: segment cones for all images

**Note: the default parameters are optimized for an AO image acquired with a field of view of 0.75 degrees. Upsampling images is recommended if you do not want to adjust parameters.**

Default: Set to normal mouse operation

* Mouse wheel, or pressing and moving right mouse button will zoom the image
* Pressing and moving center button/wheel will move the image

Draw: Pressing the left mouse button and moving the mouse will draw individual cone contour

Edit: Use the left mouse button to select a cone contour, and it will show a set of red control points. You can drag and move control points to refine cone contour. Move the mouse to a control point and press wheel/center mouse button can locally move the current entire cell contour.

Erase M: Similar to draw button, you can randomly draw a contour, and any cones will be removed if their centers are inside the contour

Erase S: Use the left mouse button to click a cone, it will remove it.

You can also hold the control key and use the right mouse button to remove a cone while in any mouse mode.

Undo: undo manual operations

Empty: It will empty all manual operation histories.

Settings: It will set the visibility of cell contours and their regions. You can also adjust the contour/region width, color, and opacity.

Help: explain a set of keyboard control

This software also keeps segmentation history of each input image. Once you detect once, the program will automatically load results in the next time you load the same image.

This software was primarily developed by Jianfei Liu, Andrei Volkov, and Johnny Tam, with research support from the Intramural Research Program of the National Institutes of Health, National Eye Institute. [Contact the Tam lab: https://nei.nih.gov/intramural/translational-imaging]