Readme

ConeDetection is a software package for identifying cone photoreceptors in non-confocal adaptive optics images such as split detection. The software GUI interface also allows for manual adjustment or labeling. The labeling 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, "Automated Photoreceptor Cell Identification on Nonconfocal Adaptive Optics Images Using Multiscale Circular Voting," Investigative Ophthalmology & Visual Science 58(11): 4477-4489, 2017

The algorithm is described in the paper above.

After downloading ConeDetection-1.4.1\_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 detection results for the current active image

Save all: write detection results for all images

Detect: Initiates automatic detection with a set of parameters, briefly explained here:

* Voting radius: control the size of search range. This radius is specified in pixel units and is important for scaling the algorithm to different fields of view. Larger valuer are used for smaller fields of view, and smaller ones for larger fields of view. (default value: 5 for a field of view of 1 or 1.5 degrees)
* Gradient threshold: Used to select the boundary points used for computing the voting response. If the cone boundaries in the image are weak, reduce this value. Otherwise, enlarge it. (default value: 5)
* Scale value: Scale for computing image gradient magnitudes. Larger values are used for smoothing out false positives, and smaller ones to recover some missed detections (at the expense of more false positives). (default value: 2)
* LOG response: A threshold to select detection points from the multi-scale LOG response. This value is a refinement of the 'scale value' parameter. Larger values are used to reduce false positives, and smaller ones to recover some missed detections. The recommendation is to first use the 'scale value' to set the threshold for false positives or to recover missed detections (coarse adjustment), and then to use this one if further refinement is needed. (default value: 1.0)
* Dim cones check box: Keep this box unchecked unless there are a large number of dim cones in the current image. This box is checked if the contrast is very low in most portions of the current image which will cause the algorithm to miss cone detections. Checking this box will force the algorithm to include dimmer cones.
* Detect current: Perform automated detection for the current image only.
* Detect all: Detect cones for all loaded images.

Adjust: normal mouse operation

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

Mark: manually add detection points

Erase: manually erase points

Undo: undo manual operations

Glyph size can be increased/decrease

Check/uncheck to show cone glyphs

Help: List keyboard controls

This software also keeps detection 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]