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Automatic Center Finder User Guide

Requirements

- Python 3.6.1 or later (could be compatible with older versions but this has yet to be tested)
- Scikit-image (skimage)
- Matplotlib
- Numpy
- Scikit-learn (sklearn)
- Scipy
- Tkinter

Setup (Mac)

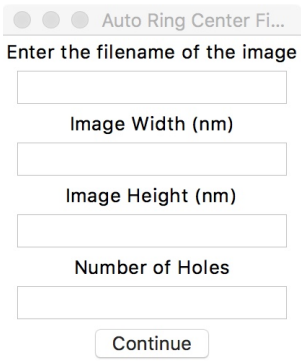
- Create a new folder in your Documents folder called CenterFinder
- Download the centerFinder.py script
- Move the centerFinder.py script along with any images that you wish to analyze into the CenterFinder folder

Launching Center Finder

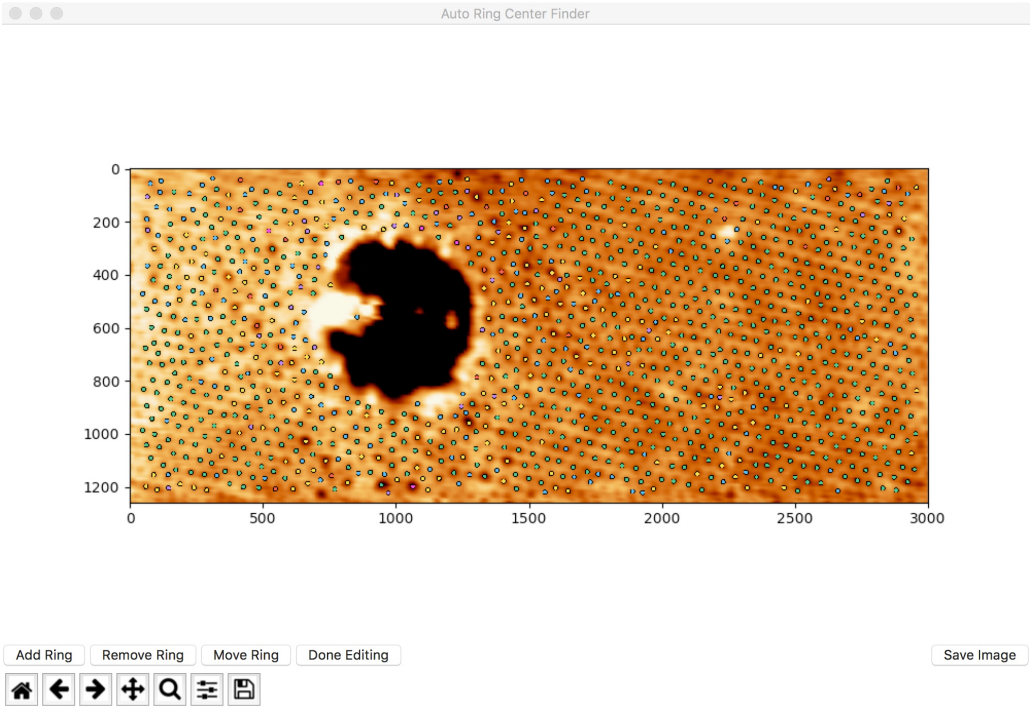
- Open up the terminal (can be done by searching terminal in Spotlight Search)
- Enter the following command into terminal to change to the correct folder
  - cd ~/Documents/CenterFinder
- Whenever you wish to run Center Finder, enter the following command
  - python centerFinder.py

Using Center Finder

- When Center Finder is launched, the following window will open



- Within this window, enter the filename of the image (including the type suffix i.e. .png or .jpg), the width and height of the image in nm, and the number of holes that are in the image
- Once you have entered all of the required information, press continue to begin the image analysis process
- After the program is finished locating the centers (this may take a minute or two), the following window will appear



Using Center Finder cont.

- Within this window, the image marked up with the automatically located centers is shown, along with several buttons that allow the user to manually adjust the centers
- Center Color Key
  - 4 Membered Ring - Purple
  - 5 Membered Ring - Blue
  - 6 Membered Ring - Green
  - 7 Membered Ring - Yellow
  - 8 Membered Ring - Red
  - 9 Membered Ring - Pink

Manual Editing

Zoom - To zoom into a particular segment of the image, click on the magnifying glass button, and then click and drag to select a rectangular region within the image to zoom into

Pan - To pan around the image while zoomed in, click on the four-directional arrow button and drag the image around to move which segment of the image is currently in view

Reset View - To reset the view so that you can view the entire image again, click on the house button

Adding Rings - To add a new ring center, click on the “Add Ring” button, and then click at the location on the image where you want to add a center. You must click the “Add Ring” button each time you wish to add an additional center

Removing Rings - To remove a particular ring center, click on the “Remove Ring” button, and then click on the center in the image you would like to remove. You must click the “Remove Ring” button each time you wish to remove an additional center

Moving Rings - To move a ring center, click on the “Move Ring” button, and then click at the location on the image where you want to move the nearest center. You must click the “Move Ring” button each time you wish to move an additional center

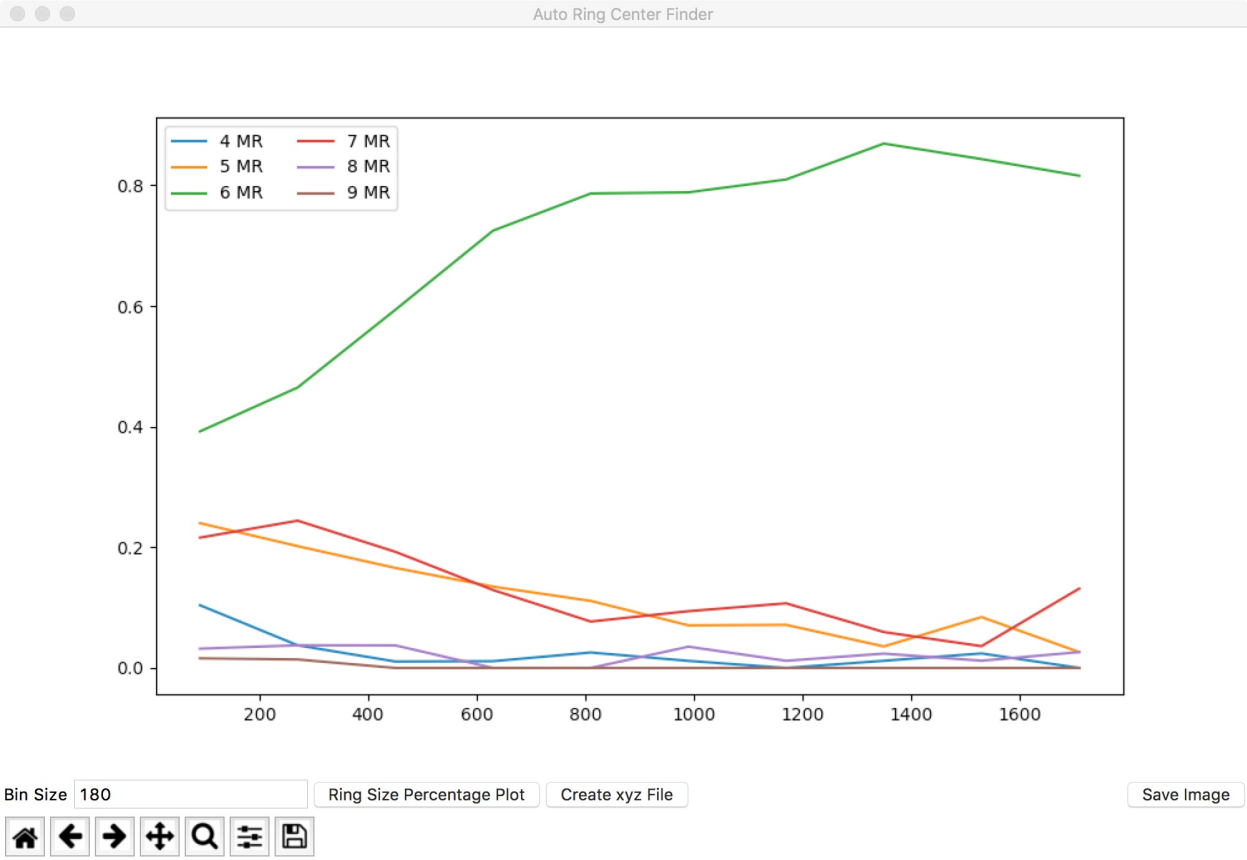
Manual Editing cont.

Save Image- To save the image at any time, click on the “Save Image” button, and it will be saved as the original file name but with plotted added at the end in the CenterFinder folder

Finish Manual Editing - To finish manually editing, click on the “Done Editing” buttons, and the window for statistics and exporting will be shown

Statistics and Exporting

- Once you click the button to finish editing once you are satisfied with the results, the following window will be displayed



Setting the Bin Size - To adjust the size of the bin used to plot the Ring Size Percentage Plot, enter an integer into the Bin Size entry field and click on the “Ring Size Percentage Plot” button to re-plot the plot using that bin size

Statistics and Exporting cont.

Exporting to XYZ File - To export the center data to the XYZ file format, click on the “Create xyz File” button, and the data will be saved as a text file with the filename of the image but with a suffix of “xyz.txt”

Optimal Images and Future Planned Improvements

- Currently, the Center Finder is optimized to work with very large image sizes, those on the order of around 1000-4000 pixels in width and 1000 to 4000 pixels in height
- Typically, high contrast and well defined images tend to work much better and produce cleaner results
- I plan to add in more accommodation for images of all sizes while preserving accuracy in the future
- Initial automatic center placement accuracy improvements are also possible in the future