

Instructions for MomentMacroJ v1.2

This macro calculates the anisometry and bulkiness of binary particles based on the dynamically equivalent ellipse as defined by Medalia (1970). The macro is available as freeware at <http://www.hopkinsmedicine.org/FAE/mmacro.htm>.

1) Open ImageJ

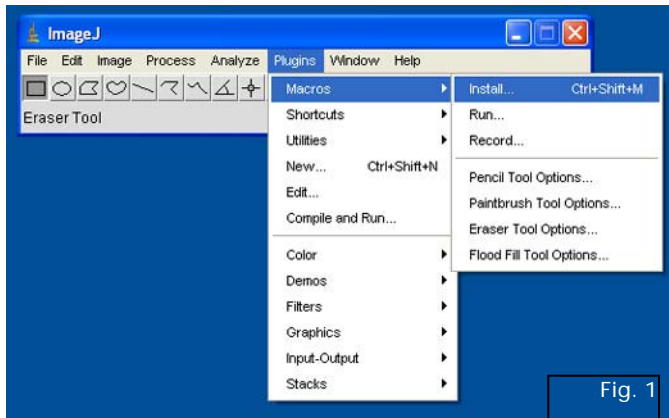
The ImageJ program is available as freeware. This macro requires ImageJ version 1.34g or later. See <http://rsb.info.nih.gov/ij/upgrade/index.html> for the latest version of ImageJ.

2) Load macro

a) Install the macro (“Plugins” → “Macro” → “Install” → select MomentMacroJ_vx_x.txt file) (Fig. 1).

MomentMacroJ is available as freeware from <http://www.hopkinsmedicine.org/FAE/mmacro.htm>. The macro file (MomentMacroJ_vx_x.txt) does not have to be saved in the ImageJ folders and may be archived anywhere on your computer.

MomentMacroJ does not remain in resident memory for ImageJ. Each time you open ImageJ, you will need to reinstall the macro.



3) Prepare 2D image

a) Open image of cross-section in ImageJ.

MomentMacroJ v1.2 is written to run with 8-bit grayscale images. (Future versions will accept 16-bit and RGB images.) See instructions below for converting images to 8-bit grayscale format.

You will need to know the resolution of your image (i.e., the scale) ahead of time (e.g., 4.06 pixels/mm). This information may also be calculated using the “measure” function in ImageJ and a suitable scale bar in your image.

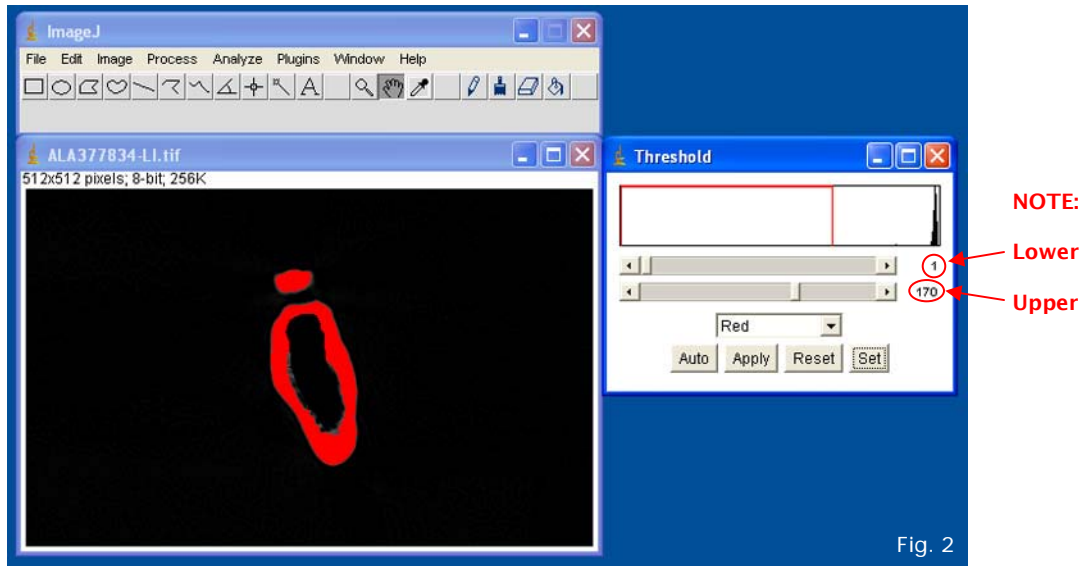
Some files may open directly into ImageJ using the “Open...” command. Other types of images, including raw CT data, must be imported into ImageJ using the “Import...” command.

Removal of trabecular bone or other tissue will be specific to each project and may be performed using the drawing tools in ImageJ prior to analysis.

b) Choose density threshold (“Image” → “Adjust” → “Threshold”) (Fig. 2).

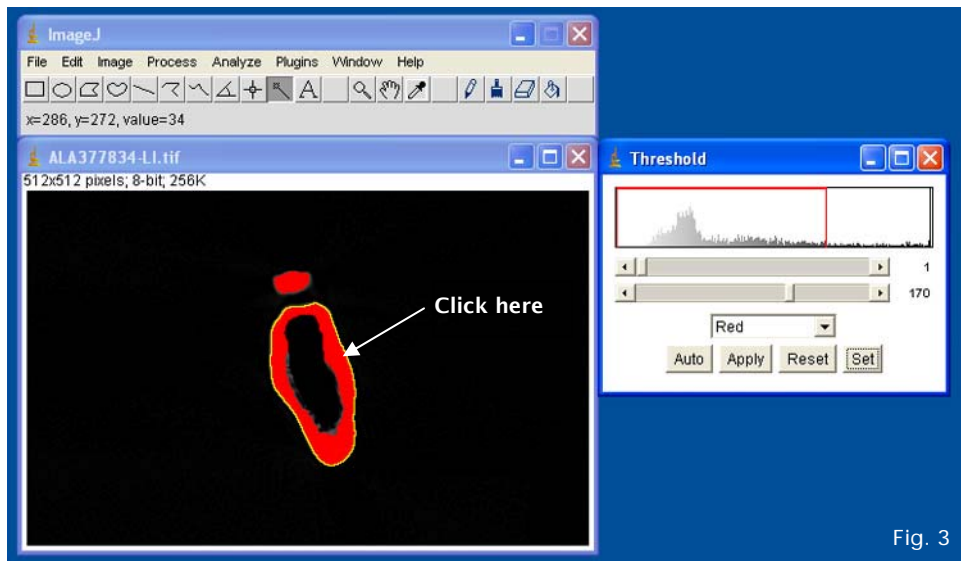
The density threshold indicates pixels that fall within a given range of bone densities. Density thresholds will be specific to individual projects. The goal is to choose a density range that provides an accurate estimation of physiologic bone tissue.

Make a note of the upper and lower threshold limits. Do not press “Auto”, “Apply”, “Reset” or “Set”.



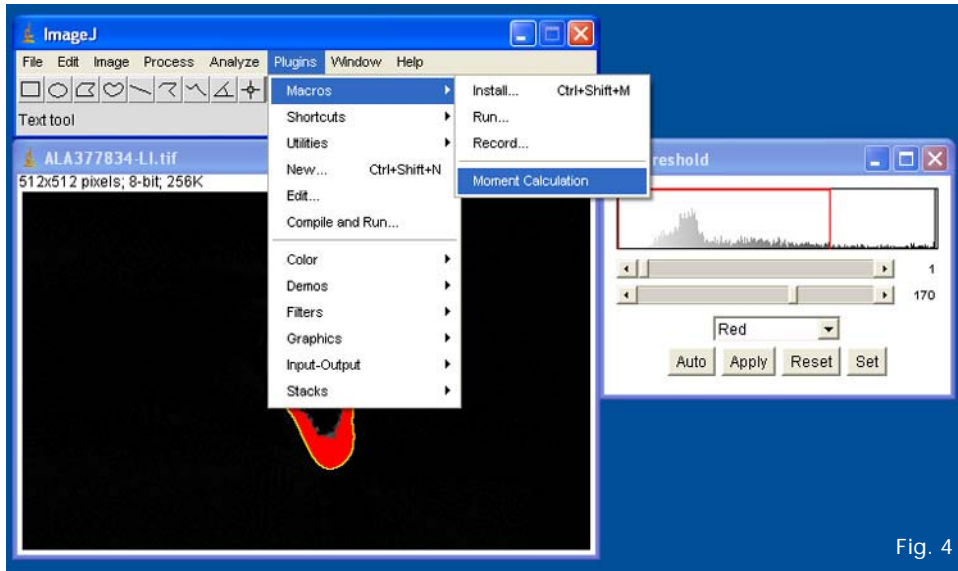
c) Use wand (tracing) tool  to select region of interest (Fig. 3).

Click with tool on bone near outer edge of bone cross-section.



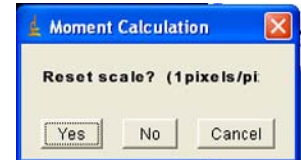
4) Run macro

a) Run macro by selecting “Moment Calculation” under the “Macro...” command (“Plugins” → “Macros” → “Moment Calculation”) (Fig. 4).



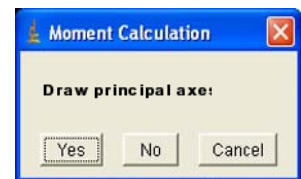
b) Reset scale? (Fig. 5)

The current scale is shown in parentheses. All results are given in terms of this scale. If you choose to reset scale, you will need to enter alternate units (e.g., mm) and number of pixels per unit.



c) Draw principal axes? (Fig. 6)

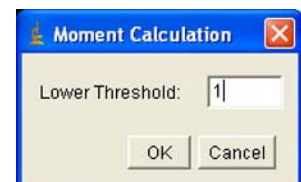
Principal axes will be drawn on your image, representing axes of maximum and minimum bending rigidity (see Fig. 8 for image).



d) Enter name of sample (“sample” is the default).

e) Enter lower threshold. (Fig. 7)

On prompt, enter the lower of the threshold values you chose in Step 3b.

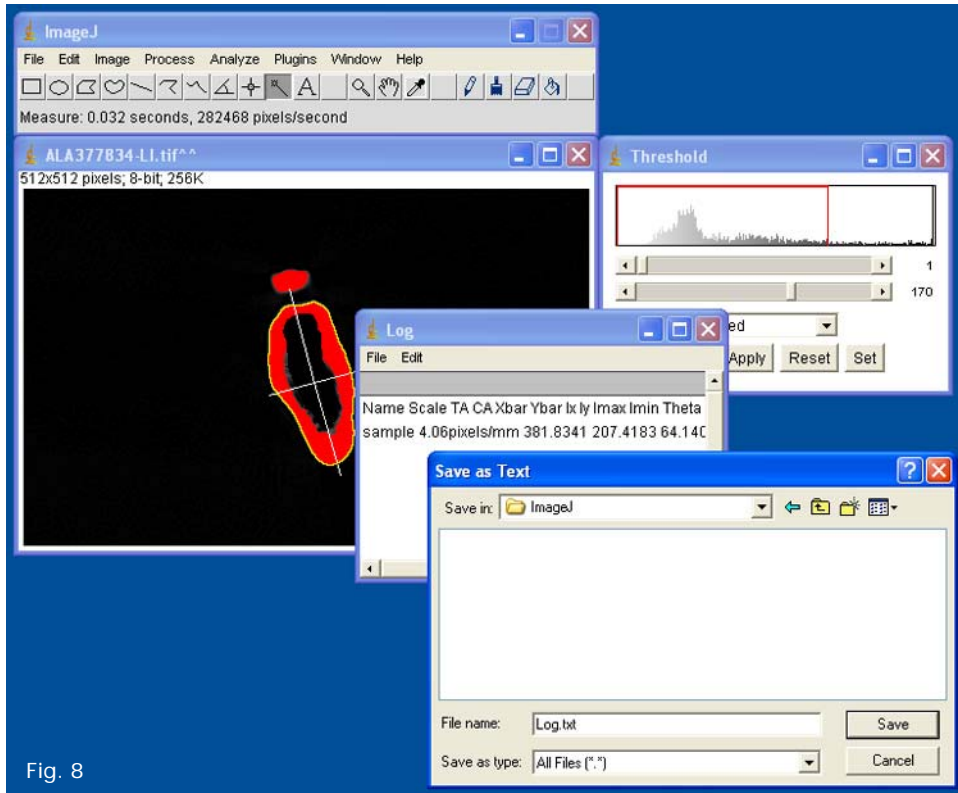


f) Enter upper threshold.

On prompt, enter the greater of the threshold values you chose in Step 3b.

5) Results. (Fig. 8)

The macro will output a “Log” window and prompt the user to save a space-delimited log file in text format (the default filename is “Log.txt”). Results may be viewed in the “Log” window to check for obvious errors. The “Save as Text” prompt saves the data in the “Log” window. A spreadsheet software (e.g., Excel) may be used to import the space-delimited log file in a user-friendly format for other types of analysis.

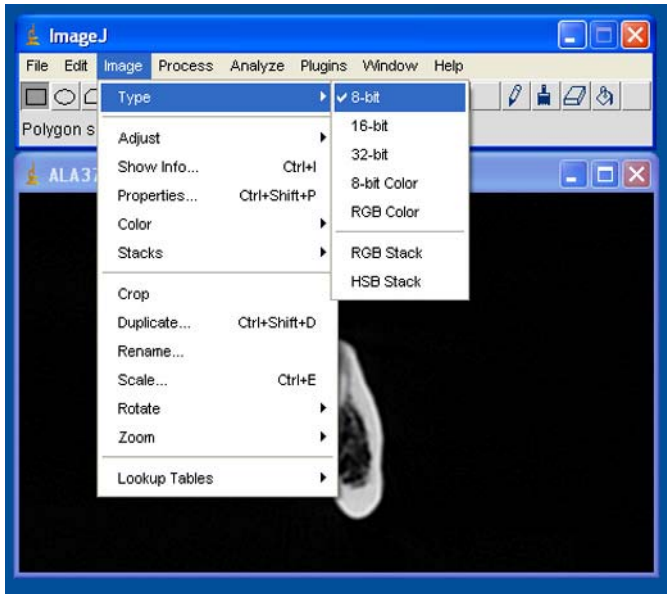


6) Analyzing multiple images.

MomentMacroJ is written to simplify sequential analysis of multiple images. The macro only needs to be installed once to analyze multiple images. The “Log” window can maintain data for multiple analyses, but must be saved to preserve data after ImageJ has been closed.

Appendix 1) Converting images to 8-bit grayscale format.

Most images may be converted to 8-bit grayscale using the “Image Type” command (“Image” → “Type” → select 8-bit) (Fig. A1). Note: Color data will be lost, and the range of grayscale values is limited to 256 values. We do not recommend using images that have been saved as JPG files.



Last updated: March 17, 2006

Please report any problems, comments, or questions to Dr. Valerie Burke DeLeon (vdeleon@jhmi.edu).