COUNTING VERMEER
Software User's Guide
for `zoomIn`, `displayWeaveMaps`, and `align` (CRJ - 10/11/15)

zoomIn

Pressing the `new x-ray` button prompts the user to select the x-radiograph tiff file of interest. The display shows the x-radiograph on the left/top and a close-up of the patch covered by the green rectangle within x-radiograph on the right/bottom. This green box is moved (click and drag) using the mouse.

Recommended exercise: Use this tool to find and document double thread faults, excessively thin/thick threads, edges with secondary cusping, and weft snakes.

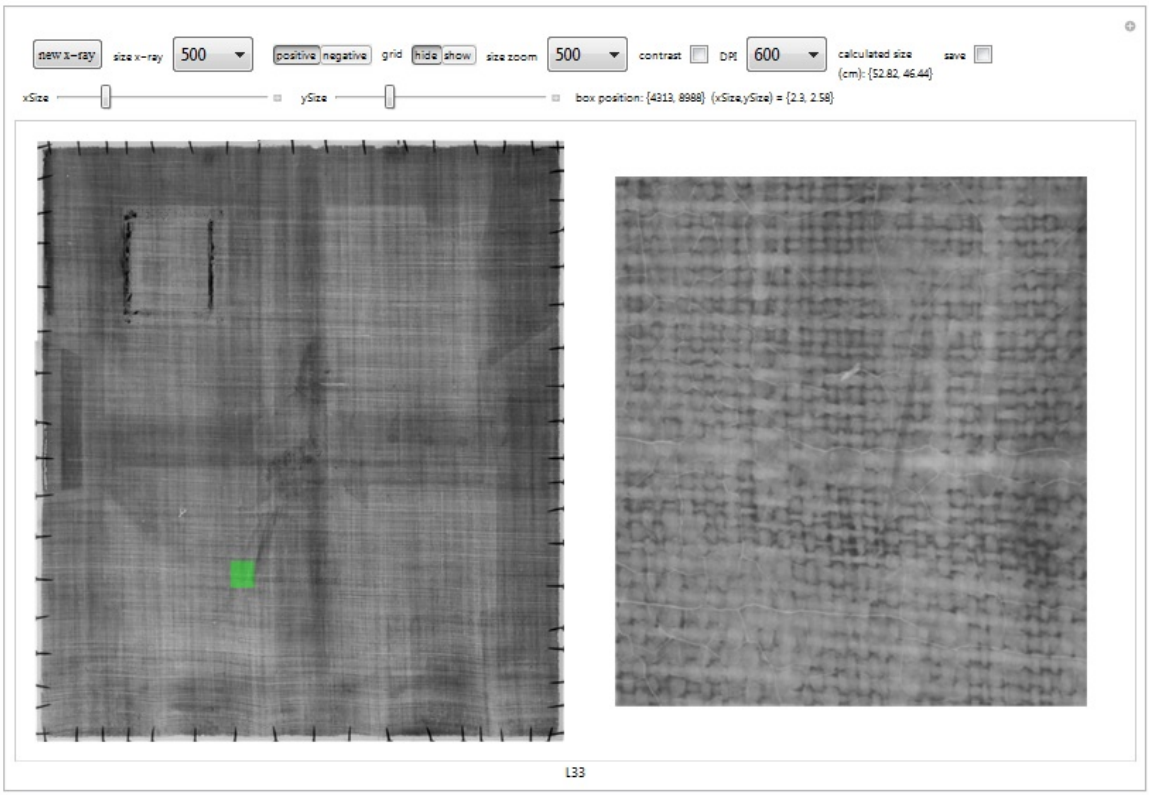

Figure 1: L33 X-radiograph Close-up

- **new x-ray** :: Pressing this button prompts the reader to select the x-radiograph of choice among folders and files available to the user's computer.

- **size x-ray** :: Sets the size of the window in which the x-radiograph is displayed with larger numbers producing larger windows

- **positive/negative** :: Allows inversion of the greyscale intensity of the x-radiograph with "negative" correpsonding to the scanned image in an exposed x-ray film and "positive" to its inversion so white pixels become black and vice versa.

- **grid : hide/show** :: A grid overlay of 2cm squares can be superimposed or removed on the full x-radiograph and similarly a grid overlay of 0.5 cm squares on the close-up patch.

- **size zoom** :: Sets the size of the window in which the close-up patch is displayed. If the size of the zoomed patch becomes too large to be displayed in a row with the original x-radiograph, the zoomed patch display will be shifted to appear below the original x-radiograph.

- **contrast** :: clicking the contrast box will leave a checkmark indicating that the zoomed patch has been histogram equalized in an attempt to improve the contrast. Clicking on the checkmark will return the image to its original state.

- **DPI** :: Pressing this button produces a list of dpi (dots per inch) values spanning all of the choices used in producing the x-radiograph scans for Vermeer's paintings on canvas. It is important that this setting match the actual dpi for appropriate conversion of numbers of pixels into centimeters. [Will there be a table of dpi values for the Vermeers? Is the dpi being read now from the image header?]

- **calculated size** :: As a check on the dpi setting, the calculated image size based on its dimensions in pixels and the user-selected dpi is posted next to the dpi button. This should compare favorably with the dimensions of the object x-rayed. [Presumably the table being composed by Ige and Petria will have these values.]
- **save** :: Clicking this box creates a tiff file of the close-up and asks the user where to store it. The file name automatically assigned to the new file includes information on the location of the zoom window as pixel coordinates in the original image and its size in cm.
- **xSize** :: This slider sets the x-dimension of the close-up. Clicking on the small "+" at the end of the slider produces a method for more flexible, finer control of this setting.
- **ySize** :: This slider sets the y-dimension of the close-up. Clicking on the small "+" at the end of the slider produces a method for more flexible, finer control of this setting.
- **box position** :: a listing of the pixel coordinates within the full image at the center of the green box
- **(xSize,ySize)** :: a listing of the selected close-up box size set by the sliders.

displayWeaveMaps

The pre-computed principal Fourier component location for various evaluation box sizes and movement steps across the face of the x-radiograph are displayed in maps of thread density (th/cm) and thread angle (degrees).

Recommended exercise: For the weave density maps in the two directions for one x-radiograph, attempt to select visually the direction with a greater standard deviation in its local thread counts in the evaluation tiles. Compare your observation with the recorded standard deviations.

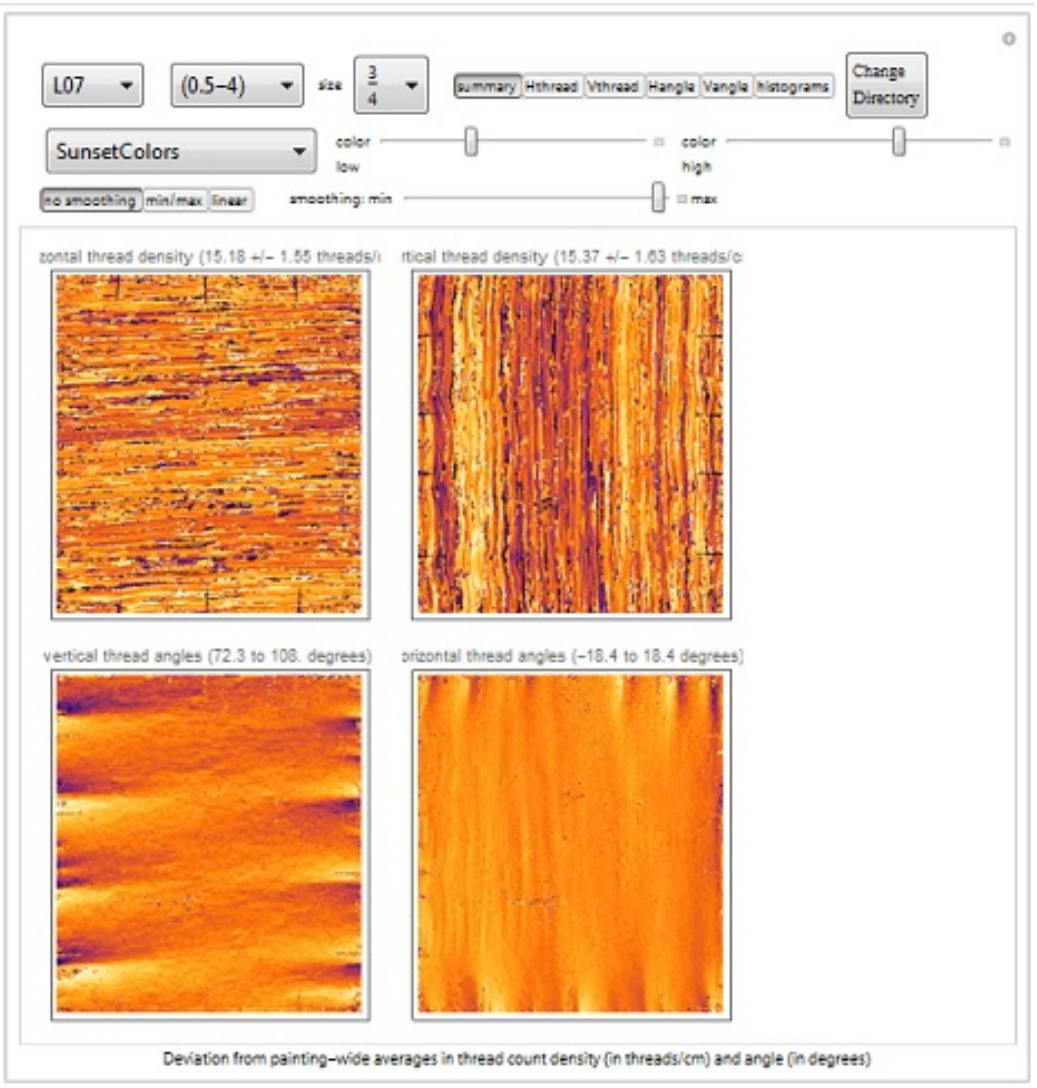

Figure 2: L07 `displayWeaveMaps` summary plot

- **select x-ray** :: Pressing this button lists file names of x-radiographs for whiich the pertinent thread count data has been collected among which the user selects the one for weave map viewing.

- **evaluation tile size and repetiton rate** :: The square evaluation tile size (over which the "local" Fourier analysis is conducted) is represented by the length (in cm) of one of its sides. The number after the dash indicates the horizontal/vertical spacing between the centers of adjacent evaluation tiles, i.e. the spacing is this number divided into the evaluation tile side length, e.g. 0.5 - 2 indicates 0.5 cm square evaluation tiles with their centers on a grid of rows and columns of dots separated by 0.5/2 = 0.25 cm. The smaller the evaluation tile size and the greater the number of repititions the longer it takes to produce the plots from the database.

- **size** :: smaller settings reduce the size of the box enclosing thel plots on the screen

- **summary/Hthread/Vthread/Hangle/ Vangle/histograms** :: With "summary" seleced, four images are shown - upper left: horizontal thread density, upper right: vertical thread density; lower left: vertical thread angles; lower right: horizontal thread angles. Each of the density maps lists across its top edge the average of the thread counts within the evaluation patches and the standard deviations about this average. For the angle maps, the range of angles encountered is listed.

  "Hthread", "Vthread", "Hangle", and "Vangle" select one of the four images in the summary view as the sole figure. A left mouse click on any of these images will replace it with the full image x-radiograph. Another click returns the chosen weave density/angle map. Each of these images is accompanied by its

color scale.

The "histograms" button presents histograms of the density/angle values associated with the evaluation tiles plotted in "summary" plot. [Currently has a BUG]

- **Change Directory** :: Allows the user to select a folder from which to fetch the pre-computed values plotted in the various figures.

- **colors** :: Pressing this button allows the user to select from about 50 different color schemes. Different color schemes can enhance the human perception of different features.

- **color low** :: This slider sets the lower level on the color bar for the individual density and angle maps. This only effects the individual maps. Clicking on the small "+" at the end of the slider produces a method for more flexible, finer control of this setting.

- **color high** :: This slider sets the upper level on the color bar for the individual density and angle maps. This only effects the individual maps. Clicking on the small "+" at the end of the slider produces a method for more flexible, finer control of this setting.

- **no smoothing / min/max / linear** :: This button offers some selectivity in Fourier peak selection in the event that no one peak dominates in the region of interest. Two different smoothing procedures - in addition to no smoothing – are available.

- **smoothing** :: This slider adjusts the level of intevention by the smoothing algorithms with "max" most aggressive. Clicking on the small "+" at the end of the slider produces a method for more flexible, finer control of this setting.

align

This program assists visual assessment of the similarity of striped patterns in weave density maps computed from two x-radiographs. The weave maps of 2 x-radiographs once selected can be rotated (in 90 degree chunks), flipped (top to bottom), and translated (click and drag) to assemble a pair sharing a common stripe pattern The single color scale used in plotting both weave maps being aligned is also provided.

Recommended exercise: Try aligning an image with itself.

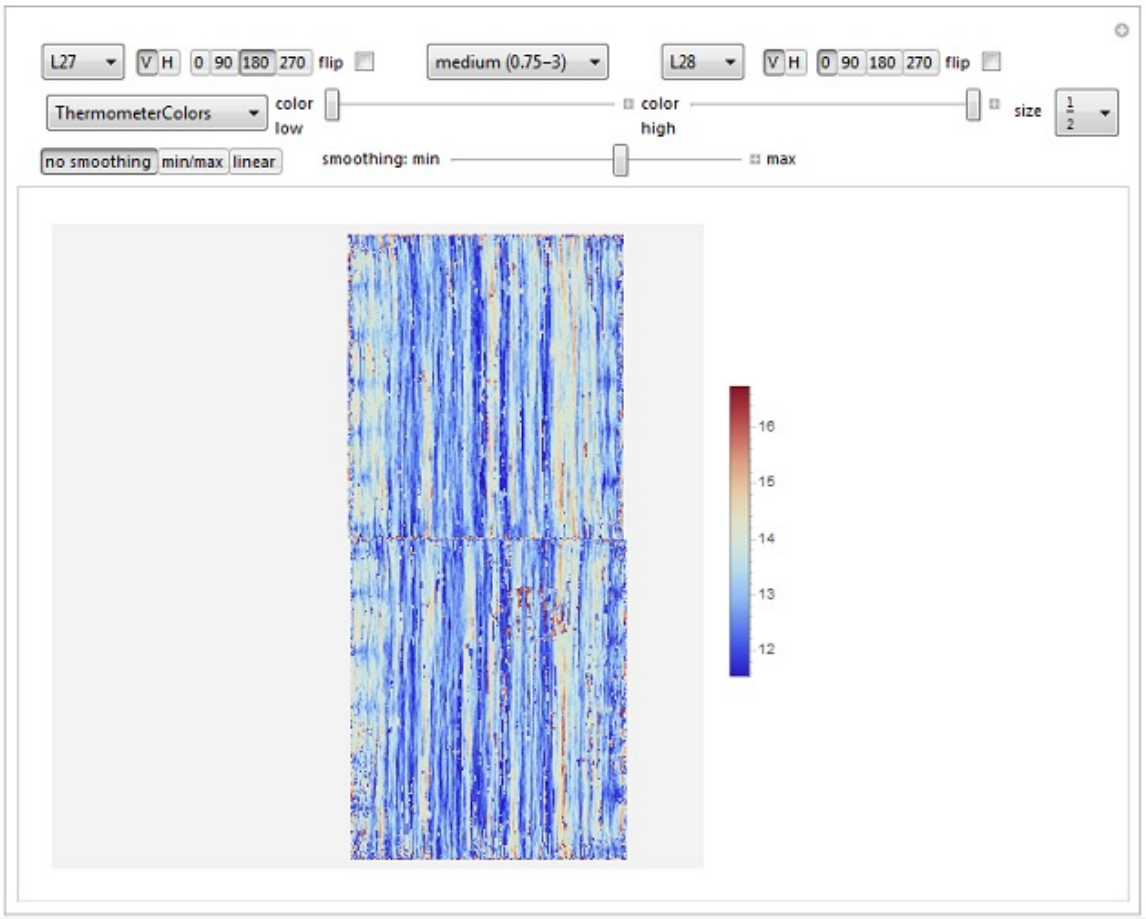

Figure 2: L27-L28 Weave Match in `align`

- **select x-ray 1** :: Pressing this button reveals a list of Vermeer paintings by L number (and 2 paintings by van Gogh by F numbers that are known to be rollmates).

- **V/H** :: Allows selection of the thread direction in x-ray 1 that is being examined.
- **0/90/180/270** :: Clockwise rotation values
- **flip** :: vertical flip of original unrotated image
- **evaluation tile size and repetiton rate** :: This button allows user selection of thick (1 cm), medium (0.75 cm), or thin (0.5 cm) evaluation tiles and of their spacing on centers separated by 2, 3, or 4 divided into the evaluation tile size size.
- **select x-ray 2** :: Pressing this button reveals a list of Vermeer paintings by L number (and 2 paintings by van Gogh by F numbers that are known to be rollmates).
- **V/H** :: Allows selection of the thread direction in x-ray 2 that is being examined.
- **0/90/180/270** :: Clockwise rotation values
- **flip** :: vertical flip of original unrotated image
- **color low** :: This slider sets the lower level on the color bar for the individual density and angle maps. This only effects the individual maps. Clicking on the small "+" at the end of the slider produces a method for more flexible, finer control of this setting.
- **color high** :: This slider sets the upper level on the color bar for the individual density and angle maps. This only effects the individual maps. Clicking on the small "+" at the end of the slider produces a method for more flexible, finer control of this setting.
- **no smoothing / min/max / linear** :: This button offers some selectivity in Fourier peak selection in the event that no one

peak dominates in the region of interest. Two different smoothing procedures - in addition to no smoothing – are available.

- **smoothing** :: This slider adjusts the level of intevention by the smoothing algorithms with "max" most aggressive. Clicking on the small "+" at the end of the slider produces a method for more flexible, finer control of this setting.