

3. Measuring Length in Digital Images

The *AnalyzingDigitalImages* software allows you to measure distances, areas, and color in a wide variety of digital images, including those taken with a digital camera, color-coded maps, aerial photographs, and satellite images.

Investigation

Spatial Analysis: Length

Materials

- *AnalyzingDigitalImages* software
- Plant Leaf image (or any image including an object of known size, such as a ruler to determine scale).

Getting Started

Start the *AnalyzingDigitalImages* software and open a picture by clicking on one of two options: "Open Picture" in the File menu, or use the "Open a Picture" button at the bottom of the screen.

The screenshot shows the *AnalyzingDigitalImages* software window. The **File** menu is open, displaying options: Open Picture (%O), Calibrate Pixel Size (%C), Save Picture (%S), Show/Hide Original (%H), Draw Color Histogram (%D), Draw Color along Line (⇧%L), Page Setup, and Print Picture (%P). A red arrow points to the **File** menu. Below the menu, a green oval highlights the text "Measure a Feature's Size and Color with Spatial Tools" over a leaf image. A ruler is visible below the leaf. At the bottom, a blue button labeled "Open a Picture" is shown with a red arrow pointing to it and the text "or Click" next to it.

Click

File Utilities Measurements Save C

Open Picture %O

Calibrate Pixel Size %C

Save Picture %S

Show/Hide Original %H

Draw Color Histogram %D

Draw Color along Line ⇧%L

Page Setup

Print Picture %P

Intro Spatial Analysis

These tools are designed so you may visualize and measure the spatial and spectral (color) information and relationships in digital images.

There are three sets of tools, and images created with one set may be used with the other tools.

Use the spatial tools to measure the size and colors of features in the original image, a color enhanced image, or a masked image.

Spatial measurements may be saved to a text file and analyzed with spreadsheet software.

The color enhancement tools let you change how the image is displayed.

The masking tool lets you count the number of pixels within a range of colors within the original or a color enhanced image.

Modified images may be saved or printed.

There are two utilities available in the File Menu:

- 1) Trim images to speed up processing time, and
- 2) Combine two or more images into one for comparison.

Other useful tools available in the File Menu:

- 1) Color histogram of the displayed image and selected areas of the image, and
- 2) Color along Selected Line.

Although these tools were not designed to create artistic images, you may make some beautiful and exotic looking images.

Measure a Feature's Size and Color with Spatial Tools

Measure the Length of the Leaf

Open a Picture

or Click

Calibration

1. Before making any measurements, calibrate the size of a pixel* to the size of an object of known length that is visible in the image. This procedure automatically starts after you select an image. To run the calibration method again, use the "Calibrate Pixel Size" in the File Menu.

* A pixel is the smallest portion of a digital image with uniform color. For most digital photos, the pixels are so small you won't be able to see them.

2. Click and drag the cursor across the length of the scale. To adjust the ends of the line, either click and drag the blue or red end of the line or click the small arrows that appear below the image.

TIP: Use the longest length possible since this minimizes small errors of drawing the calibration line.

TIP: To make measurements with a centimeter scale, rather than enter "4" and "in" in the above boxes, type "10.16" and "cm" instead. Note: 4 inches x 2.54 cm/in = 10.16 cm.

Select Method of Pixel Size Calibration

Select Method to Calibrate the Pixel Size

Known Pixel Size

Scale Present in Image

None

Click if you know the size of the pixels, which is common for orthophotographs from aerial reconnaissance and satellite imagery.

Click if there is a linear scale located in the image. This includes photographed objects of known length (ruler, penny, clipboard, etc.) or a distance scale on digital maps or satellite imagery.

Click if there is no way to know the size of the pixels in the image.



Picture 4.png is 612 by 514 pixels

	X	Y		
Start of Line	69	471		Length of Drawn Line <input type="text" value="4"/>
End of Line	533	474		Unit of Length <input type="text" value="in"/>

When zoomed in, pan around the image by using the arrow keys or hold the SHIFT key and click and drag the image.

Zoom In
Magnification: 0.93%
Zoom Out

3. TEST YOUR CALIBRATION: After completing the calibration, use the "line" analysis tool in the Spatial Analysis window to measure the length of the scale. If possible, measure a visible scale perpendicular to the direction of the first test. For example, if you used the length of a ruler to calibrate the pixel size, use the width of the ruler as the second test, if it is visible.

If the calibration is incorrect, recalibrate before moving on—in the **File** Menu, choose **Calibrate Pixel Size**.

The screenshot shows the Spatial Analysis window with the 'Line Tool' selected. A red arrow points to the 'Select' button. The 'Line Tool' panel displays the following data:

Pixel Position		Adjust
X	Y	
Start Point	69 471	[Adjust Arrows]
Stop Point	533 472	
Number of Pixels 465		
Length of Line 4. in Check		
Color	Intensity [%]	
Average Red	86	
Average Green	85	
Average Blue	84	

Below the data table is a 'Measurements' menu with options: 'Save Measurement' (⌘M), 'Show Last Measurement' (⌘L), and 'New Measurement File' (⌘N). A red arrow points from the 'Calibrate Pixel Size' text to the 'Measurements' menu. The background image shows a green leaf next to a ruler, with a red line drawn across the ruler and the text 'Draw Line' with an arrow pointing to it. The status bar at the bottom indicates 'Picture 4.png is 612 by 514 pixels'.

Measure Length

1. Make length measurements by clicking and dragging on features in the image. To adjust the ends of the line, either click and drag the blue or red end of the line or click the small **Adjust** arrows that appear to the left of the image.
2. If desired, **Save** values to a text file for use later with Excel or other spreadsheet/graphing software. To save measurements, use "Save Measurements" in the Measurements Menu. Besides the measurement, additional data are saved automatically to help check the quality of your measurements later.
3. Open a variety of images and see if you can make length/distance measurements in those images.