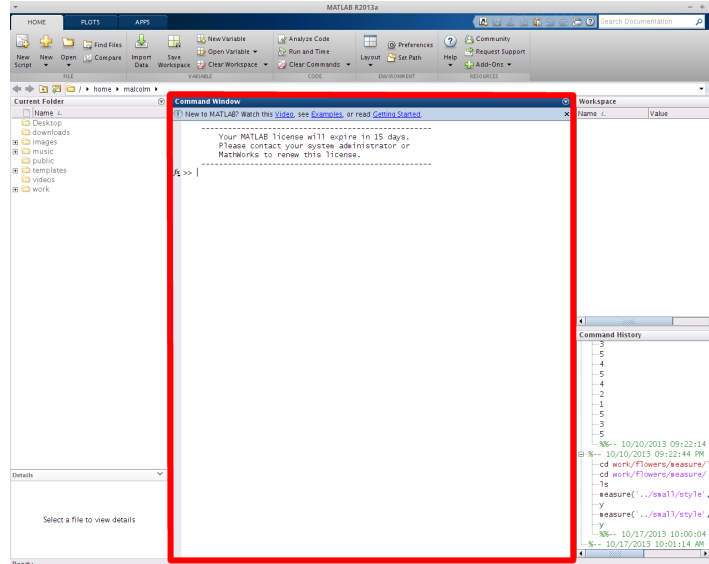


## Analyzing flower photos 2014-02-14

1. Open Matlab (in the icon bar at the bottom of the screen). A splash should show up, then the program will load.



2. In the center of the screen is a Command Window where you type commands. It should have a line that starts with >>. Click on the Command Window.



3. Change to the directory with the measuring scripts by typing the following (minus the >>):

```
>> cd ~/Desktop/Flowers/measure
```

Then press enter.

4. Enter the following command to run the measuring script for the type of measurements you want to record:

a) for styles:

```
>> measure('..small/style', 'style')
```

b) for anther filaments:

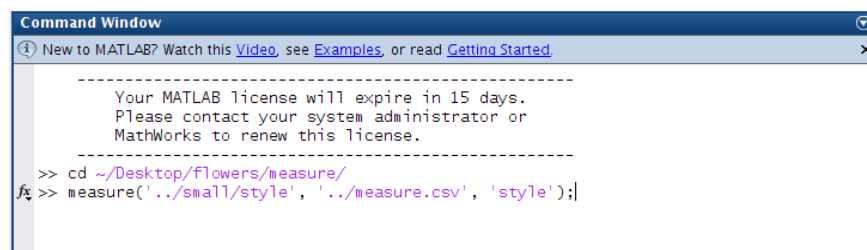
```
>> measure('..small/filament', 'filament')
```

c) for petal anther filaments:

```
>> measure('..small/petal_filament', 'petal_filament')
```

d) for leaves:

```
>> measure('..small/leaf', 'leaf')
```



5. A new window will pop up displaying the current image and the objects in it. In the Command Window, some text will appear with a menu. You can modify the image using the various menu options (see below). The goal is to end up with something that looks like this leaf image:

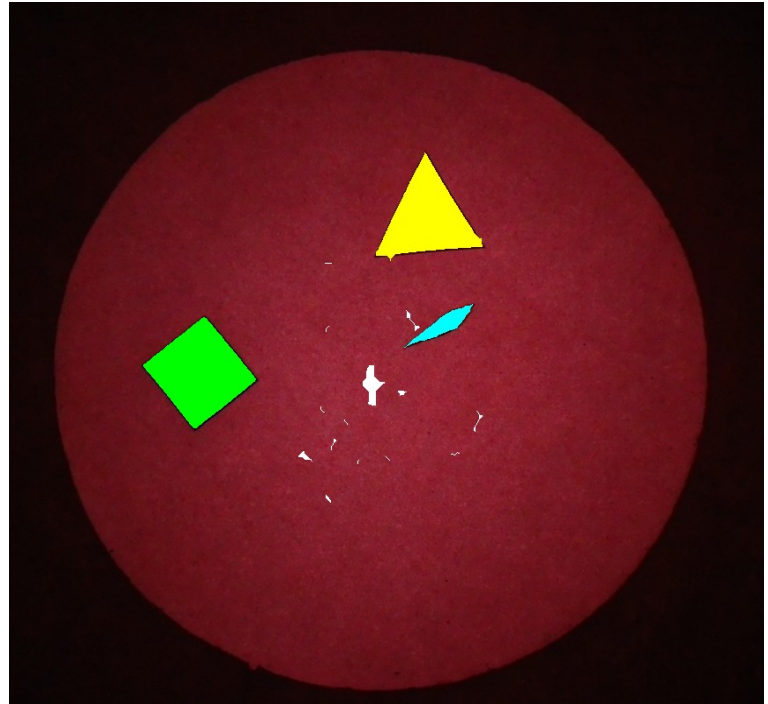
There are four object types, with different colors:

The **reference square** is shown in green. It is used to determine the real-world size of the objects in the image. It should be cleanly separated from the background.

The **reference triangle** is shown in yellow. It contains the image id and is used to verify the size of objects.

**Objects of interest** are shown in cyan. These are the objects that will be measured (leaves, styles, etc.).

**Junk objects** are shown in white. These will be ignored.



6. The script should automatically identify the **square**, **triangle**, **object of interest**, and **junk** items for each image. However, this is not perfect and so you must verify that the objects have been correctly identified. The main menu lists commands to correct object identifications, and save the results.

To choose a menu option, click in the Command Window, press the appropriate number, then press enter. Menu options are:

**1) objects**

Lets you designate which objects are **objects of interest** and which are **junk**. After choosing this option, clicking on an object in the display image sets it as an **object of interest**, and clicking on an **object of interest** sets it as a **junk object**. Right-click to exit this mode.

**2) reference**

Lets you designate which object is the **reference square**, and which is the **reference triangle**. Clicking on an object sets it as the **square**, and Shift-clicking on a object sets it as the **triangle**. Right-click to exit.

**3) thin objects**

Thins all **objects of interest** to lines. It is usually the last thing you want to do on style, filament, and petal filament images before saving. It may take a little while for this to run.

**4) draw**

Activates drawing mode, which has its own submenu (see below).

**5) next & save**

Saves the image to a file and loads the next image.

**6) help**

Tells you to find Malcolm for help...

**0) quit**

Exits the measuring script. Any unsaved changes to the current image will be lost. Before exiting you will be prompted if you are sure you wish to exit. Press y to exit or n to keep working, then press enter.

7. The drawing submenu allows you to edit the shape of objects. While you are in drawing mode, the program will not try to determine what type each object is, but will recalculate all object types on exiting from draw mode.

To choose a menu option, click in the Command Window, press the appropriate number, then press enter. Menu options are:

**1) point**

Draw points whose size is based on the drawing radius. Mainly useful for connecting nearby shapes and other minor adjustments. Click to draw as many points as you want, then right-click to return to the drawing menu.

**2) line**

Draw a single line whose width is based on the drawing radius. Useful for drawing in the shape of objects. Click to add points to the line, then right-click to add the final point and return to the drawing menu.

**3) erase**

Erase points whose size is based on the drawing radius. Mainly useful for minor cleanup. Click to erase as many points as you want, then right-click to return to the drawing menu.

**4) erase line**

Erase all the points on a single line whose width is based on the drawing radius. Useful for major cleanups (especially when the drawing radius is large). Click to add points to the erased line, then right-click to add the final erased point and return to the drawing menu.

**5) erase objects and junk**

Erases all putative **objects of interest** and **junk objects**, but leaves the **square** and **triangle** alone. Useful when the image is just a huge mess.

**6) set drawing radius**

Choose this to set the drawing radius used to determine the size of points and lines. Simply enter a value and press enter to set the radius to that value. More conveniently, you can also press + while drawing or erasing points and lines to increase the drawing radius, or press - to decrease the drawing radius.

**7) undo drawn changes**

Clears all changes made in the current drawing mode.

**0) done**

Keeps all changes made in the current drawing mode and returns to the main menu. Object types will be recalculated upon exiting the drawing menu, so you may need to reset object types using the main menu.

8. For each image you will typically want to make all drawing changes first, next set object types, then thin **objects of interest** (unless analyzing leaves), and finally save the image.

Do this until you get bored or run out of time, then exit. The program will pick up where you left off next time.

## Notes and tips:

- The number of **objects of interest** is shown in the upper right corner of the image. Make sure this number matches what you think you are seeing. Typically, leaf images will have one **object of interest**, style images will have 3, and filament and petal filament images will have 5 each.
- To zoom in or out on the image, use the magnifying glass icons in the menu of the displayed image, but make sure that you click on the magnifying glass again after zooming. If you leave the image in zoom mode, the script will crash when you try to draw.
- If the script crashes or spews lots of red error messages, copy the errors into a text file and send it to Malcolm. Then close Matlab, reopen it, and run the measuring script again. You may have lost the work on the current image, but it should otherwise pick up where you left off.
- If you accidentally saved a version of an image that is incorrect (forgot to thin, etc.), note the image code and the mistake on a separate sheet of paper.
- Set the drawing radius to a large number and use erase line to clear large areas of junk.
- The program will automatically fill in objects with holes in them when you exit drawing mode. So, for instance, if you had to draw in the reference triangle, you could just draw in the outline and the whole thing would be filled in when you exit the drawing menu.

## Example:

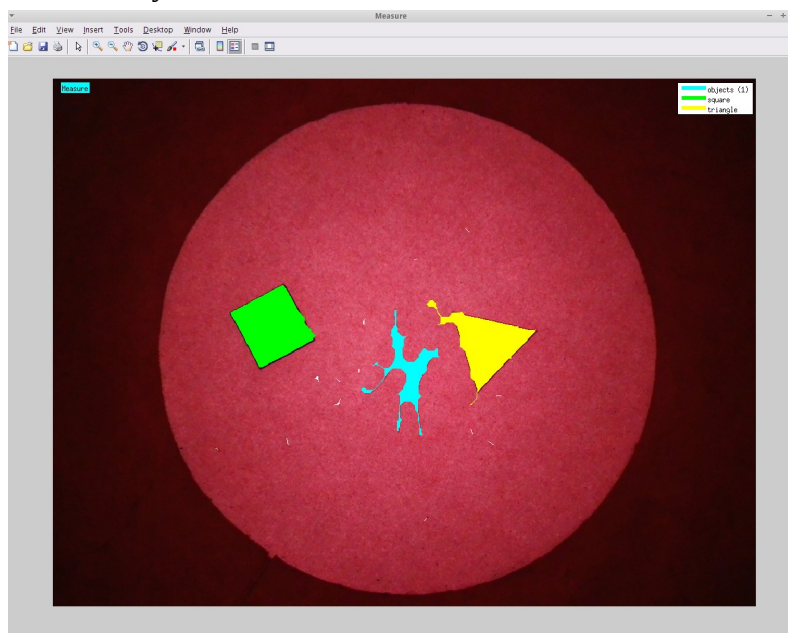
1. Load the measuring script:

```
Command Window
New to MATLAB? Watch this Video, see Examples, or read Getting Started.

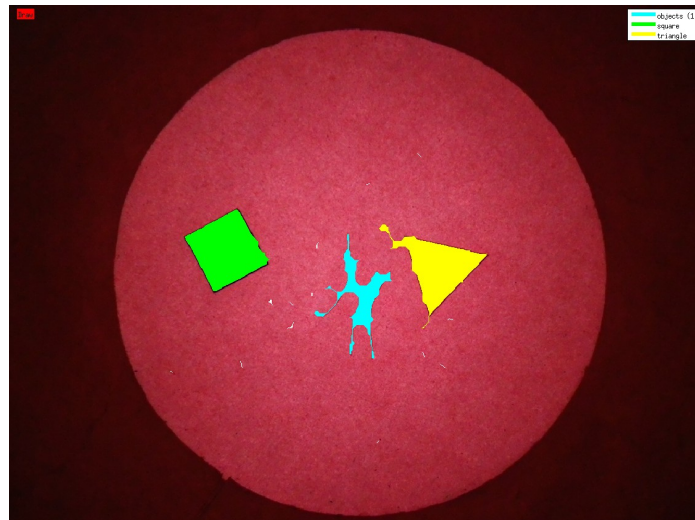
-----
Your MATLAB license will expire in 15 days.
Please contact your system administrator or
MathWorks to renew this license.
-----

>> cd ~/Desktop/flowers/measure/
>> measure('..\small/style', 'measure.csv', 'style');
```

2. The first image is rather messy:



3. Enter drawing mode to clean up object shapes:



4. Clear all objects and junk to remove the object blob.

5. Set the drawing radius high, and use erase line mode to clean up the triangle

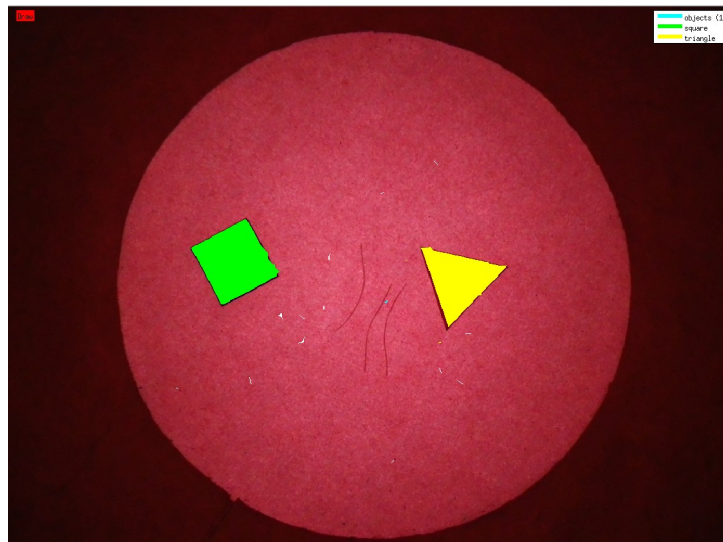
```
Draw TYE:
  1) point
  2) line
  3) erase
  4) erase line
  5) set drawing radius (currently 1)
  6) clear drawings
  0) done
```

```
5
Enter drawing radius (currently 1): 8
Radius set to 8
```

```
Draw TYE:
  1) point
  2) line
  3) erase
  4) erase line
  5) set drawing radius (currently 8)
  6) clear drawings
  0) done
```

```
4
Erase line mode... right click or esc to end
```

6. Use erase line, and click several points around the outside of the triangle, then right-click to choose the final point and erase



7. Now that we're done erasing, set the drawing radius to a more reasonable 1



Draw TYE:

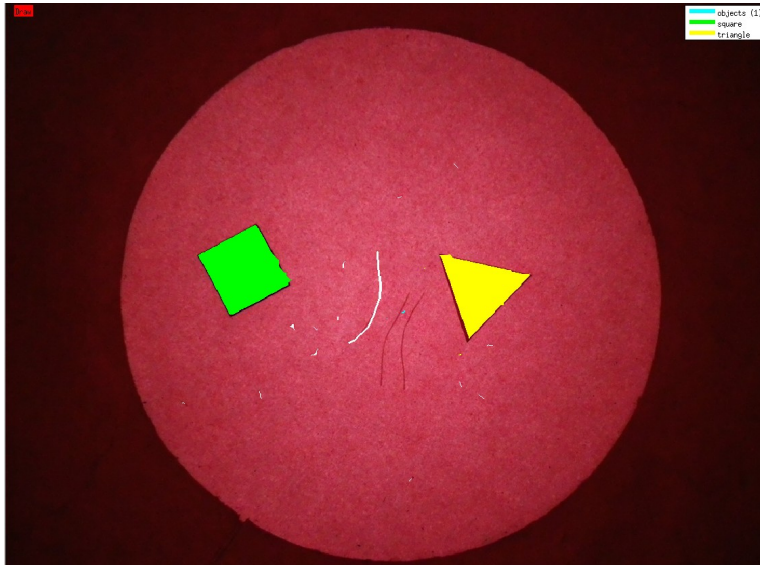
- 1) point
- 2) line
- 3) erase
- 4) erase line
- 5) set drawing radius (currently 8)
- 6) clear drawings
- 0) done

5

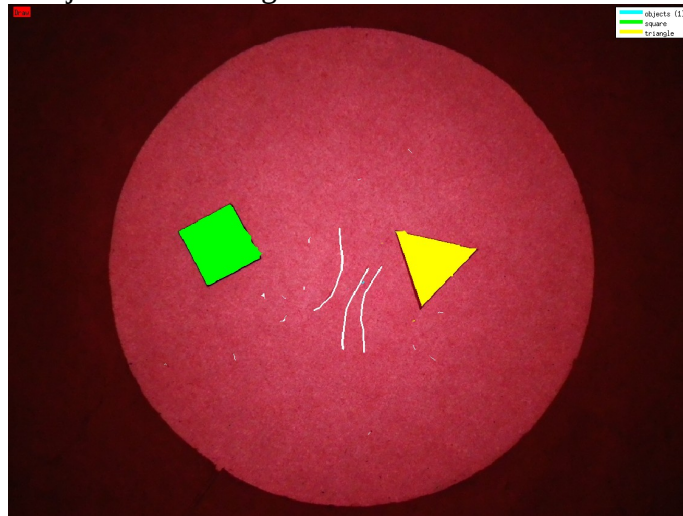
Enter drawing radius (currently 8): 1

Radius set to 1

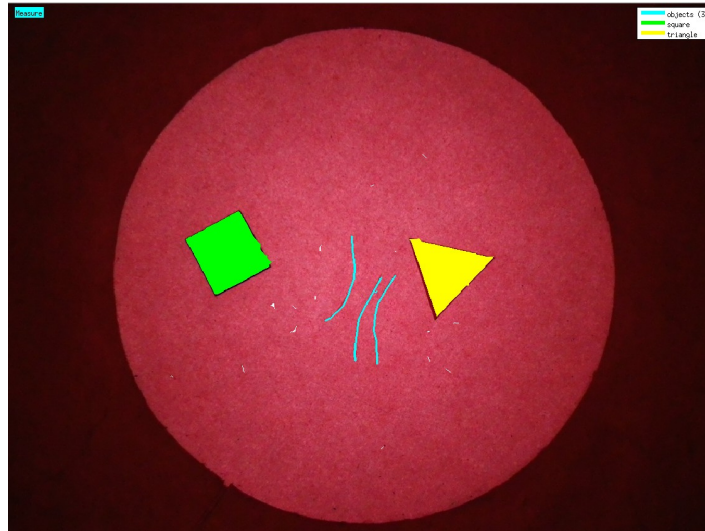
8. Choose line and click points along one of the objects, then right-click to add the final point and to fill in the object outline:



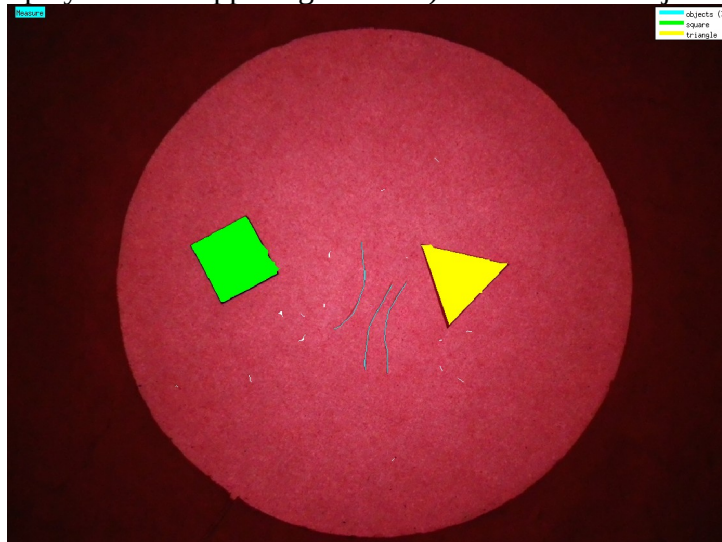
9. Repeat this for the other objects in the image:



10. This looks pretty good, so exit drawing mode



11. Note that the program has already correctly determined which objects are which, and has the right number of objects (3, displayed in the upper right corner). Now thin the objects of interest:



12. That looks good, so save the image and move on to the next.