CSC D01

11/10 (aka 110%)

Deliverable 3

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Bug #1:

Link: https://github.com/matplotlib/matplotlib/issues/5004
Description:

The image produced in OffsetImage (image.BboxImage) does not properly perform alpha blending. Whereas if the same image is drawn by figure.figimage (image.FigureImage) there is no issue.

Replication:

```
import matplotlib
import matplotlib.pyplot as plt
import matplotlib.image as image
from matplotlib.offsetbox import TextArea, DrawingArea, OffsetImage, AnnotationBbox

if __name__ == '__main__':
    matplotlib.rcParams['figure.facecolor'] = 'ffffff'

    fig, ax = plt.subplots()

    ax.set_title('Draw image')
    ax.set_xlim((-2,2))
    ax.set_ylim((-2,2))

    img = image.imread('test.png')
    fig.figimage(img, 0, 0)

    imagebox = OffsetImage(img, zoom=1)
    annotation = AnnotationBbox(imagebox, (-1.5, -1.5), frameon=False, xycoords='data',
boxcoords="offset points", pad=0)
    ax.add_artist(annotation)

    plt.show()
```

What classes/parts of matplotlib will need to be looked at/fixed:

Since the class that is giving this issue is BboxImage it will be the focus of the bug fix. The class is found in image.py and since FigureImage works (in same file) hopefully it will give us a better understanding of how to fix the bug.

Bug #2:

Link: https://github.com/matplotlib/matplotlib/issues/5472
Description:
Call legend.get_frame() will always return a frame, in other words it is incapable of throwing an error or some other reasonable “something went wrong!” flag.
Replication:

```
import matplotlib.pyplot as plt
import numpy as np
a = np.random.rand(10,1)
# graph 1 - the green legend frame is generated properly
plt.plot(a, label='label')
legend = plt.legend()
frame = legend.get_frame()
frame.set_facecolor('green')
plt.show()

import seaborn as sns
# graph 2 - Seaborn overlaps the legend frame
plt.plot(a, label='label')
legend = plt.legend()
frame = legend.get_frame()
frame.set_facecolor('green')
plt.show()
```

What classes/parts of matplotlib will need to be looked at/fixed:

The bug is a result of bad coding as get_frame simply returns a frame class - it needs a way to check for potential conflicts. The _legendPatch variable in the Legend class has a visible attribute perfect for this situation but may require tinkering with the rcParams class and rcsetup.py.

Feature #3:

Link: https://github.com/matplotlib/matplotlib/issues/3292
Description:

When importing matplotlib __init__.py is run and it file searches for home directories or a temporary directory as defined by the environment. Some users would like the ability to control where matplotlib searches for these directories, particularly on systems where $HOME is defined but, may not be mounted.

Replication:

This feature would be used whenever a module from matplotlib is imported.

What classes/parts of matplotlib will need to be looked at/fixed:

The __init__.py file is run whenever a module from matplotlib is imported. The feature would have to be added to the _get_home() function in this file that returns where the home.

Bug #4:

Link: https://github.com/matplotlib/matplotlib/issues/6000
Description:
When attempting to set the visibility of a streamplot to be invisible, the resultant plot still has it's arrows showing.
Replication:

```
import numpy as np
import matplotlib.pyplot as plt

# Data
x = np.linspace(-10, 10, 10)
y = np.linspace(-10, 10, 10)
X, Y = np.meshgrid(x, y)
U = X
V = X**2

# basic streamline plot
plt.figure()
sp1 = plt.streamplot(x, y, U, V)

# Attempt to hide lines and arrows from streamline plot
plt.figure()
sp2 = plt.streamplot(x, y, U, V)
sp2.lines.set_visible(False)
sp2.arrows.set_visible(False)

plt.show()
```

What classes/parts of matplotlib will need to be looked at/fixed:
Introspection into how `streamplot.py` and figures (`figure.py`) interact with each other, definately look at the `set_visible()` method in artist.py, the states `self._visible`, `self.pchanged()`, and whether or not it has been implemented properly inside class `figure`.

Bug #5:

Link: https://github.com/matplotlib/matplotlib/issues/6002

Description:

Using pyplot.streamplot with a non-default start_points argument leads to a misplacement of the streamline.

Replication:

```
import numpy as np
import matplotlib.pyplot as plt

# Data
x = np.linspace(-10, 10, 10)
y = np.linspace(-10, 10, 10)
X, Y = np.meshgrid(x, y)
U = X*0 + 1
V = X*0
start_points = [[0, 0]]

# Base streamline plot
plt.figure()
sp1 = plt.streamplot(x, y, U, V, color=[.5]*3)

# Streamline plot with 'start_points' argument
sp2 = plt.streamplot(x, y, U, V, start_points=start_points, color='r')
plt.plot(*start_points[0], marker='o', label="Starting point")
plt.plot([], [], color='r', label="Associated streamline")

# Legend and limits
plt.xlim(-10, 10)
plt.ylim(-10, 10)
plt.legend(numpoints=1)

plt.show()
```

What classes/parts of matplotlib will need to be looked at/fixed:

Streamplot.py appears to be mishandling the starting_points input variable by possibly miscalculating the coordinate conversion for the grid. When starting_points is defaulted to None Streamplot generates coordinates at the origin thus avoiding the bug as seen in the our examples first streamplot.

Bug #1 Report:

Initially when we found the issue ported on the github issue board, we thought it was interesting as it was an alpha issue. Thus the problem seemed simple as there was an issue with how OffsetImage was implementing the alpha portion of the png file.

While working on how to go about finding the cause of the bug we realize that the problem was not that simple. Both classes FigureImage and OffsetImage(BboxImage) rely on a common parent, Artist, for a lot of the drawing and alpha functions, but since one worked and one didn't it could only mean Artist is implemented correctly and something else is going on. After extensive searching/fiddling around through the code, we ended up unable to find the source of the error.

After considerable consideration we decided to no longer pursue find a fix for this particular bug.

Some Points Worth Mentioning:

- The incorrect image produced by OffsetImage is noticeably different from the image we produced as to the image attached to the original issue. This leads us to believe that OS or the particular machine the code is run may affect the end result. Also, it could be that the difference is caused by some other fix.
- The issue is well over 5 months old but has less than 5 comments on it. This shows that the bug was either not worth fixing or was just too confusing to solve.

Feature #3 Report:

Users can now set a new environment variable (MATPDIR) to point to the path that they would like Matplotlib to treat as your home directory. If this environment variable is set, it will take precedence over any other directory by Matplotlib.

The file changed for this feature was lib/matplotlib/__init__.py (this file runs its code every time Matplotlib is imported).
This feature did not require any changed to the architecture of the program and instead, only one function (_get_home()) was modified to achieve this functionality.

To gain the functionality of this new feature, a user must:

- Clone our git repository
- Build and install Matplotlib from that source code (and its dependencies)
- Set the environment variable MATPDIR to a valid path
- Import Matplotlib

To verify this feature is working, verification tests were written (compatible across many operating systems) and then can be run by executing the script fullf3test.py in our repository after building and installing Matplotlib from the source code in our repository.

Acceptance test:

```
Scenario:  Importing Matplotlib to use a different home directory

When the user sets an environment variable (MATPDIR) and then imports
matplotlib and runs matplotlib._get_home()

Then function will return the path defined in MATPDIR if it is a valid path
and therefore the program will use the directory as its home.
```

Bug #4 Report:

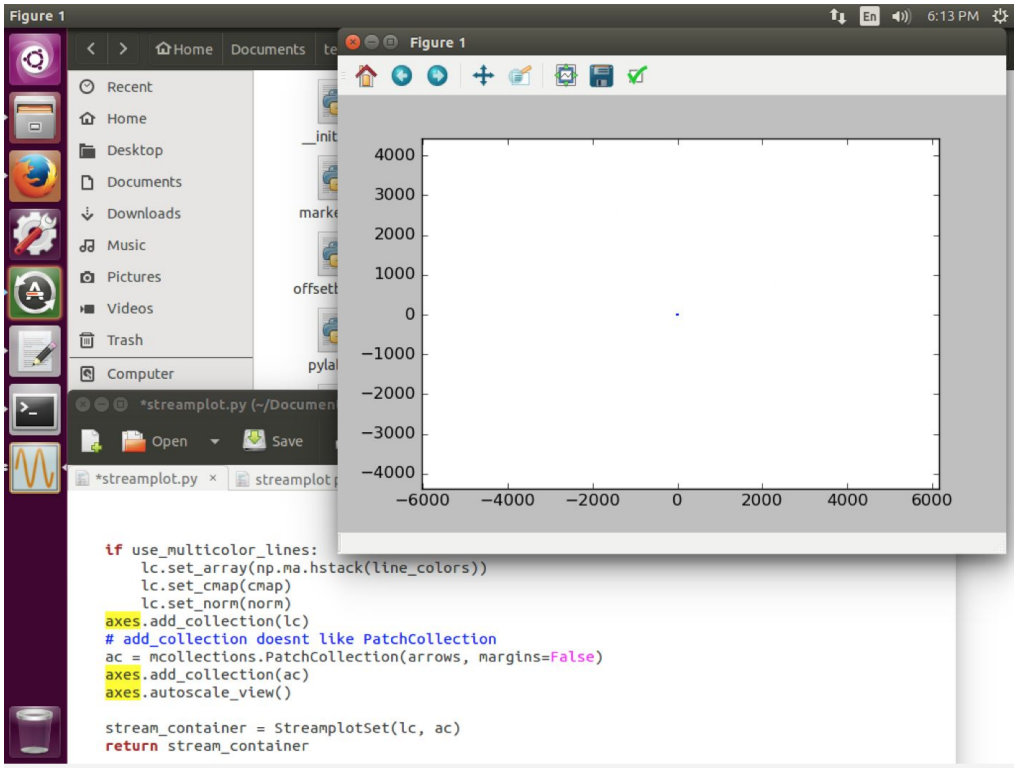
During the research of this bug it was discovered there was the reason the developers avoided adding a PatchCollection object to the axes - at this point in time users can now enjoy our improved streamplot function - or as we like to call it the black hole simulator.

The file changed for this feature was lib/matplotlib/streamplot.py - namely the streamplot function. This bug fix modifies the algorithm in which the arrows are added to the axis.

To gain the functionality of this new feature, a user must:

- Clone our git repository
- Build and install Matplotlib from that source code (and its dependencies)
- import matplotlib.pyplot and numpy

Attempting to create a graphing using pyplot's streamplot method will result in every point being plotted at the origin, but it is now possible to set the visibility of the arrow heads! This resetting of every plot point is a result of the axis' add_collection method reacting not as expected in regards to receiving a PatchCollection object for its' argument. As of the drafting of this report this newly discovered bug is being investigated.



Bug #2:

Deemed too large scale as all instances of when the error is called would have to be rewritten.

Bug #5:

This bug was later fixed in another issue/feature.