Professor_Bear_Image_Analysis_Hough

March 14, 2017

1 Professor Bear :: Image Analysis :: Hough transforms

1.1 Professor Bear github

Code for Professor Bear YouTube videos at https://github.com/nikbearbrown

1.2 Download Anaconda 4 for Python 2.7

Download Anaconda 4 for Python 2.7 version https://www.continuum.io/downloads

Anaconda 4.3.0 includes an easy installation of Python (2.7.13, 3.4.5, 3.5.2, and/or 3.6.0) and updates of over 100 pre-built and tested scientific and analytic Python packages. These packages include NumPy, Pandas, SciPy, Matplotlib, and Jupyter. Over 620 more packages are available. https://docs.continuum.io/anaconda/pkg-docs

1.3 iPython

Go to the directory that has your iPython notebook
At the command line type
jupyter notebook notebookname
ipython notebook notebookname will also work
For example,
jupyter notebook Professor_Bear_Image_Analysis_Loading_Histograms.ipynb

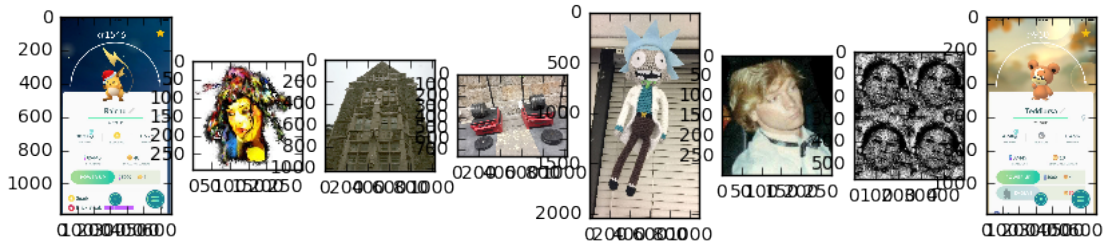
```
In [1]: # Bring in python image analysis libraries
        %matplotlib inline
        import matplotlib.pyplot as plt
        import matplotlib.image as mpimg
        import numpy as np
        from skimage import color
        import skimage.filters as filters
        from skimage.transform import hough_circle
        from skimage.feature import peak_local_max
        from skimage import feature
        from skimage import morphology
        from skimage.draw import circle_perimeter
        from skimage import img_as_float, img_as_ubyte
        from skimage import segmentation as seg
        from skimage.morphology import watershed
```

```
from scipy import ndimage as nd
from scipy.ndimage import convolve
from skimage import feature
import glob # for bulk file import

# Set defaults
plt.rcParams['image.cmap'] = 'gray' # Display grayscale images in... grays
plt.rcParams['image.interpolation'] = 'none' # Use nearest-neighbour
plt.rcParams['figure.figsize'] = 10, 10

# Import test images
imgpaths = glob.glob("./img/*.jpg") + glob.glob("./img/*.png")
# imgpaths = glob.glob("img/*.jpg") + glob.glob("img/*.png")  Windows
# Windows has different relative paths than Mac/Unix
imgset = [mpimg.imread(x) for x in imgpaths]

# Display thumbnails of the images to ensure loading
plt.figure()
for i,img in enumerate(imgset):
    plt.subplot(1, len(imgset), i+1)
    plt.imshow(img, cmap = 'gray')
```



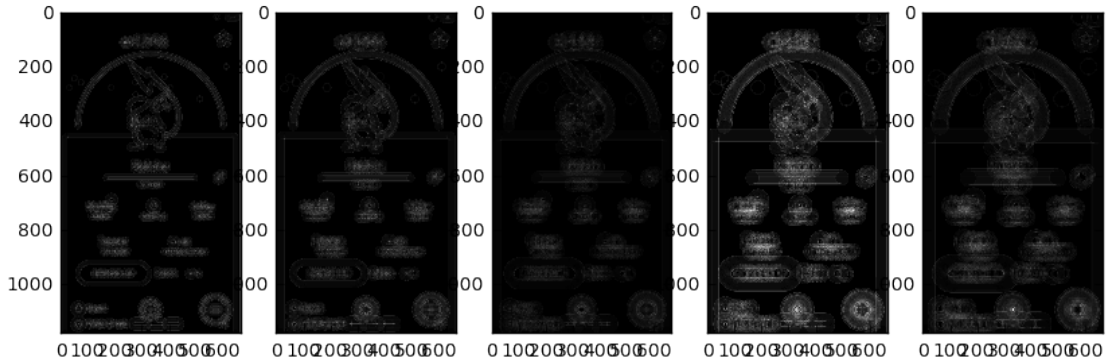
1.4 Hough transforms

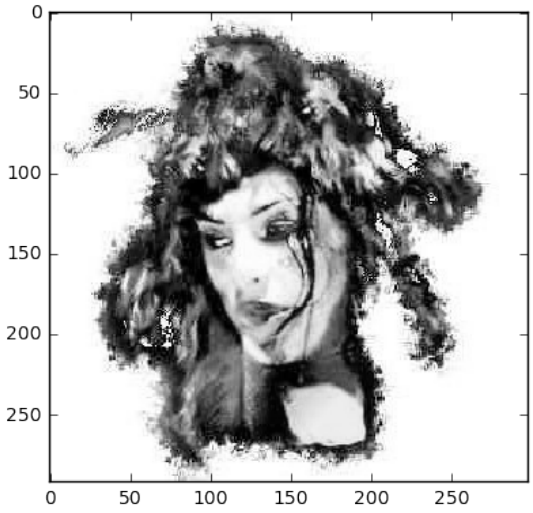
The Hough transform (https://en.wikipedia.org/wiki/Hough_transform) is a feature extraction technique used in image analysis, computer vision, and digital image processing. The purpose of the technique is to find imperfect instances of objects within a certain class of shapes by a voting procedure. This voting procedure is carried out in a parameter space, from which object candidates are obtained as local maxima in a so-called accumulator space that is explicitly constructed by the algorithm for computing the Hough transform.

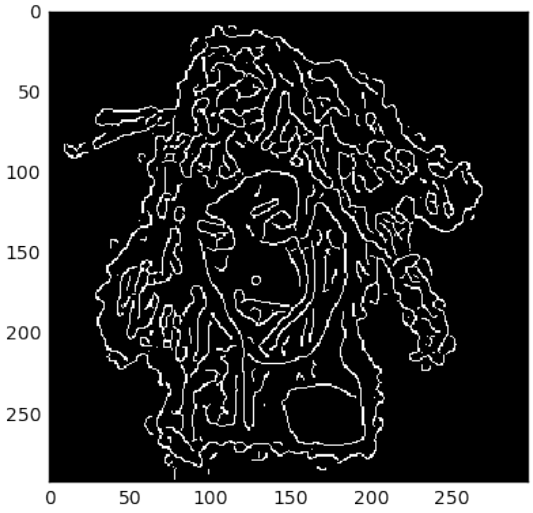
```
In [2]: # Plot the circular Hough transforms of an image at the given radii.
        def plot_circle_hough(img, radii, sigma):
            edges = feature.canny(img, sigma)
            hough = hough_circle(edges, radii)
            plt.figure()
            plt.subplot(1, 2, 1)
```

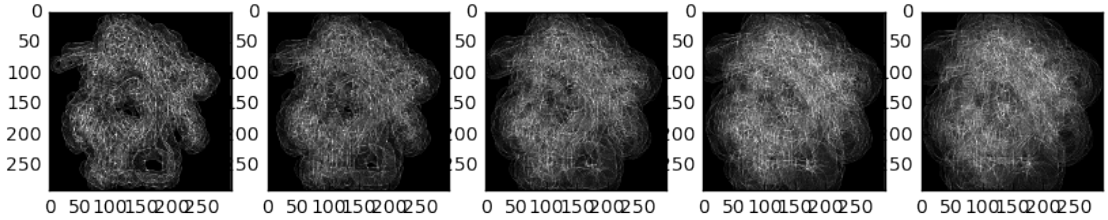
```
        plt.imshow(imgbw)
        plt.subplot(1, 2, 2)
        plt.imshow(edges)
        plt.figure()
        for j in range(len(hough)):
            plt.subplot(1, len(hough), j+1)
            plt.imshow(hough[j,:,:])
```

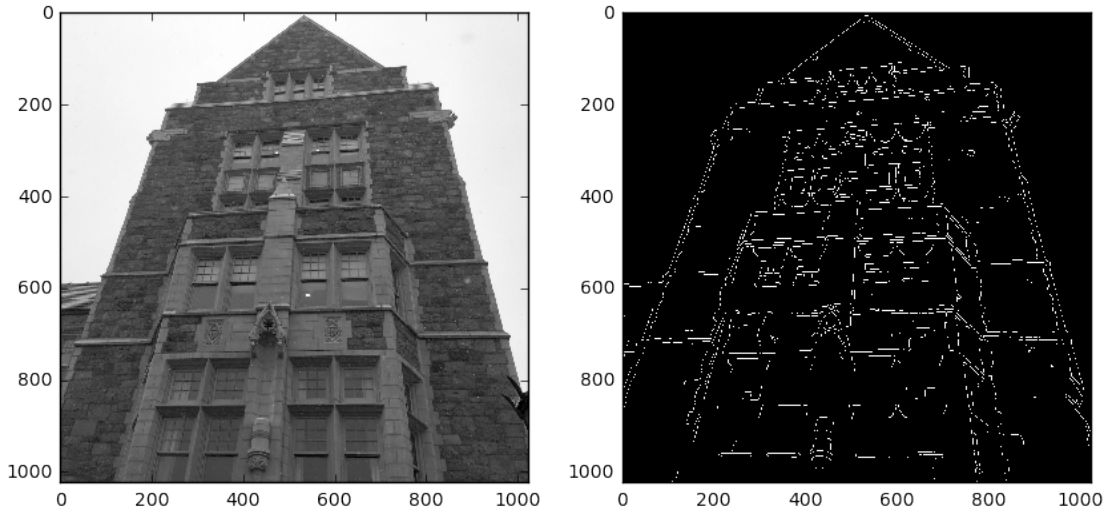
In [3]:
```
# Apply to test images
radii = np.arange(10, 35, 5)
sigma = 2.0
for i,img in enumerate(imgset):
    imgbw = img_as_float(color.rgb2grey(img)) # downsample to make it easie
    plot_circle_hough(imgbw, radii, sigma)
```

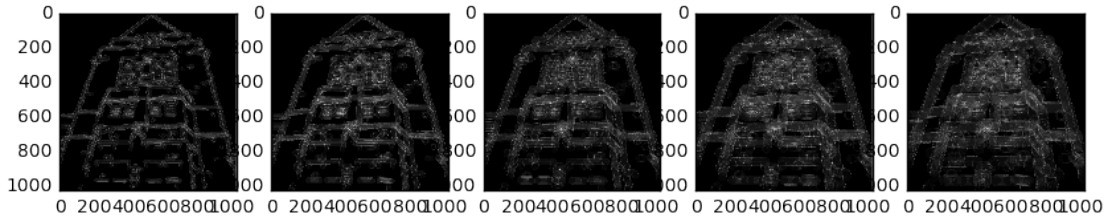


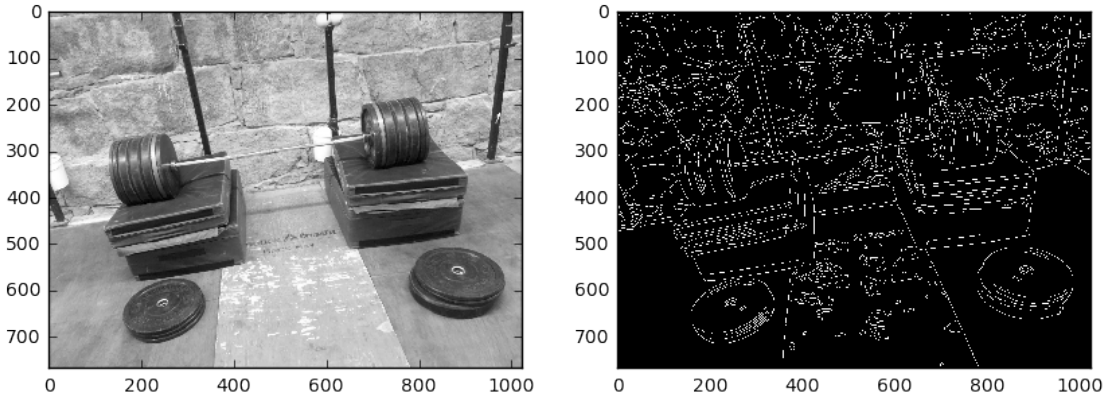


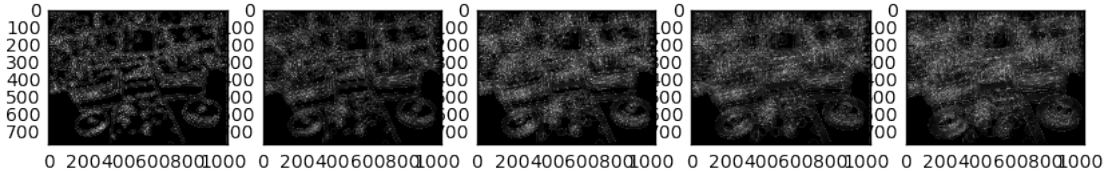


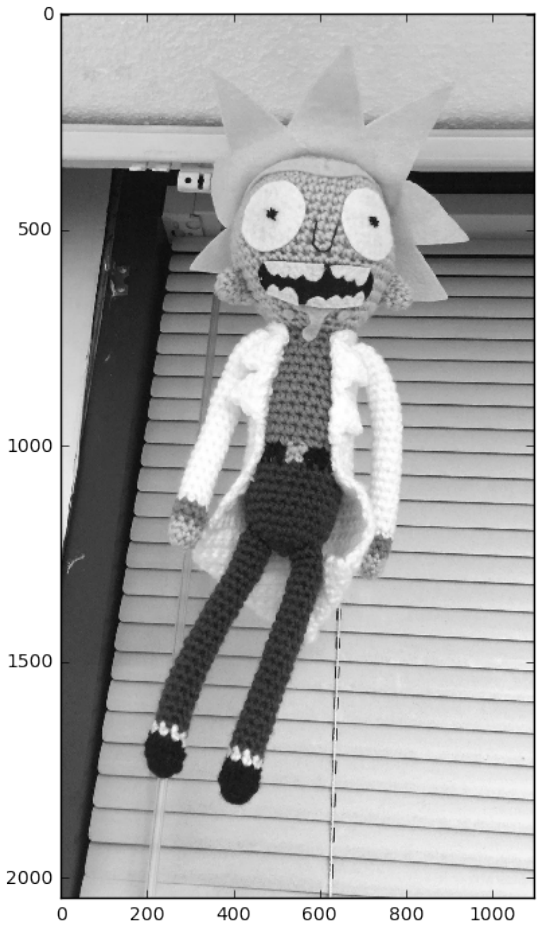











0
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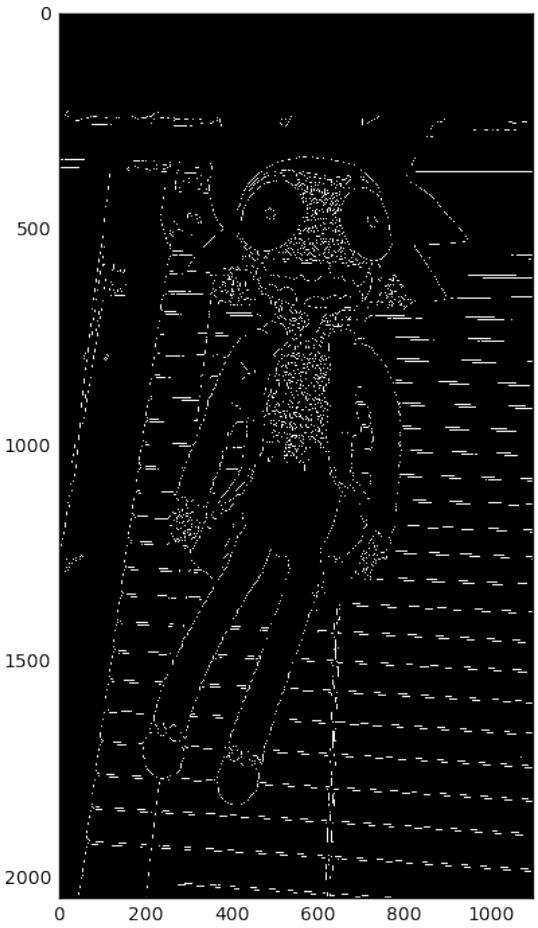
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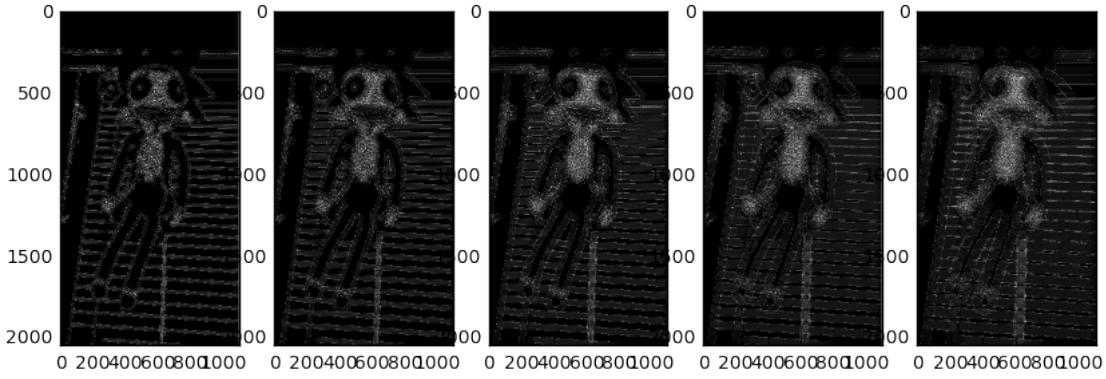
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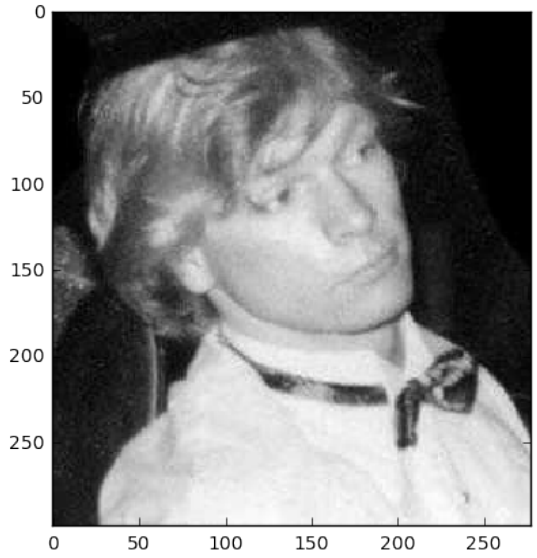
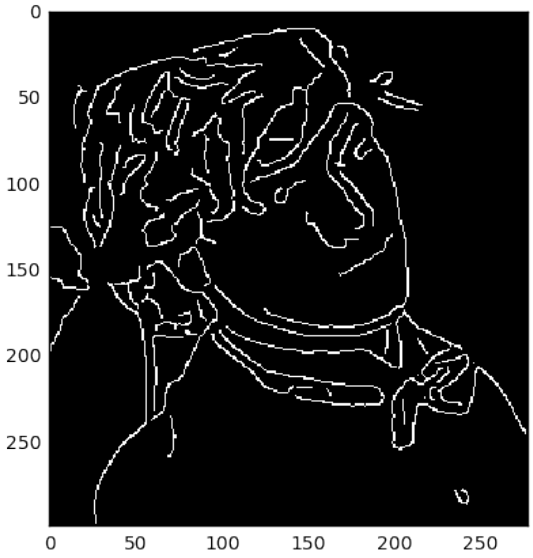
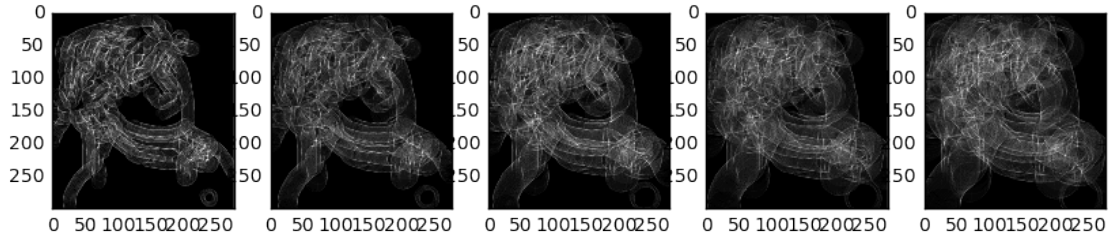
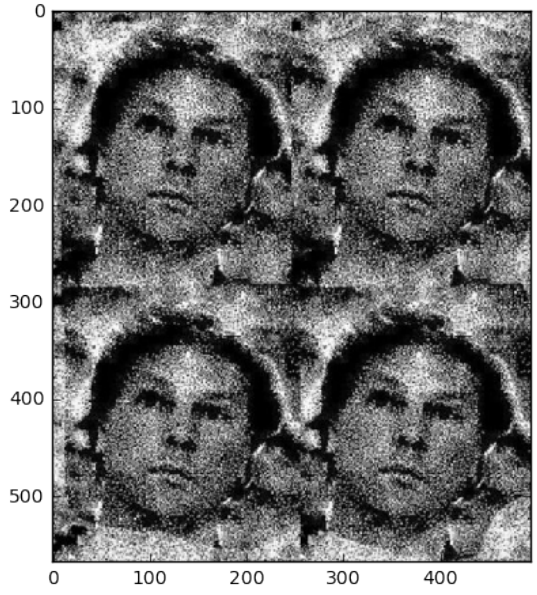
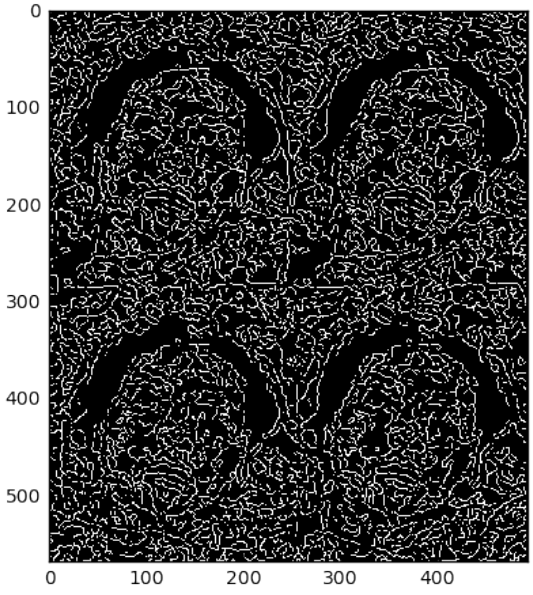
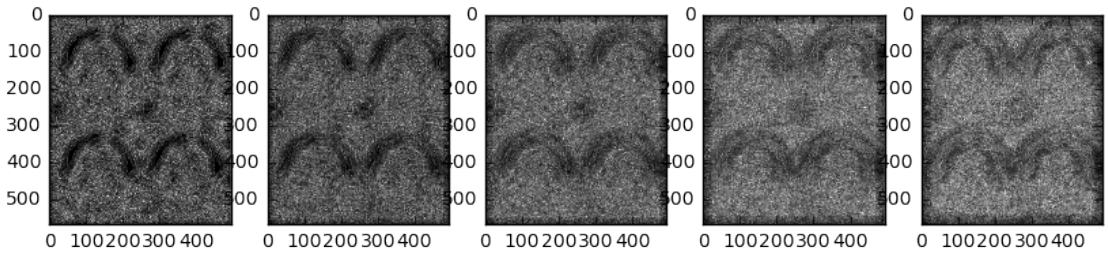
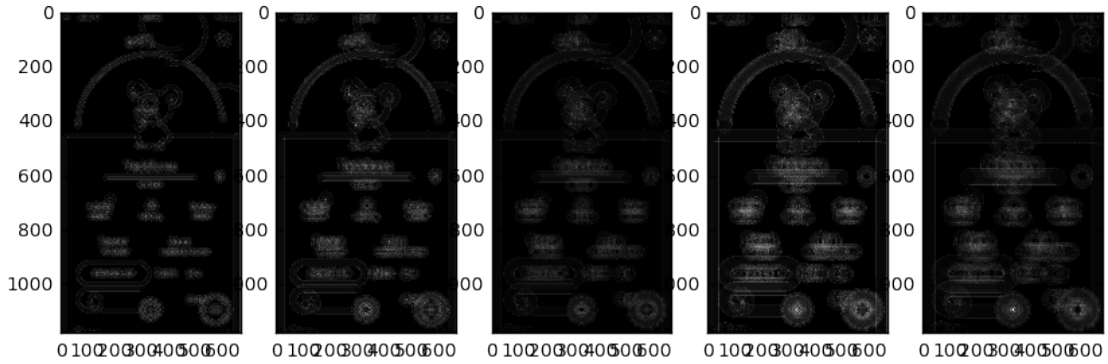
0 200400600800 1000




AT&T
8:15 PM
CP910
Teddiursa
93 / 93 HP
4.24kg
WEIGHT
NORMAL
0.46m
HEIGHT
89445
STARDUST
13
TEDDIURSA CANDY
POWER UP
5000
4
EVOLVE
CP91
Teddiursa



```
In [4]: def plot_detected_circles(img, radii, sigma):
            edges = filters.canny(img, sigma)
            hough = hough_circle(edges, radii)

            # Code after this point adapted from the scikit documentation. Not full
            accums = []
            found_centers = []
            found_radii = []

            for radius, h in zip(radii, hough):
                # For each radius, extract two circles
                peaks = peak_local_max(h, num_peaks=2)
                found_centers.extend(peaks)
                accums.extend(h[peaks[:, 0], peaks[:, 1]])
                found_radii.extend([radius, radius])

            # Draw the most prominent 5 circles
            image = color.gray2rgb(img)
            for idx in np.argsort(accums)[::-1][:5]:
                center_x, center_y = found_centers[idx]
                radius = found_radii[idx]
                cx, cy = circle_perimeter(center_y, center_x, radius)
                image[cy, cx] = (220, 20, 20)

            plt.imshow(image, cmap=plt.cm.gray)
```

```
In [ ]:
```

```
In [ ]:
```

2 Python Tutorials

Python 101 Beginning Python http://www.rexx.com/~dkuhlman/python_101/python_101.html

The Official Python Tutorial - [http://www.python.org/doc/current/tut/tut.html](http://www.python.org/

The Python Quick Reference -http://rgruet.free.fr/PQR2.3.html

YouTube Python Tutorials

Google Python Class - http://www.youtube.com/watch?v=tKTZoB2Vjuk

Python Fundamentals Training – Classes http://www.youtube.com/watch?v=rKzZEtxIX14

Python 2.7 Tutorial Derek Banas - http://www.youtube.com/watch?v=UQi-L-_chcc

Python Programming Tutorial thenewboston - http://www.youtube.com/watch?v=4Mf0h3HphEA

3 Evaluation

Install Anaconda 4 for Python 2.7 and get this notebook to run with a set of your images.