Image Processing.

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YouTube link: Image Processing with Python by Sreeni (https://www.youtube.com/playlist?list=PLZsOBAyNTZwYx-7GylDo3LSYpSompzsqW)

Lesson 1: Understanding digital images for processing in Python.

Necessary libraries.

In [1]:
```
from skimage import io
import numpy as np
import matplotlib.pyplot as plt
import os
```

In [2]:
```
os.chdir(r'C:\Users\acer\Pictures\Wallpapers')
```

In [3]:
```
myimage = io.imread('abc.jpg')
```

In [4]:
```
myimage.shape
```

```
(3590, 5385, 3)
```

3 represents the R, G and B channels.

In [5]:
```
myimage[0]
```

```
array([[239, 182,   7],
       [239, 182,   7],
       [239, 182,   5],
       ...,
       [253, 190,   0],
       [253, 190,   0],
       [254, 191,   0]], dtype=uint8)
```

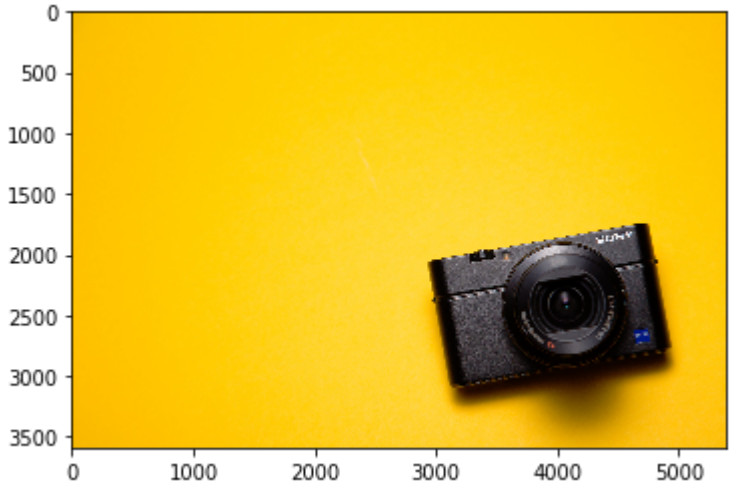
In [6]:
```
print(myimage.min(),myimage.max())
```

```
0 255
```

The data type of 'myimage' is **uint8**. This means the color channel values of the pixels can be in the range [0,255] i.e Upper Bound for this value is 2^8 - 1 = 255.

Visualizing the image in matplotlib.

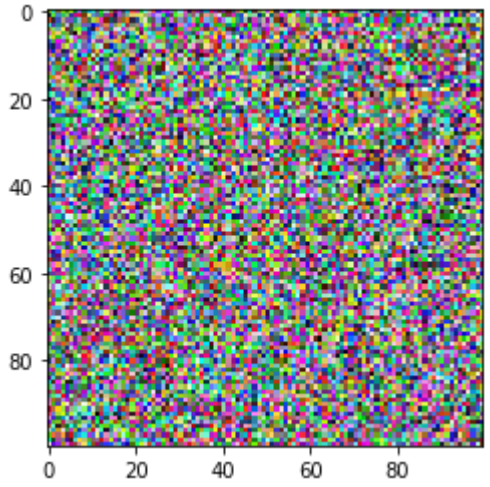
In [7]:
```
plt.imshow(myimage)
plt.show()
```



Visualize random pixels in an image.

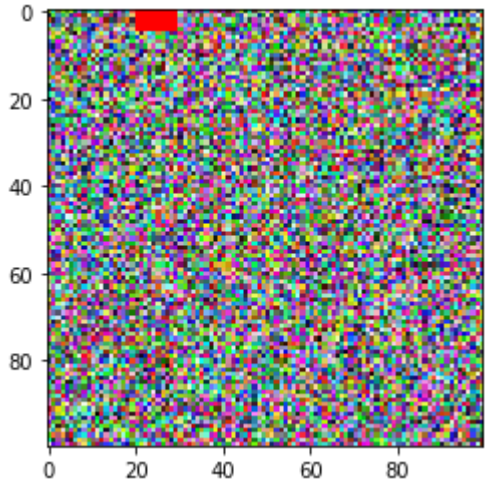
In [8]:
```
randomImage = np.random.randint(0,256, size = (100,100,3))
```

In [9]:
```
plt.imshow(randomImage)
plt.show()
```



In [10]:
```
randomImage[0:5,20:30] = [255,0,0]
```

In [11]:
```
plt.imshow(randomImage)
plt.show()
```



We can also pass in normalized values of RGB.

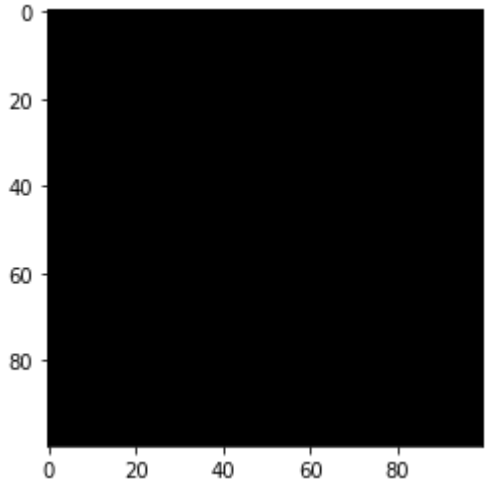
In [12]:
```
from skimage import img_as_float
```

In [13]:
```
floatImage = img_as_float(randomImage)
```

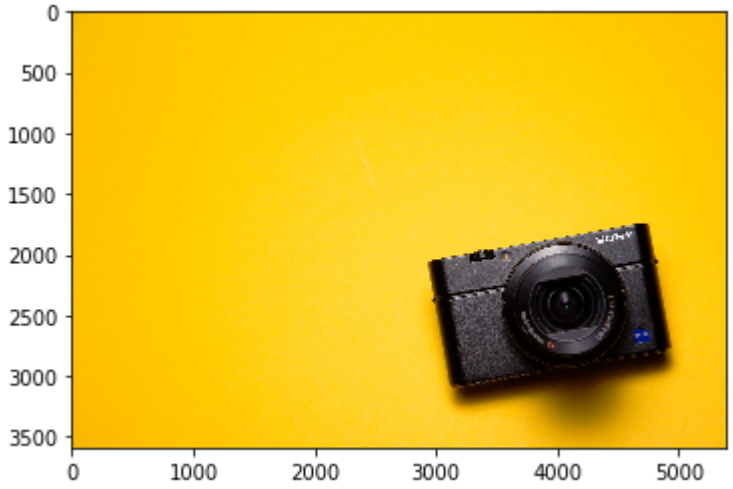
In [14]:
```
floatImage[0][2]
```

```
array([5.93718141e-08, 5.05242497e-08, 3.18977982e-08])
```

In [15]:
```
plt.imshow(floatImage)
plt.show()
```



In [16]:
```
plt.imshow(img_as_float(myimage))
plt.show()
```



Lesson 2: Reading Images in Python.

Necessary librarires.

In [17]:
```
from PIL import Image
```

In [18]:
```
img = Image.open('abc.jpg')
```

In [19]:
```
print(type(img))
```

```
<class 'PIL.JpegImagePlugin.JpegImageFile'>
```

In [20]:
```
print(img.format)
```

```
JPEG
```

Imported as jpeg NOT numpy array.

Converting the image as an array.

In [21]:
```
img1 = np.asarray(img)
```

In [22]:
```
print(type(img1))
```

```
<class 'numpy.ndarray'>
```

In [23]:
```
import matplotlib.image as mpimg
import matplotlib.pyplot as plt
```

In [24]:
```
img = mpimg.imread('abc.jpg')
```

In [25]:
```
type(img)
```

```
numpy.ndarray
```

Directly imported as ndarray unlike PIL.Image

In [26]:
```
img.shape
```

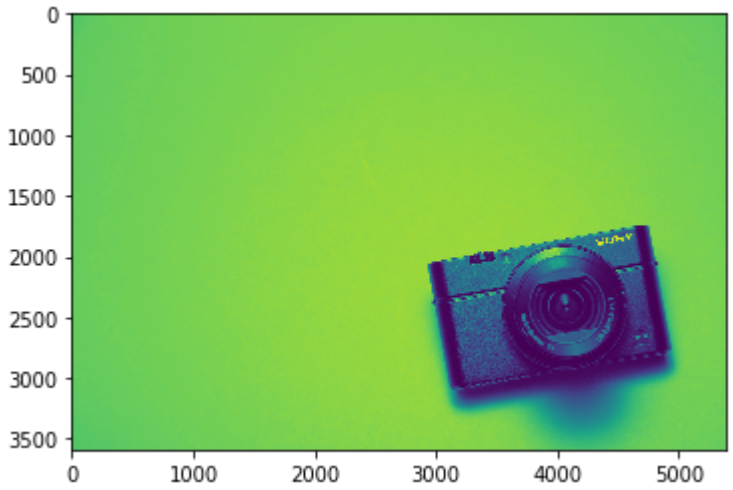
```
(3590, 5385, 3)
```

Lesson 3: Imgae processing using skimage.

In [56]:
```
from skimage import io
import matplotlib.pyplot as plt
```

Importing the image as grayscale.

In [38]:
```
img = io.imread('abc.jpg', as_gray = True)
plt.imshow(img)
plt.show()
```



Shape of the original image.

In [40]:
```
img.shape
```

```
(3590, 5385)
```

Image Transformation.

In [57]:
```
# To transform an image, we do have some functions like rescaling, resizing and downscaling.
from skimage.transform import rescale, resize, downscale_local_mean
```

Rescaling the image.

- Scale image by a certain factor.

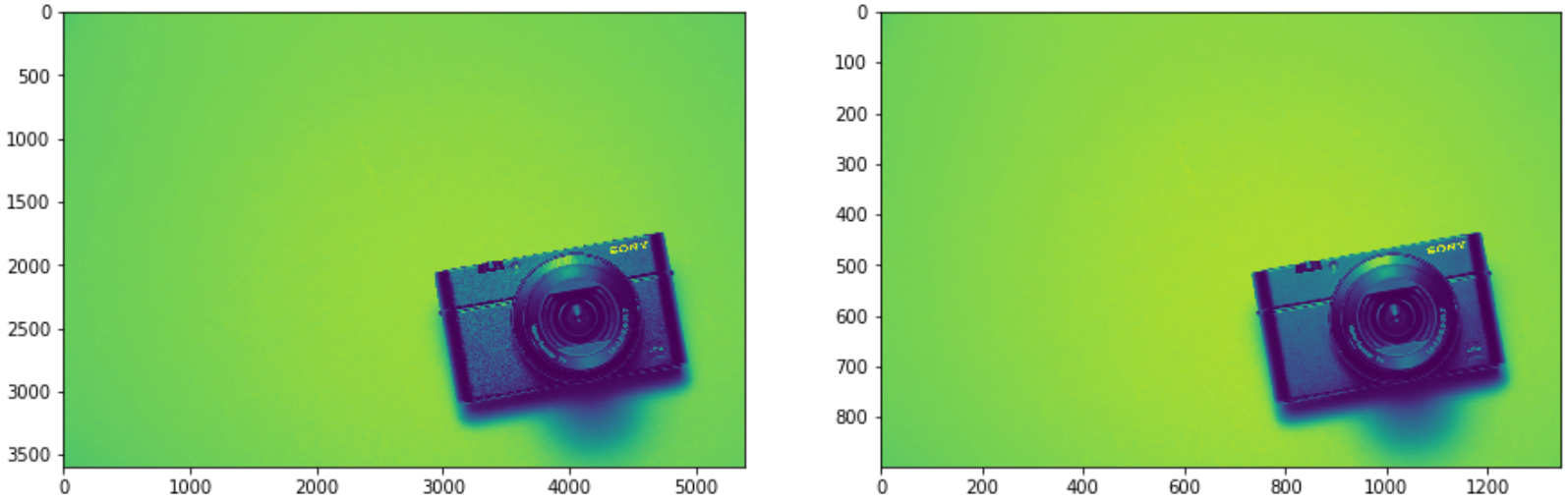
In [48]:
```
rescaled_img = rescale(img, scale = 1/4, anti_aliasing = True)
rescaled_img.shape
```

```
(898, 1346)
```

In [47]:
```
round(img.shape[0]/4), round(img.shape[1]/4)
```

```
(898, 1346)
```

In [53]:
```
plt.figure(figsize = (15,10))
plt.subplot(1,2,1)
plt.imshow(img)

plt.subplot(1,2,2)
plt.imshow(rescaled_img)

plt.show()
```



Look at the change in axes ticks.

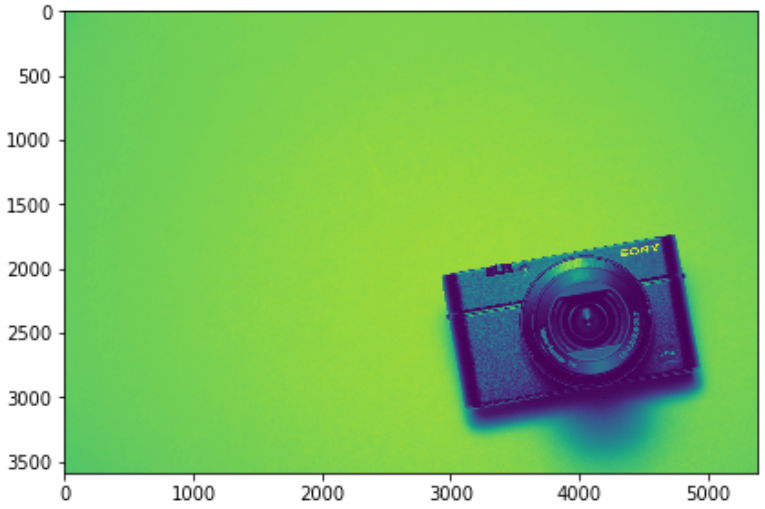
Resizing the image.

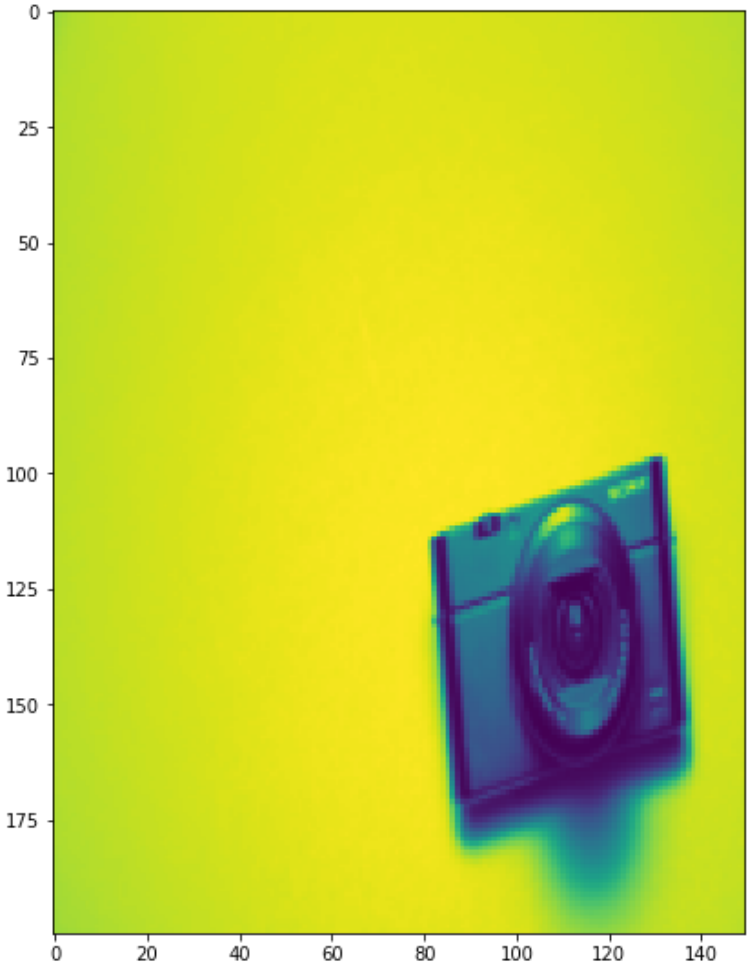
- Resize image to match a certain size.

In [54]:
```
resized_img = resize(img, output_shape = (200,150), anti_aliasing = True )
resized_img.shape
```

```
(200, 150)
```

In [55]:
```
plt.figure(figsize = (15,10))
plt.subplot(1,2,1)
plt.imshow(img)

plt.subplot(1,2,2)
plt.imshow(resized_img)

plt.show()
```





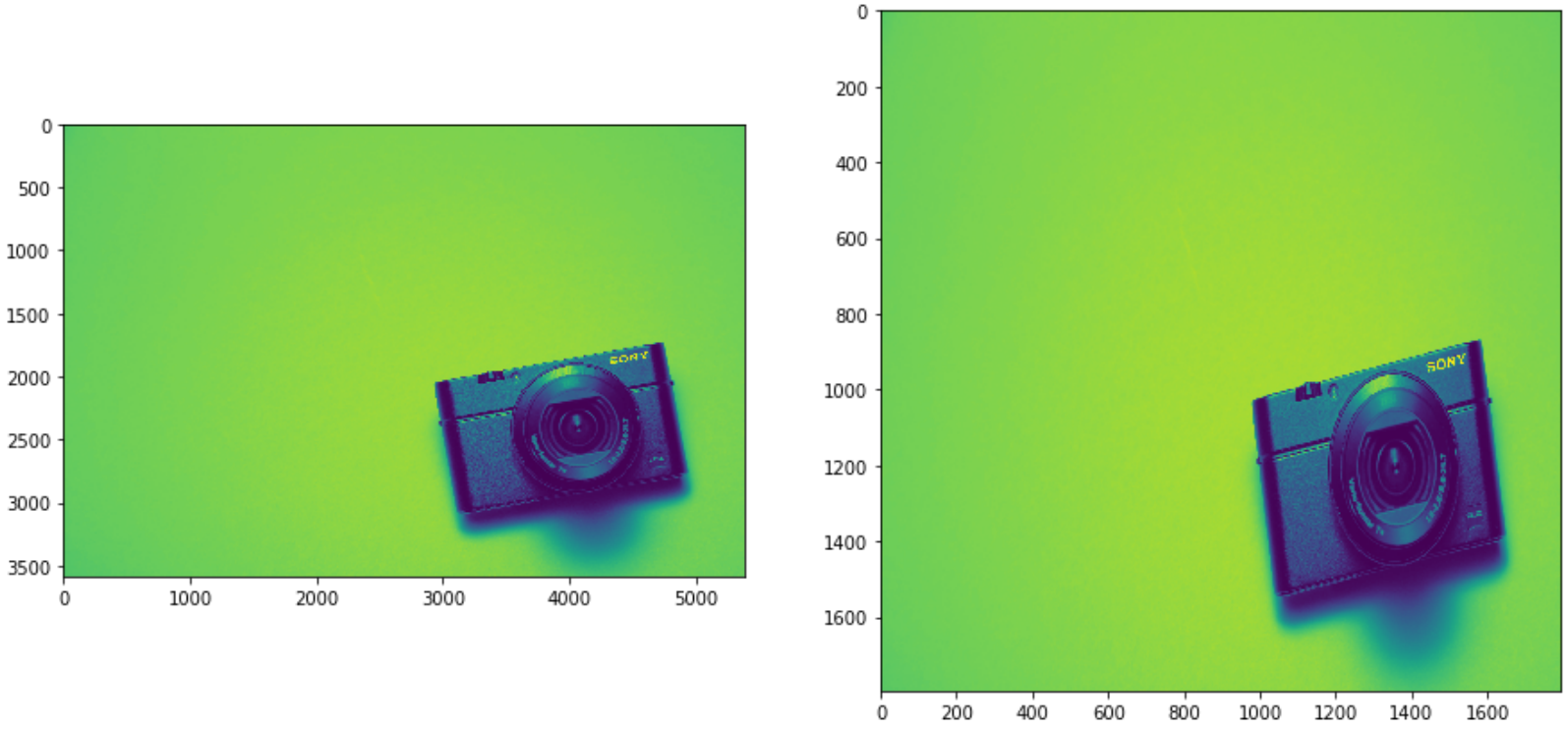
Downscale using local mean.

- Down-sample N-dimensional image by local averaging.

In [58]:
```
downscaled_img = downscale_local_mean(img, factors = (2,3))
downscaled_img.shape
```

```
(1795, 1795)
```

In [59]:
```
plt.figure(figsize = (15,10))
plt.subplot(1,2,1)
plt.imshow(img)

plt.subplot(1,2,2)
plt.imshow(downscaled_img)

plt.show()
```



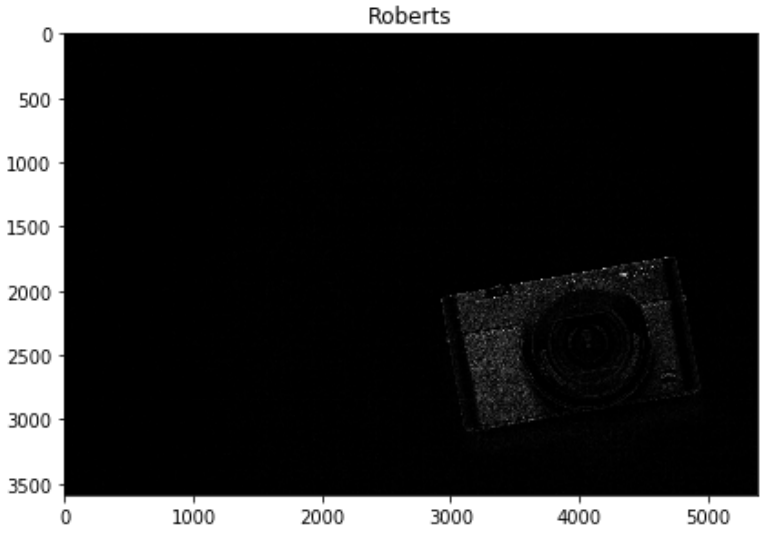
Edge Filtering.

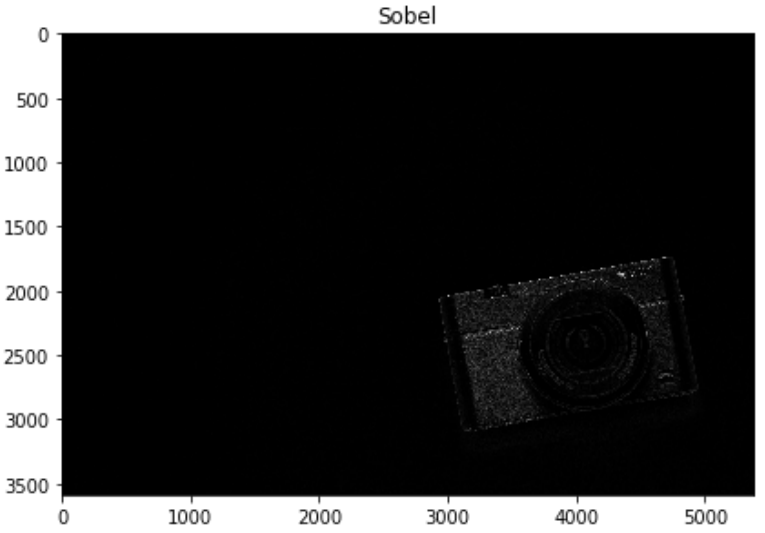
In [61]:
```
from skimage.filters import roberts, sobel, scharr, prewitt
```

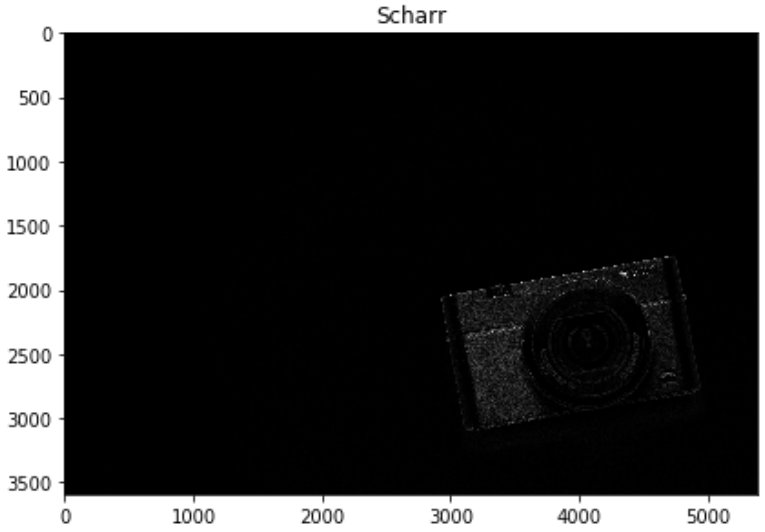
In [68]:
```
methods = (roberts, sobel, scharr, prewitt)
names = ['Roberts', 'Sobel', 'Scharr', 'Prewitt']
```

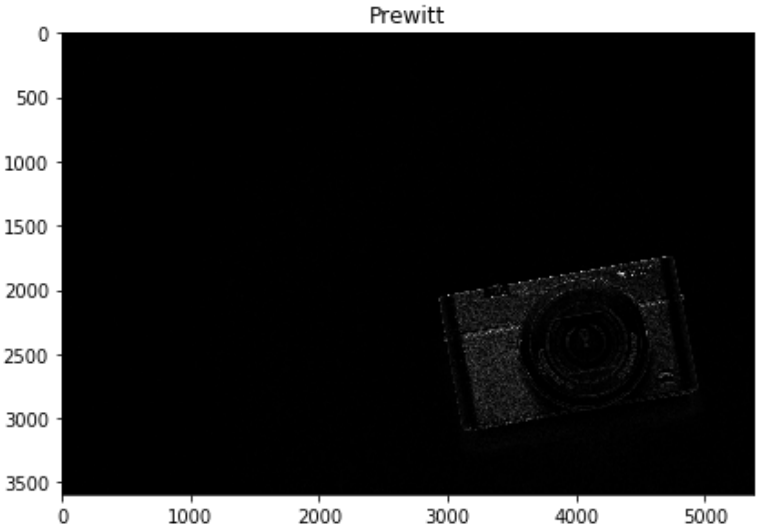
In [71]:

```
plt.figure(figsize = (15,15))

for ii in range(4):
    plt.subplot(2,2,ii+1)
    sample = methods[ii](img)
    plt.imshow(sample, cmap = 'gray')
    plt.title(names[ii])

plt.show()
```


Roberts
0
500
1000
1500
2000
2500
3000
3500
0
1000
2000
3000
4000
5000


Sobel
0
500
1000
1500
2000
2500
3000
3500
0
1000
2000
3000
4000
5000


Scharr
0
500
1000
1500
2000
2500
3000
3500
0
1000
2000
3000
4000
5000

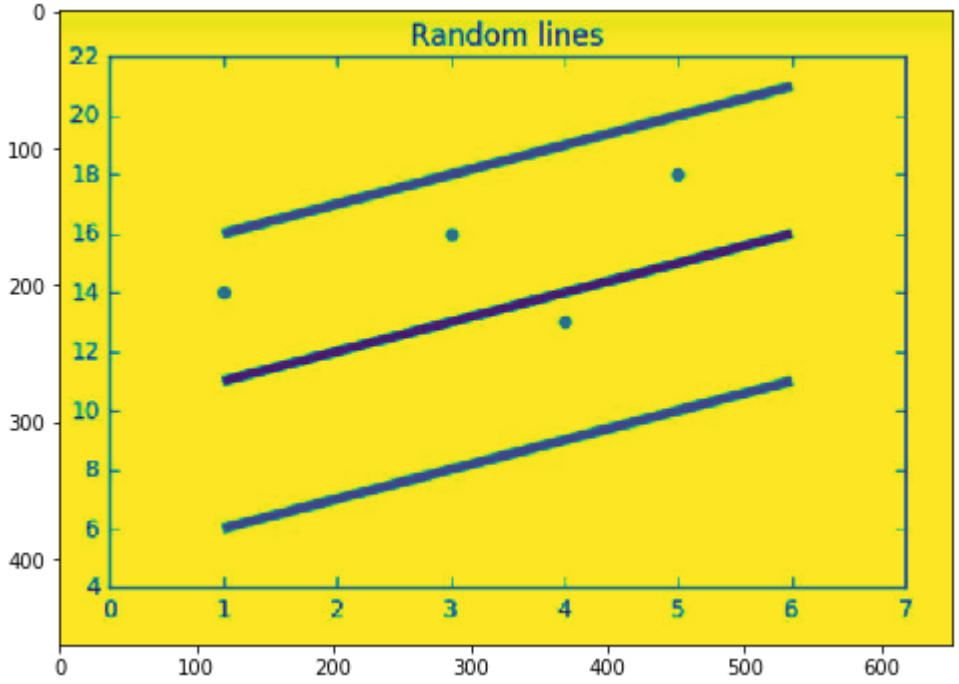

Prewitt
0
500
1000
1500
2000
2500
3000
3500
0
1000
2000
3000
4000
5000

Another example.

In [72]:
```
os.chdir(r'C:\Users\acer\PycharmProjects\untitled')
```

In [73]:
```
img1 = io.imread('svr.jpg', as_gray = True)
```

In [74]:
```
plt.figure(figsize = (8,8))
plt.imshow(img1)
plt.show()
```

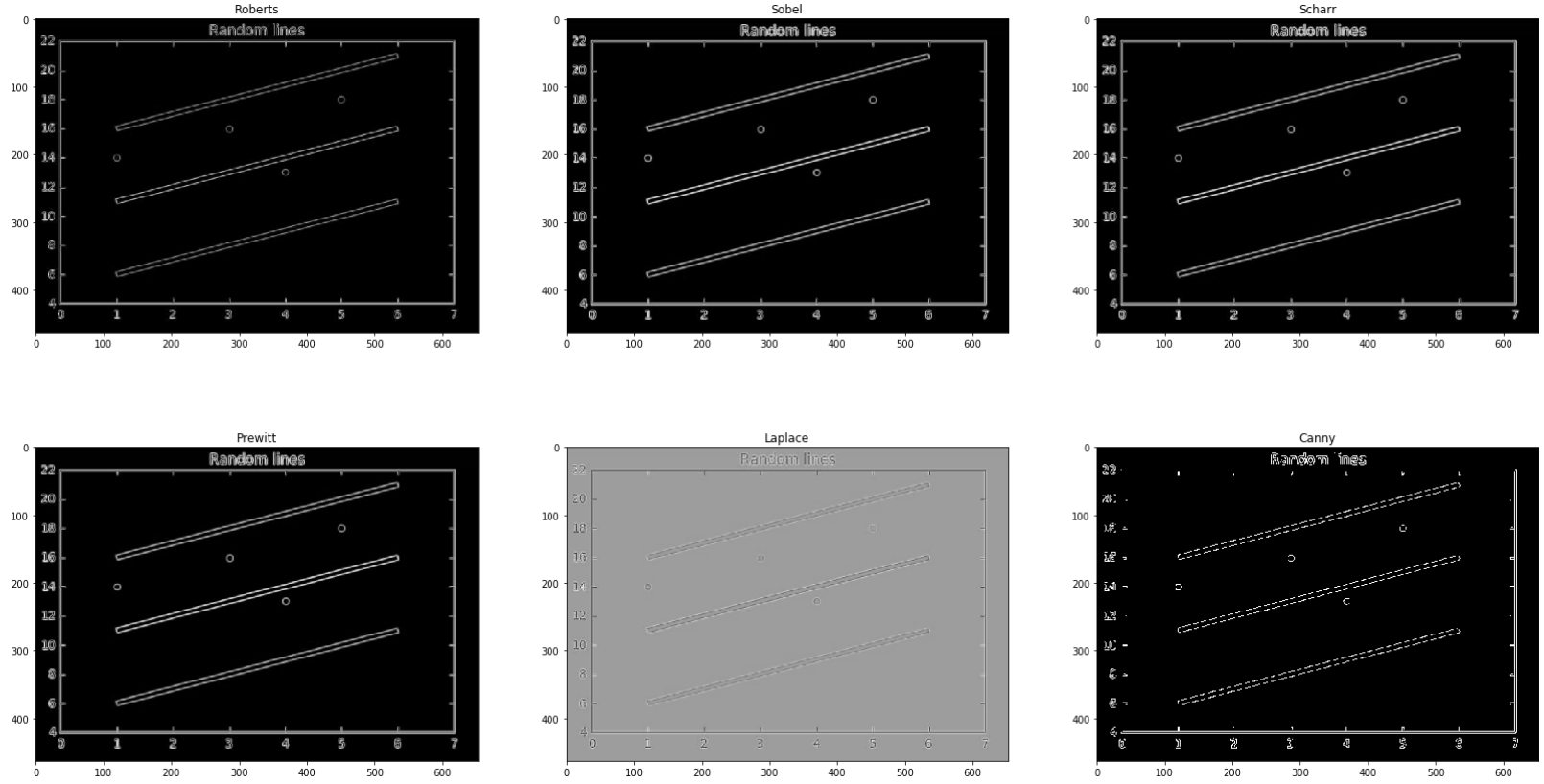


Using edge detection in this image.

In [76]:
```
from skimage.filters import roberts, sobel, scharr, prewitt, laplace
from skimage.feature import canny
```

In [77]:
```
methods = (roberts, sobel, scharr, prewitt, laplace, canny)
names = ['Roberts', 'Sobel', 'Scharr', 'Prewitt', 'Laplace', 'Canny']
```

In [81]:
```
plt.figure(figsize = (28,15))

for ii in range(6):
    plt.subplot(2,3,ii+1)
    sample = methods[ii](img1)
    plt.imshow(sample, cmap = 'gray')
    plt.title(names[ii])

plt.show()
```



The End.