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In [ ]:
```python
import cv2
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
```
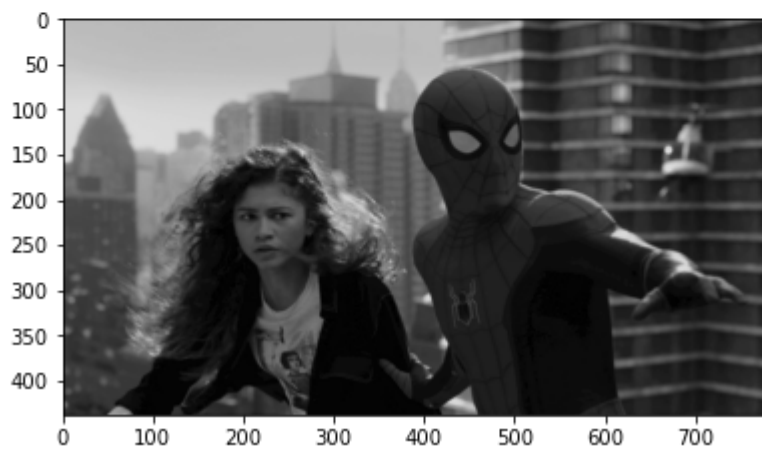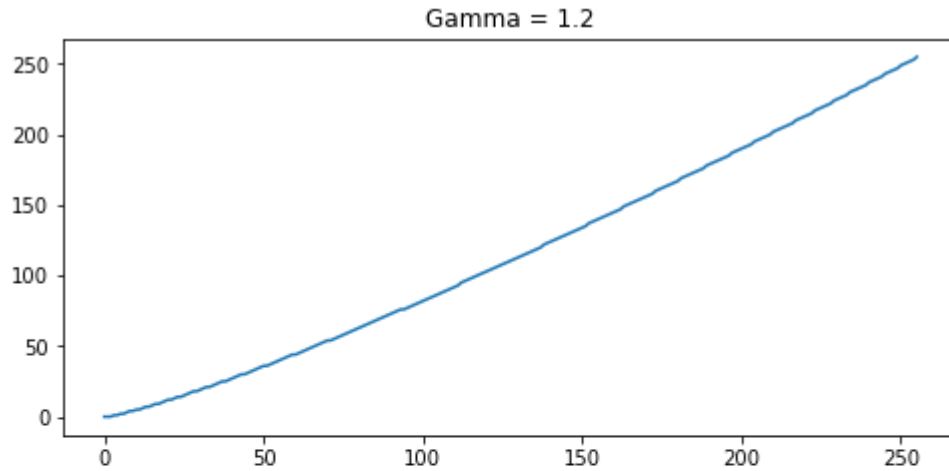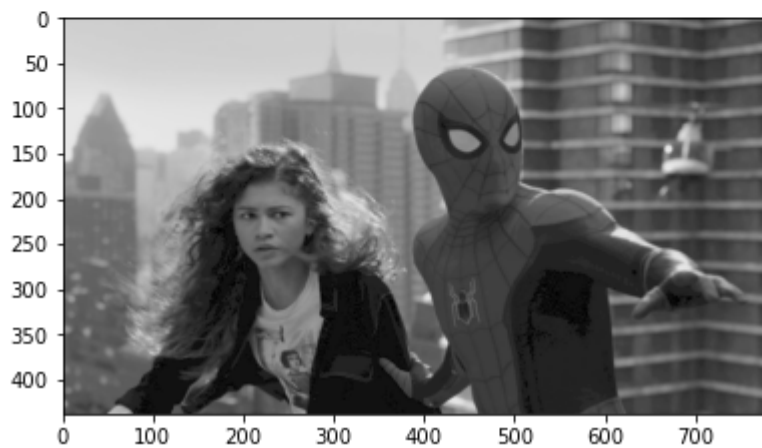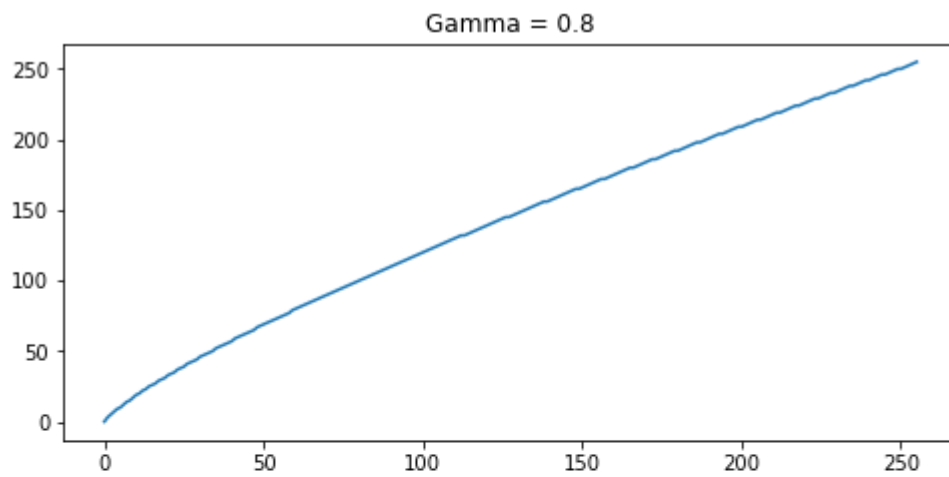
1

In [ ]:
```python
img = cv2.imread("spider.png",cv2.IMREAD_GRAYSCALE)

gamma = [0.2,0.8,1.2,2]
for g in gamma:
    t = np.array([(p/255)**g*255 for p in range(0,256)]).astype(np.uint8)
    tansformedImg = cv2.LUT(img,t)
    fig, ax  = plt.subplots(2,1,figsize = (8,8))
    ax[0].plot(t)
    ax[0].set_title("Gamma = {}".format(g))
    tansformedImg = cv2.cvtColor(tansformedImg,cv2.COLOR_BGR2RGB)
    ax[1].imshow(tansformedImg)
```

Gamma = 0.8

Gamma = 1.2

Gamma = 2

2

In [ ]:
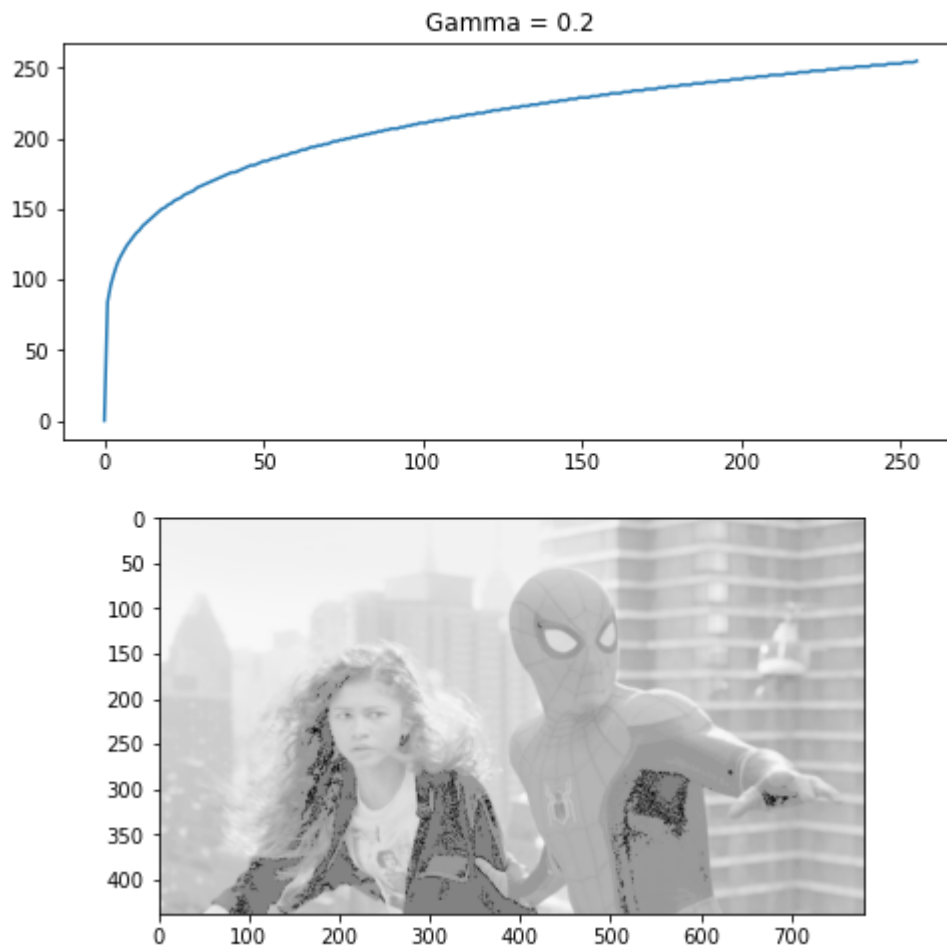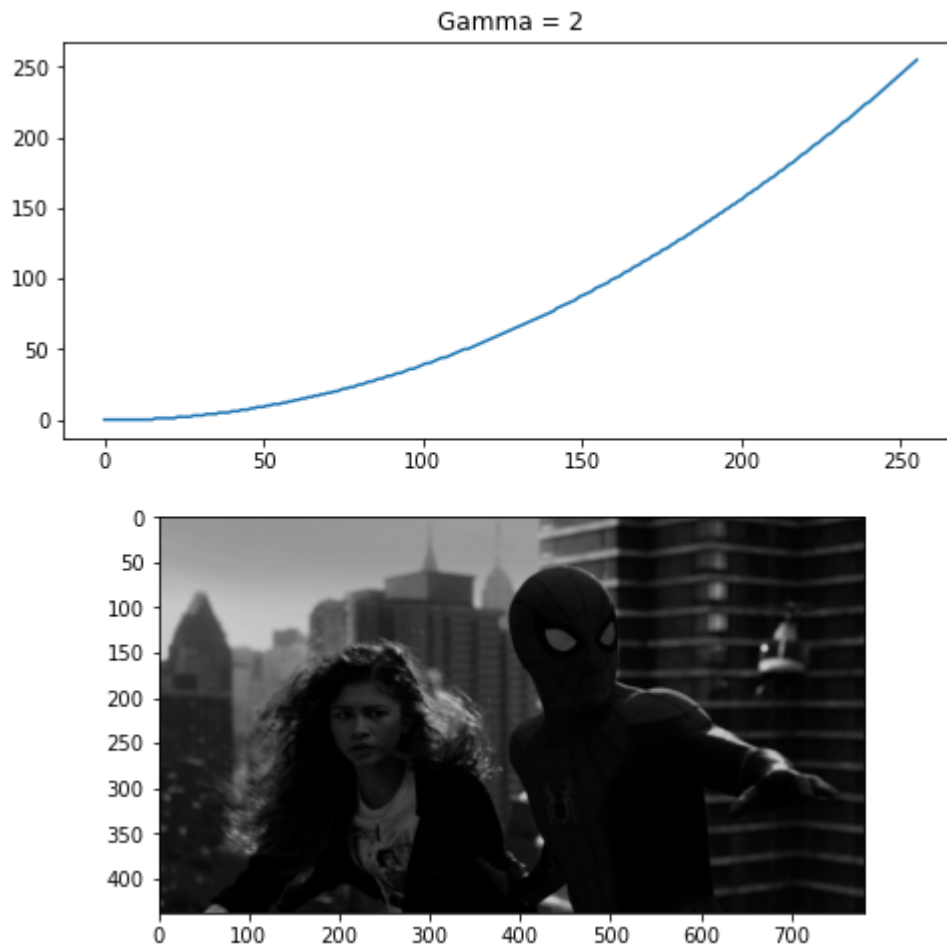
```python
img = cv2.imread("spider.png",cv2.IMREAD_GRAYSCALE)

t1 = np.linspace(0,100,50)
t2 = np.linspace(100,255,150)
t3 = np.linspace(255,255,56)

t = np.concatenate((t1,t2,t3),axis=0).astype(np.uint8)
assert len(t)==256
g = cv2.LUT(img,t)

g = cv2.cvtColor(g,cv2.COLOR_BGR2RGB)
fig, ax  = plt.subplots(2,1,figsize = (8,8))
ax[0].plot(t)
ax[1].imshow(g)
```
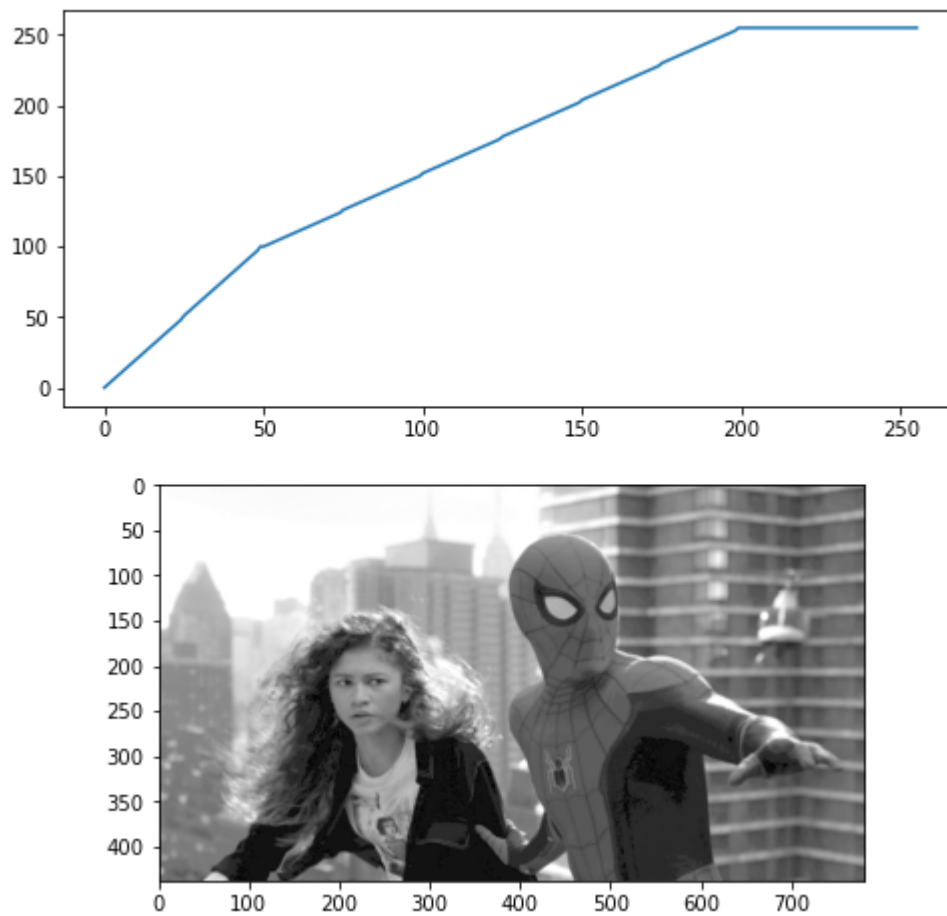
Out[ ]:   <matplotlib.image.AxesImage at 0x24b994fdf40>
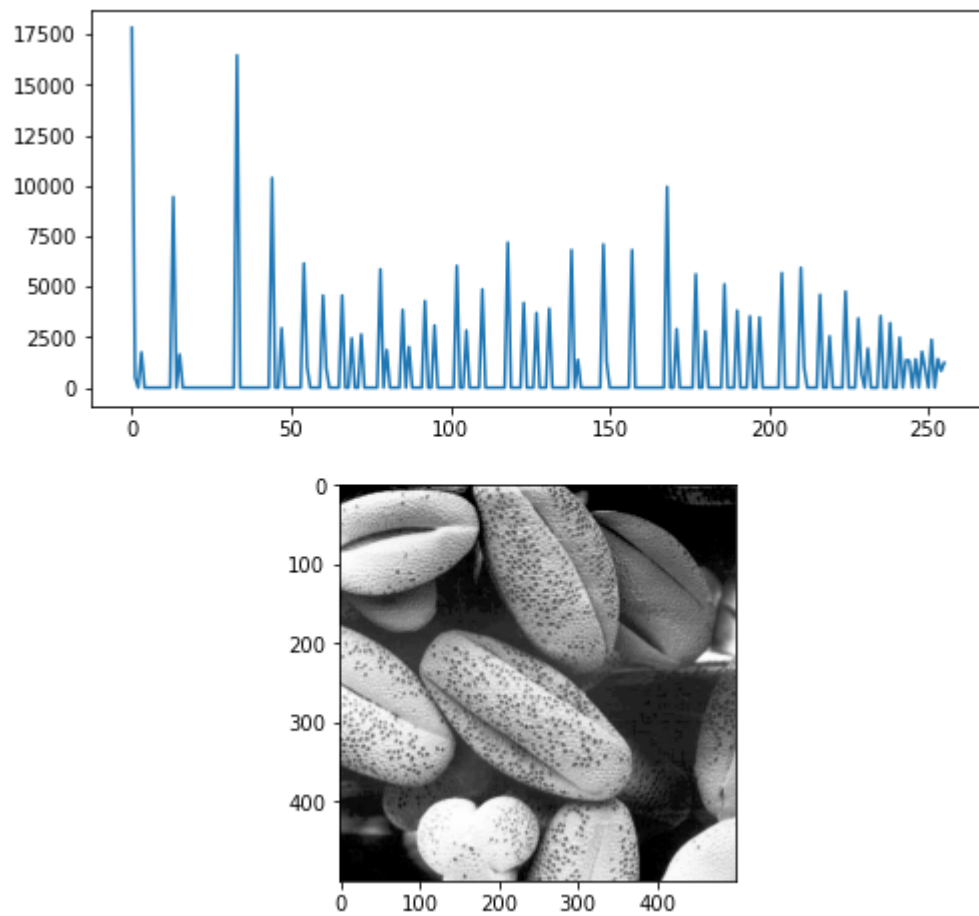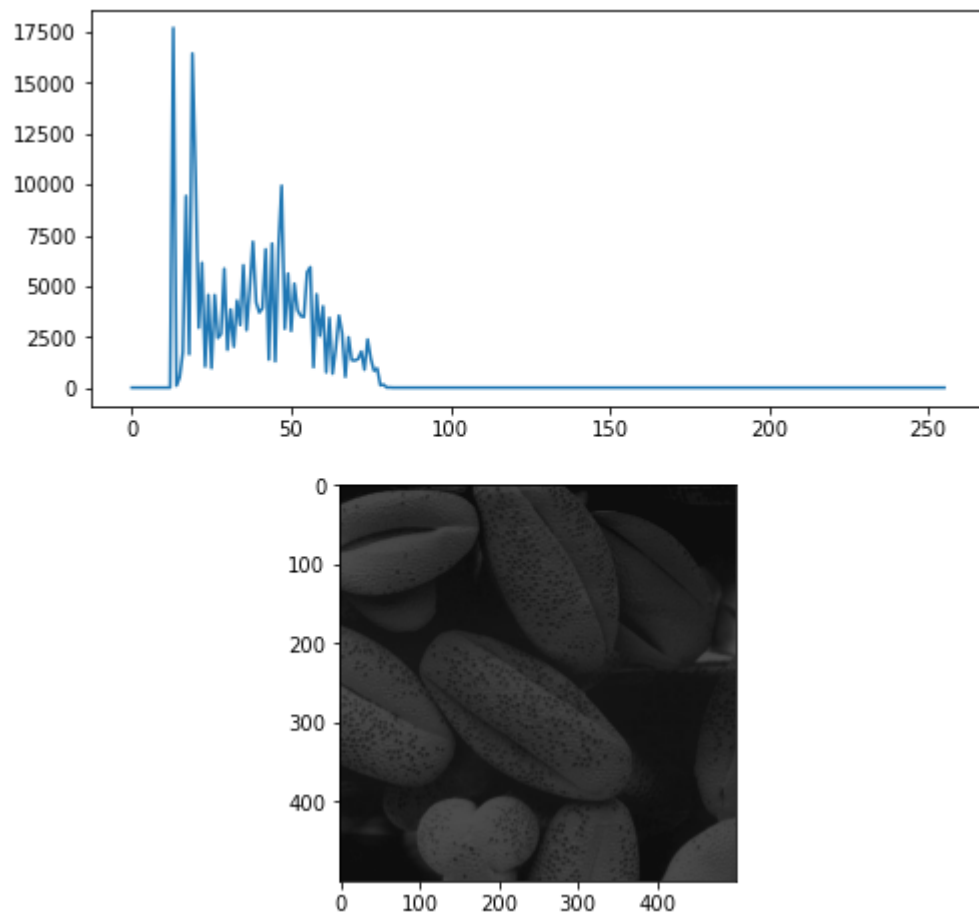
3

```
In [ ]:    img1 = cv2.imread("shells.tif",cv2.IMREAD_GRAYSCALE)

           hist_f = cv2.calcHist([img1],[0],None,[256],[0,256])
           g = cv2.equalizeHist(img1)
           hist_g = cv2.calcHist([g],[0],None,[256],[0,256])

           ###############  a  ################
           fig, ax  = plt.subplots(2,1,figsize = (8,8))
           ax[0].plot(hist_f)
           img1 = cv2.cvtColor(img1,cv2.COLOR_BGR2RGB)
           ax[1].imshow(img1)

           ###############  b,c  ################
           fig, ax  = plt.subplots(2,1,figsize = (8,8))
           ax[0].plot(hist_g)
           g = cv2.cvtColor(g,cv2.COLOR_BGR2RGB)
           ax[1].imshow(g)
```
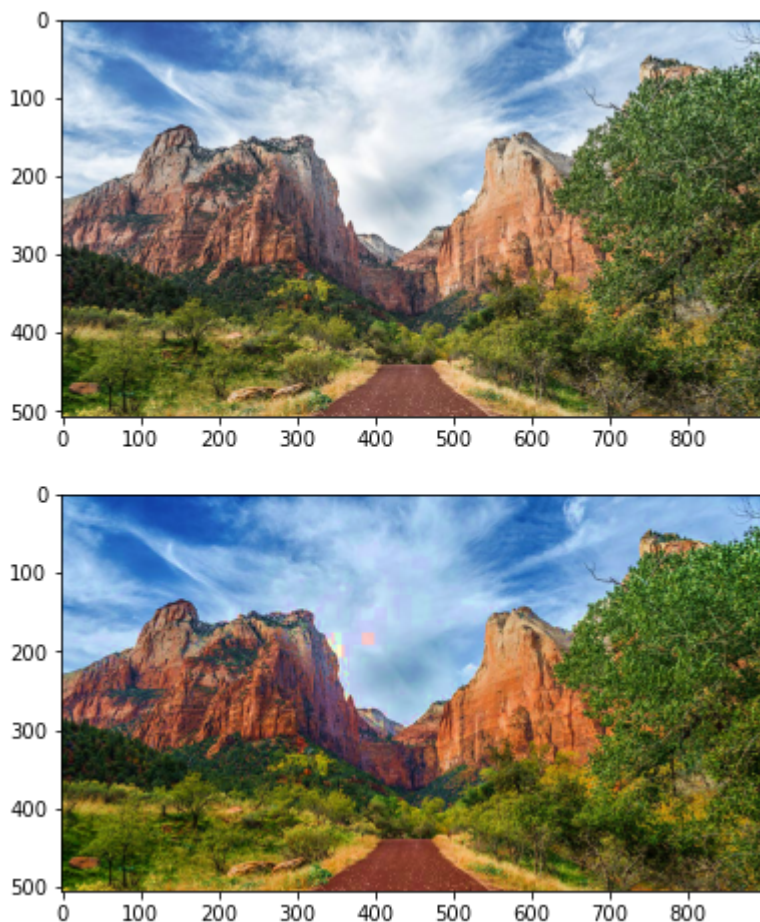
Out[ ]:   `<matplotlib.image.AxesImage at 0x217c34853a0>`

4

In [ ]:
```python
###############  a  ###############
img1 = cv2.imread("zion_pass.jpg")

imgNew = cv2.cvtColor(img1,cv2.COLOR_BGR2HSV)
h,s,v = cv2.split(imgNew)
s = cv2.add(s,50)
imgSatIncreased = cv2.merge([h,s,v])

fig, ax  = plt.subplots(2,1,figsize = (8,8))
img2 = cv2.cvtColor(img1,cv2.COLOR_BGR2RGB)
ax[0].imshow(img2)
imgSatIncreased = cv2.cvtColor(imgSatIncreased,cv2.COLOR_HSV2RGB)
ax[1].imshow(imgSatIncreased)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x217c3996b80>
```


In [ ]:
```python
###############  b  ###############
img = cv2.imread("zion_pass.jpg")
hsv = cv2.cvtColor(img, cv2.COLOR_BGR2HSV)

lower_red = np.array([160,100,50])
upper_red = np.array([180,255,255])

lower_green = np.array([26,10,30])
upper_green = np.array([97,100,255])

lower_blue = np.array([95,50,50])
upper_blue = np.array([130,255,255])
```

```python
red_mask = cv2.inRange(hsv,lower_red,upper_red)
green_mask = cv2.inRange(hsv,lower_green,upper_green)
blue_mask = cv2.inRange(hsv,lower_blue,upper_blue)

hsv[:,:,0][red_mask==255] += 20
hsv[:,:,0][green_mask==255] += 20
hsv[:,:,0][blue_mask==255] += 20

fig, ax = plt.subplots(2,1,figsize=(8,8))
img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
ax[0].imshow(img)
imgHueIncreased = cv2.cvtColor(hsv,cv2.COLOR_HSV2RGB)
ax[1].imshow(imgHueIncreased)
```

Out[ ]: <matplotlib.image.AxesImage at 0x217c5175730>