In [1]:
```
import numpy as np
import cv2
import sys
```

In [3]:
```
cap = cv2.VideoCapture(0)
if not cap.isOpened():
    print('video open failed')
    cap.release()
    sys.exit()

cv2.namedWindow('webcam')

width = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
height = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))
fps = int(cap.get(cv2.CAP_PROP_FPS))
fourcc = cv2.VideoWriter_fourcc(*'DIVX')

out = cv2.VideoWriter('my_cam.avi', fourcc, fps, (width, height))

while True:

    ret, frame = cap.read()
    if not ret:
        print('video read failed')
        break
    ############
    edge = cv2.Canny(frame, 50, 100)
    edge = cv2.cvtColor(edge, cv2.COLOR_GRAY2BGR)

    # 기타 이미지 프로세싱 코딩

    ############

    out.write(edge)

    cv2.imshow('webcam', frame)

    if cv2.waitKey(20) == 27:
        break

cap.release()
out.release()
cv2.destroyAllWindows()
cv2.waitKey(1)
```

Out[3]: -1

In [6]:
```
oldx = -100
oldy = -100

def call_mouse(event, x, y, flags, param):
    global oldx, oldy
    if event == cv2.EVENT_LBUTTONDOWN:
        print('EVENT_LBUTTONDOWN:',x, y)
        oldx, oldy = x, y

    elif event == cv2.EVENT_MOUSEMOVE:
        if flags == cv2.EVENT_FLAG_LBUTTON:
            cv2.line(img, (oldx, oldy), (x, y), (255, 0, 0), 5, cv2.LINE_AA)
            cv2.imshow('img', img)
```

```
            oldx, oldy = x, y

img = np.ones((400, 600, 3), dtype = np.uint8)*255

cv2.namedWindow('img')
cv2.setMouseCallback('img', call_mouse, img)


cv2.imshow('img', img)

cv2.waitKey()
cv2.destroyAllWindows()
cv2.waitKey(1)
```

```
EVENT_LBUTTONDOWN: 103 75
EVENT_LBUTTONDOWN: 238 46
EVENT_LBUTTONDOWN: 162 213
EVENT_LBUTTONDOWN: 302 91
```

Out[6]:
```
-1
```

In [9]:
```
def call_track(pos):
    img[:] = pos
    cv2.imshow('img', img)

img = np.ones((400, 600, 3), dtype = np.uint8)

cv2.namedWindow('img')
cv2.createTrackbar('level', 'img', 100, 255, call_track)


cv2.imshow('img', img)

cv2.waitKey()
cv2.destroyAllWindows()
cv2.waitKey(1)
```

Out[9]:
```
-1
```

In [18]:
```
src = cv2.imread('/Users/illbumjung/YGL/5. Vision/OneDrive-2021-11-02/Lenna.p

# dst = cv2.add(src, (100, 100, 100, 0))
# dst = np.clip(src + 100., 0, 255).astype(np.uint8)

dst = cv2.cvtColor(src, cv2.COLOR_BGR2HSV)

cv2.imshow('src', src)
cv2.imshow('dst', dst)


cv2.waitKey()
cv2.destroyAllWindows()
cv2.waitKey(1)
```

Out[18]:
```
-1
```

In [30]:
```
img1 = cv2.imread('/Users/illbumjung/YGL/5. Vision/OneDrive-2021-11-02/Ch_3_B
                  cv2.IMREAD_GRAYSCALE)
img2 = np.zeros((256,256), np.uint8)

# cv2.circle(img2, (128,128), 50, 50, -1)
cv2.circle(img2, (128,128), 100, 100, -1)
```

```
cv2.circle(img2, (128,128), 50, 50, -1)

dst1 = cv2.add(img1,img2)
dst2 = cv2.addWeighted(img1, 0.5, img2, 0.5, 0.0)
dst3 = cv2.subtract(img1,img2)

cv2.imshow('img1', img1)
cv2.imshow('img2', img2)
cv2.imshow('dst1', dst1)
cv2.imshow('dst2', dst2)
cv2.imshow('dst3', dst3)

cv2.waitKey()
cv2.destroyAllWindows()
cv2.waitKey(1)
```

Out[30]:
```
-1
```

In [38]:
```
src = cv2.imread('/Users/illbumjung/YGL/5. Vision/OneDrive-2021-11-02/Ch_3_Ba
                 cv2.IMREAD_COLOR)

# b, g, r = cv2.split(src)

# b = src[:,:,0]
# g = src[:,:,1]
# r = src[:,:,2]

src_hsv = cv2.cvtColor(src, cv2.COLOR_BGR2HSV)

h, s, v = cv2.split(src_hsv)

cv2.imshow('src', src)
# cv2.imshow('b_chl', b)
# cv2.imshow('g_chl', g)
# cv2.imshow('r_chl', r)

cv2.imshow('h_chl', h)
cv2.imshow('s_chl', s)
cv2.imshow('v_chl', v)

cv2.waitKey()
cv2.destroyAllWindows()
cv2.waitKey(1)
```

Out[38]:
```
-1
```

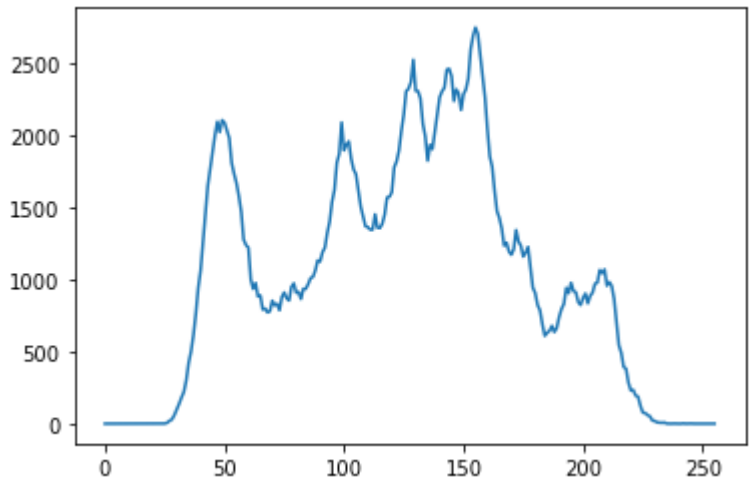
In [35]:
```
print(src.shape)
print(src.dtype)
print(type(src))
```

```
(367, 550, 3)
uint8
<class 'numpy.ndarray'>
```

In [39]:
```
import matplotlib.pyplot as plt
```

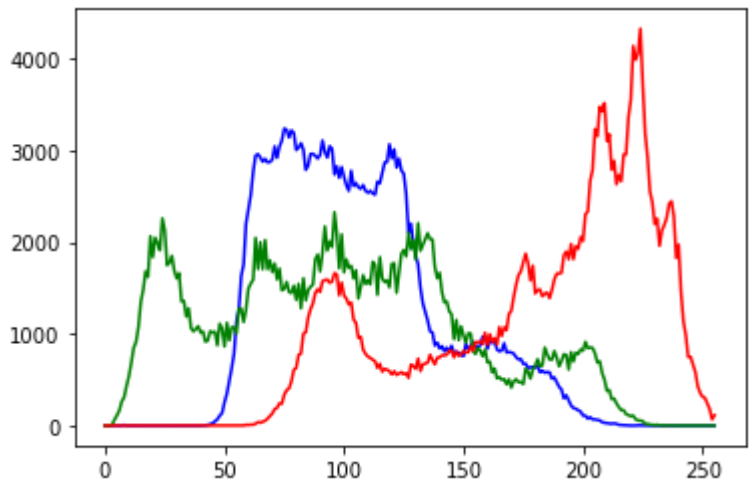
In [42]:
```
src = cv2.imread('/Users/illbumjung/YGL/5. Vision/OneDrive-2021-11-02/Ch_3_Ba
                 cv2.IMREAD_GRAYSCALE)

hist = cv2.calcHist([src], [0], None, [256], [0, 256])
```

```
cv2.imshow('src', src)

cv2.waitKey()
cv2.destroyAllWindows()
cv2.waitKey(1)

plt.plot(hist)
plt.show()
```

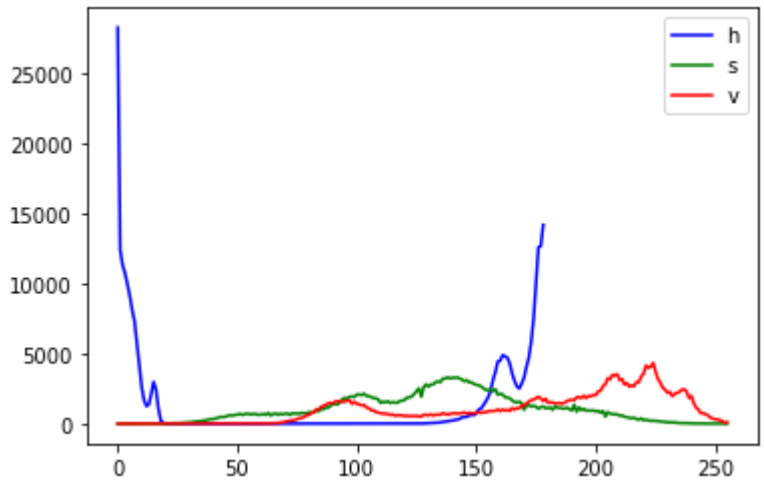


In [43]:

```
src = cv2.imread('/Users/illbumjung/YGL/5. Vision/OneDrive-2021-11-02/Ch_3_Ba
                 cv2.IMREAD_COLOR)

b, g, r = cv2.split(src)

hist_b = cv2.calcHist([b], [0], None, [256], [0, 256])
hist_g = cv2.calcHist([g], [0], None, [256], [0, 256])
hist_r = cv2.calcHist([r], [0], None, [256], [0, 256])


cv2.imshow('src', src)

cv2.waitKey()
cv2.destroyAllWindows()
cv2.waitKey(1)

plt.plot(hist_b, color = 'b')
plt.plot(hist_g, color = 'g')
plt.plot(hist_r, color = 'r')

plt.show()
```



In [45]:
```
src = cv2.imread('/Users/illbumjung/YGL/5. Vision/OneDrive-2021-11-02/Ch_3_Ba
                 cv2.IMREAD_COLOR)


src_hsv = cv2.cvtColor(src, cv2.COLOR_BGR2HSV)

h, s, v = cv2.split(src_hsv)

hist_h = cv2.calcHist([h], [0], None, [179], [0, 180])
hist_s = cv2.calcHist([s], [0], None, [256], [0, 256])
hist_v = cv2.calcHist([v], [0], None, [256], [0, 256])


cv2.imshow('src', src)

cv2.waitKey()
cv2.destroyAllWindows()
cv2.waitKey(1)

plt.plot(hist_h, color = 'b', label = 'h')
plt.plot(hist_s, color = 'g', label = 's')
plt.plot(hist_v, color = 'r', label = 'v')

plt.legend()

plt.show()
```



In [46]:
```
import numpy as np
import sys
import cv2
```

In [53]:
```
src = cv2.imread('/Users/illbumjung/YGL/5. Vision/OneDrive-2021-11-02/Ch_4_Hi
                 cv2.IMREAD_GRAYSCALE)

cv2.imshow('src', src)

# smin, smax, _, _ = cv2.minMaxLoc(src)
# print('min', smin)
# print('max', smax)
# dst = np.clip(255 * (src - smin)/(smax - smin), 0, 255).astype(np.uint8)

dst1 = cv2.normalize(src, None, 0, 255, cv2.NORM_MINMAX, -1)

cv2. imshow('dst1', dst1)
```

```
cv2.waitKey()
cv2.destroyAllWindows()
cv2.waitKey(1)
```

Out[53]:
```
-1
```

In [55]:
```
src = cv2.imread('/Users/illbumjung/YGL/5. Vision/OneDrive-2021-11-02/Ch_4_Hi
                 cv2.IMREAD_GRAYSCALE)

dst1 = cv2.normalize(src, None, 0, 255, cv2.NORM_MINMAX, -1)
dst2 = cv2.equalizeHist(src)

cv2.imshow('src', src)
cv2. imshow('dst1', dst1)
cv2. imshow('dst', dst2)

cv2.waitKey()
cv2.destroyAllWindows()
cv2.waitKey(1)
```

Out[55]:
```
-1
```

In [62]:
```
src = cv2.imread('/Users/illbumjung/YGL/5. Vision/OneDrive-2021-11-02/Ch_4_Hi
                 cv2.IMREAD_COLOR)

src_hsv = cv2.cvtColor(src, cv2.COLOR_BGR2HSV)

h, s, v = cv2.split(src_hsv)

dst1 = cv2.normalize(v, None, 0, 255, cv2.NORM_MINMAX, -1)
dst2 = cv2.equalizeHist(v)

dst_hvs1 = cv2.merge([h,s,dst1])
dst_hvs2 = cv2.merge([h,s,dst2])

dst_f1 = cv2.cvtColor(dst_hvs1, cv2.COLOR_HSV2BGR)
dst_f2 = cv2.cvtColor(dst_hvs2, cv2.COLOR_HSV2BGR)


cv2.imshow('src', src)
cv2. imshow('dst1', dst_f1)
cv2. imshow('dst', dst_f2)

cv2.waitKey()
cv2.destroyAllWindows()
cv2.waitKey(1)
```

Out[62]:
```
-1
```

In [ ]:
```

```