In [1]:

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import matplotlib.pyplot as plt
import numpy as np
import cv2

def main():
    img_path = "balloons.jpg"
    print(img_path)
    rgb = plt.imread(img_path)
    print(rgb.shape)
    rgbImg = cv2.resize(rgb,(800,800))
    r,c,k=rgbImg.shape

    grayscale = np.zeros((r,c),dtype=np.uint8)
    grayscale = rgb2Grayscale(rgbImg)
    #grayscale = cv2.cvtColor(rgbImg,cv2.COLOR_RGB2GRAY)
    filteredImg = np.zeros((r,c),dtype=np.uint8)

    kernel1 = np.array([[-1, -1, -1],[-1, 8, -1],[-1, -1, -1]])
    filteredImg = convolution2d1(grayscale,kernel1)
    processed_img2 = cv2.filter2D(grayscale,-1,kernel1);

    img_set = [rgbImg,grayscale,filteredImg,processed_img2]
    title_set = ['RGB','Grayscale','filteredImg','processed_img2']
    hist_title = ["RGB Histogram","Grayscale","",'filteredImg','processed_img2

    plt_img(img_set,title_set)
    manual_hist(img_set,hist_title,r,c)

def convolution2d1(image, kernel):
    m, n = kernel.shape
    c, r = image.shape
    image = np.pad(image,1,constant_values = 0)
    print(image.shape)
    new_image = np.zeros((c, r))
    for i in range(r):
        for j in range(c):
            cx,cy = (i+m),(j+n)
            if cx < r and cx >= 0 and cy < c and cy >= 0:
                sum = np.sum(image[i:i+m, j:j+n]*kernel)
                sum = np.rint(sum)
                sum = max(0,sum)
                sum = min(255,sum)
                new_image[i,j] = sum
    return new_image


def rgb2Grayscale(img):
        r,c,k = img.shape
        grayscale = np.zeros((r,c),dtype=np.uint8)

        red = img[:,:,0]
        green = img[:,:,1]
        blue = img[:,:,2]

        for i in range(r):
                for j in range(c):
                        tmp = .144 * red[i,j] + .587 * green[i,j] + .299 * blu
                        if tmp > 255:
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                                tmp = 255
                        grayscale[i,j] = tmp
                        #print(grayscale[i,j])
        return grayscale

def plt_img(img_set,title_set):
        ch = len(img_set)
        plt.figure(figsize=(20,20))
        j=1
        for i in range(ch):
                plt.subplot(4,2,j)
                img = img_set[i]
                ln = len(img)
                if ln == 3:
                        plt.imshow(img)
                else:
                        plt.imshow(img,cmap = 'gray')
                plt.title(title_set[i])
                j = j + 2

def manual_hist(img_set,hist_title_set,r,c):
        ch = len(img_set)
        l = 2
        for i in range(ch):
                img = (img_set[i])
                histogram = np.zeros((256), dtype=int)
                for j in range(r):
                        for k in range(c):
                                temp = img[j,k].astype(int)
                                histogram[temp] = 1 + histogram[temp]
                y =  np.arange(256)
                plt.subplot(4,2,l)
                plt.plot(y,histogram)
                plt.ylim(0,)
                plt.title(hist_title_set[i])
                l = l + 2
        plt.show()

if __name__ == '__main__':
        main()
```

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balloons.jpg
(324, 412, 3)
(802, 802)
```
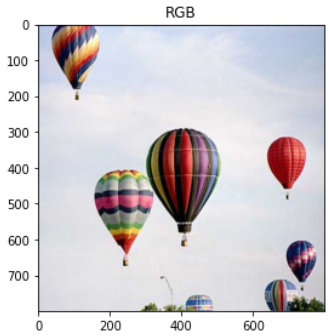
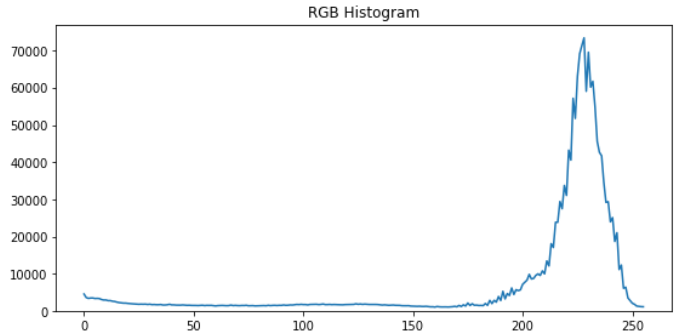
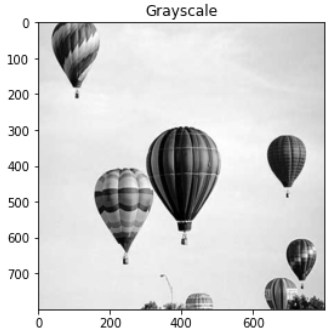
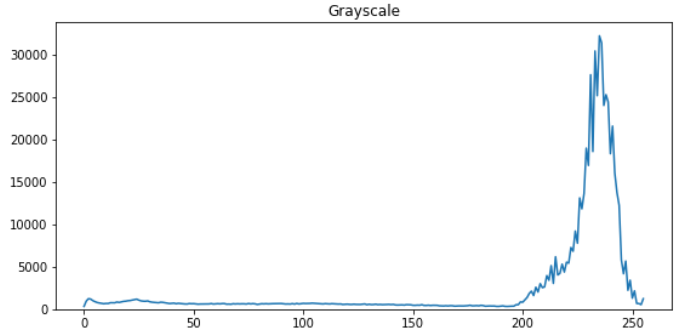
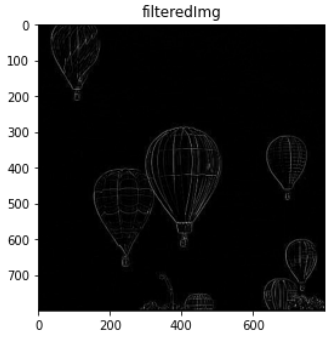
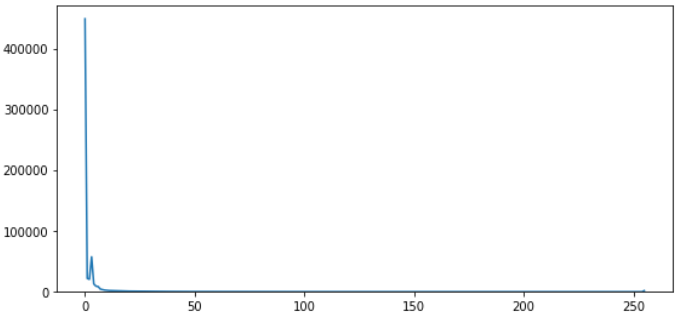


RGB

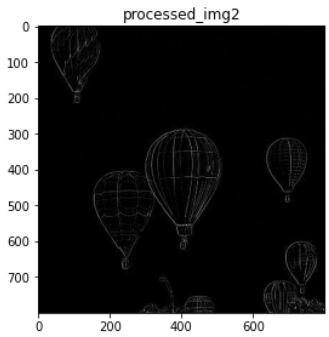

RGB Histogram

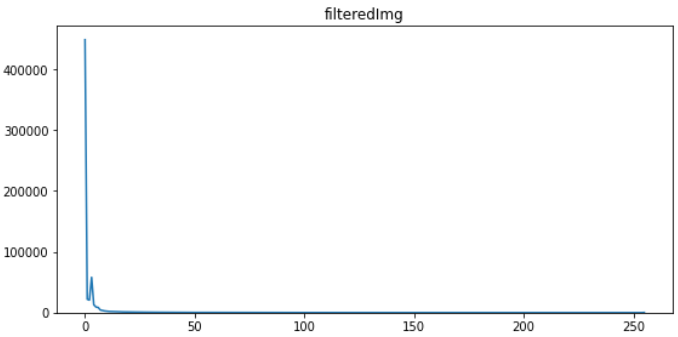

Grayscale


Grayscale


filteredImg




processed_img2


filteredImg

In [ ]:

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