Code:

```
# %%
#LOAD IMAGE

from matplotlib import gridspec
from PIL import Image
import cv2
from matplotlib import pyplot as plt
from matplotlib.gridspec import GridSpec
import numpy as np

filepath = 'image1.jpg'

imageObj = cv2.imread(filepath)
plt.title("Original Image")
plt.imshow(cv2.cvtColor(imageObj, cv2.COLOR_BGR2RGB))
plt.savefig('1.jpg')
plt.show()



# %%
#EROSION

#img=cv2.cvtColor(imageObj,cv2.COLOR_BGR2RGB)
img=cv2.cvtColor(imageObj,cv2.COLOR_RGB2GRAY)

val_o,img_bin=cv2.threshold(img,0,255,cv2.THRESH_BINARY+cv2.THRESH_OTSU)

blue_color = cv2.calcHist([imageObj], [0], None, [256], [0, 256])
red_color = cv2.calcHist([imageObj], [1], None, [256], [0, 256])
green_color = cv2.calcHist([imageObj], [2], None, [256], [0, 256])

plt.title('Histogram')
plt.plot(blue_color)
plt.plot(red_color)
plt.plot(green_color)
colors =('r','g','b')
plt.savefig('2.jpg')
plt.show()



kernel=np.ones((5,5),np.float32)
img_eroded=cv2.erode(img_bin,kernel,iterations=1)
plt.title('Eroded Color Image')
plt.imshow(img_eroded)
plt.savefig('3.jpg')
```

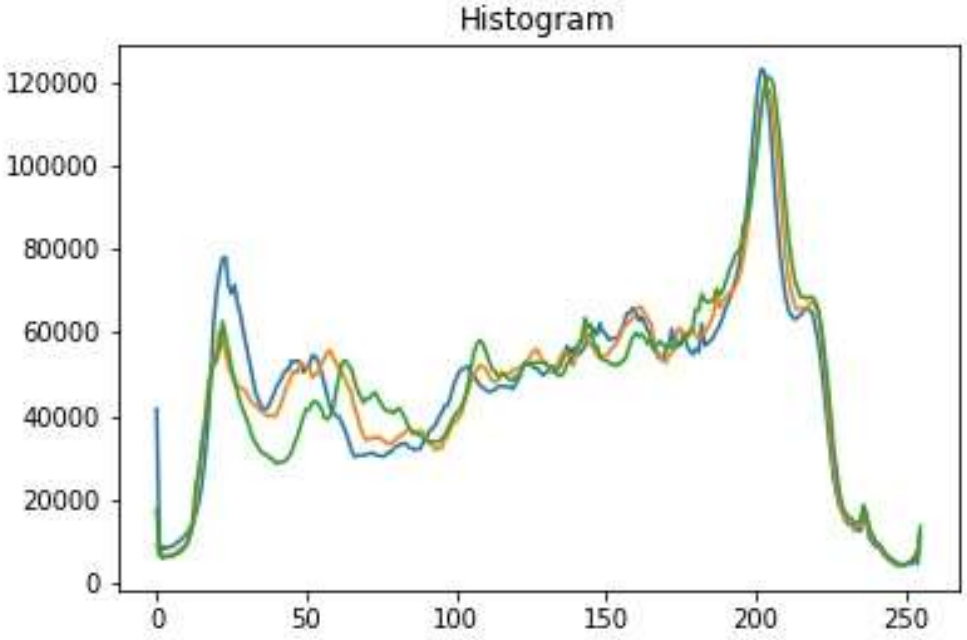
```
plt.show()

hist_grayscale = cv2.calcHist([img], [0], None, [256], [0,256])
hist_otsu = cv2.calcHist([img_bin], [0], None, [256], [0,256])
hist_eroded = cv2.calcHist([img_eroded], [0], None, [256], [0,256])


# %%
#EROSION PLOTTING

row=2
col=3

fig=plt.figure(figsize=(15,15))
gs=GridSpec(row,col)

fig.add_subplot(gs[0,0])
plt.title('Original Grayscale Image')
plt.imshow(img,cmap='gray')

fig.add_subplot(gs[0,1])
plt.title('OTSU Binarized Image')
plt.imshow(img_bin,cmap='gray')

fig.add_subplot(gs[0,2])
plt.title('Eroded Binarized Image with 5x5 Kernel')
plt.imshow(img_eroded,cmap='gray')

fig.add_subplot(gs[1,0])
plt.title('Histogram')
plt.plot(hist_grayscale)

fig.add_subplot(gs[1,1])
plt.title('Histogram')
plt.plot(hist_otsu)

fig.add_subplot(gs[1,2])
plt.title('Histogram')
plt.plot(hist_eroded)

plt.savefig('4.jpg')

# %%
#DILATION

kernel=np.ones((5,5),np.float32)
img_dilated=cv2.dilate(img_bin,kernel,iterations=1)
plt.title('Dilated Color Image')
plt.imshow(img_dilated)
```

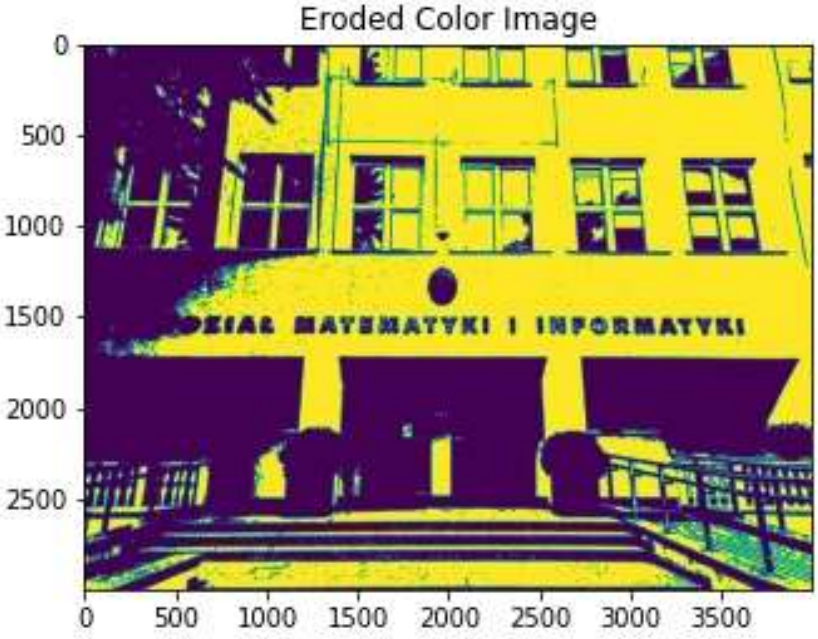
```
plt.savefig('5.jpg')
plt.show()

hist_dilated = cv2.calcHist([img_dilated], [0], None, [256], [0,256])

# %%
#DILATION PLOTTING

row=2
col=3

fig=plt.figure(figsize=(15,15))
gs=GridSpec(row,col)

fig.add_subplot(gs[0,0])
plt.title('Original Grayscale Image')
plt.imshow(img,cmap='gray')

fig.add_subplot(gs[0,1])
plt.title('OTSU Binarized Image')
plt.imshow(img_bin,cmap='gray')

fig.add_subplot(gs[0,2])
plt.title('Dilated Binarized Image with 5x5 Kernel')
plt.imshow(img_dilated,cmap='gray')

fig.add_subplot(gs[1,0])
plt.title('Histogram')
plt.plot(hist_grayscale)

fig.add_subplot(gs[1,1])
plt.title('Histogram')
plt.plot(hist_otsu)

fig.add_subplot(gs[1,2])
plt.title('Histogram')
plt.plot(hist_eroded)

plt.savefig('6.jpg')

# %%
#GRADIENT
kernel=np.ones((5,5),np.float32)
img_gradient = cv2.morphologyEx(img_bin, cv2.MORPH_GRADIENT, kernel)
plt.title('Gradient Color Image')
plt.imshow(img_gradient)
plt.savefig('7.jpg')
plt.show()
```

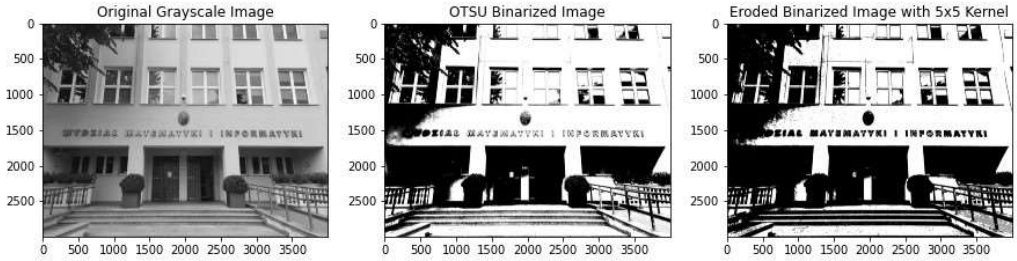
```
hist_gradient = cv2.calcHist([img_gradient], [0], None, [256], [0,256])



# %%
#GRADIENT PLOTTING

row=2
col=3

fig=plt.figure(figsize=(15,15))
gs=GridSpec(row,col)

fig.add_subplot(gs[0,0])
plt.title('Original Grayscale Image')
plt.imshow(img,cmap='gray')

fig.add_subplot(gs[0,1])
plt.title('OTSU Binarized Image')
plt.imshow(img_bin,cmap='gray')

fig.add_subplot(gs[0,2])
plt.title('Gradient Binarized Image with 5x5 Kernel')
plt.imshow(img_gradient,cmap='gray')

fig.add_subplot(gs[1,0])
plt.title('Histogram')
plt.plot(hist_grayscale)

fig.add_subplot(gs[1,1])
plt.title('Histogram')
plt.plot(hist_otsu)

fig.add_subplot(gs[1,2])
plt.title('Histogram')
plt.plot(hist_gradient)

plt.savefig('8.jpg')
```

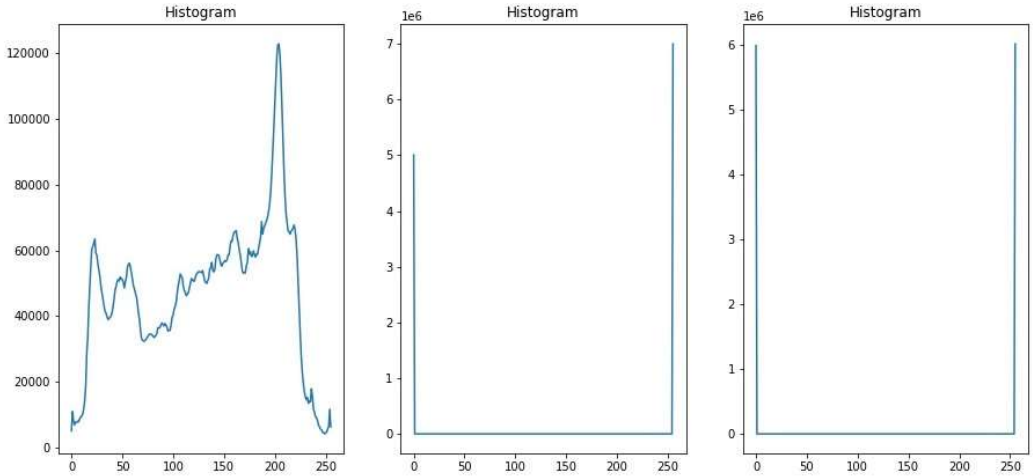
Output:

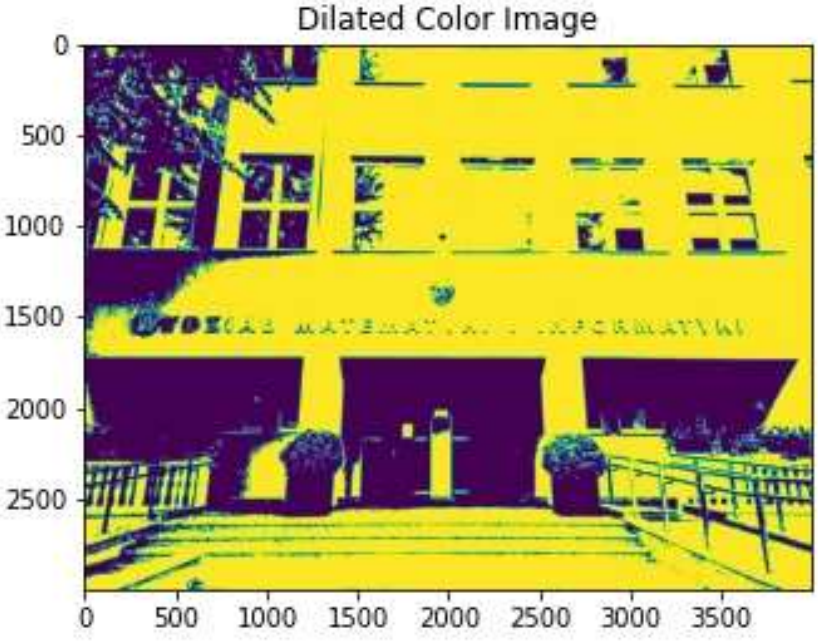

Original Image
0
500
1000
1500
2000
2500
0
500
1000
1500
2000
2500
3000
3500

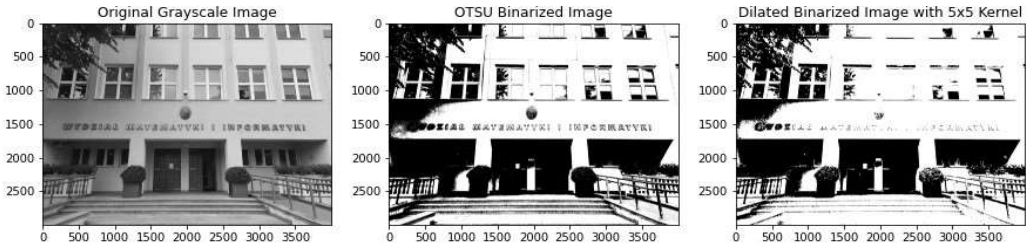

Histogram
120000
100000
80000
60000
40000
20000
0
0
50
100
150
200
250

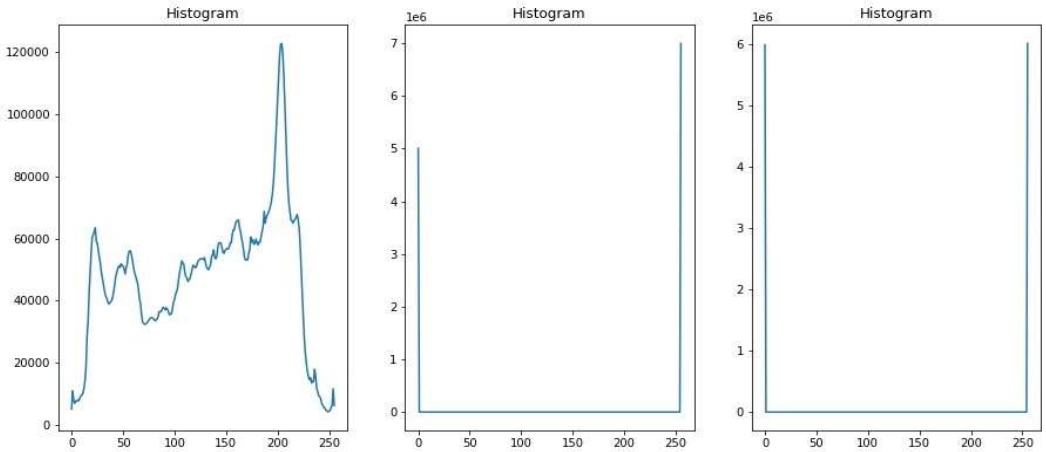

Eroded Color Image
0
500
1000
1500
2000
2500
0
500
1000
1500
2000
2500
3000
3500

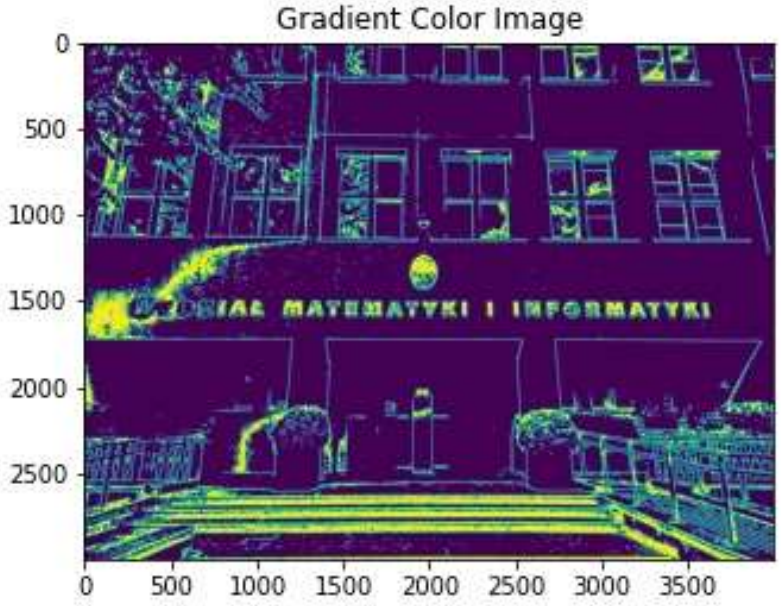

Original Grayscale Image
OTSU Binarized Image
Eroded Binarized Image with 5x5 Kernel

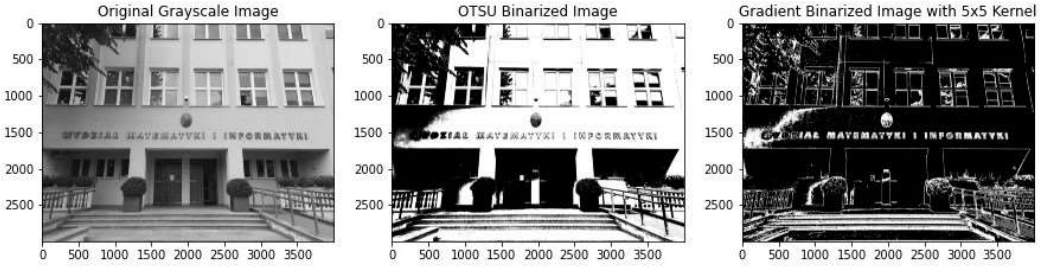

Histogram
Histogram
Histogram
1e6
1e6

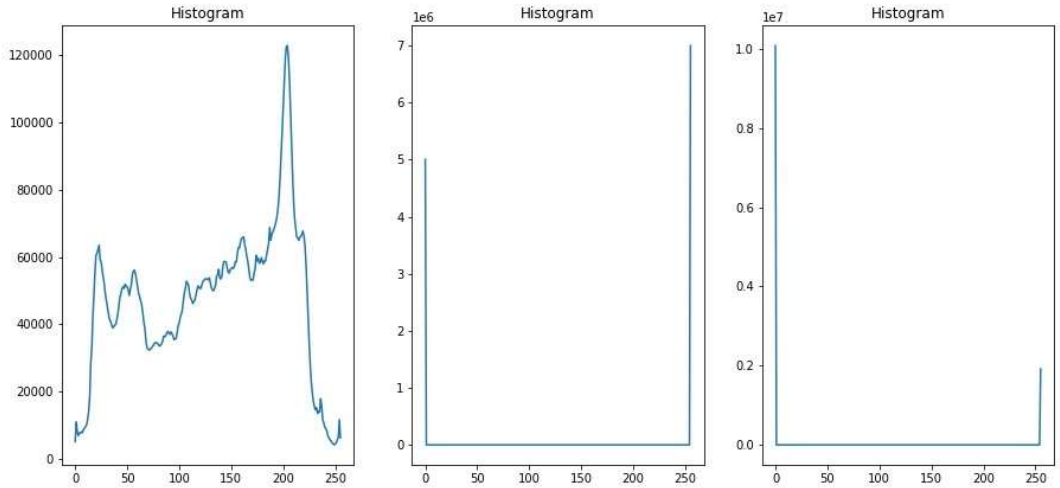

Dilated Color Image


Original Grayscale Image
OTSU Binarized Image
Dilated Binarized Image with 5x5 Kernel


Histogram
Histogram
Histogram


Gradient Color Image
0
500
1000
1500
2000
2500
0
500
1000
1500
2000
2500
3000
3500


Original Grayscale Image
OTSU Binarized Image
Gradient Binarized Image with 5x5 Kernel


Histogram
Histogram
1e6
Histogram
1e7