nguyen-trieu-vuong-20002182-lab3

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Importing libraries

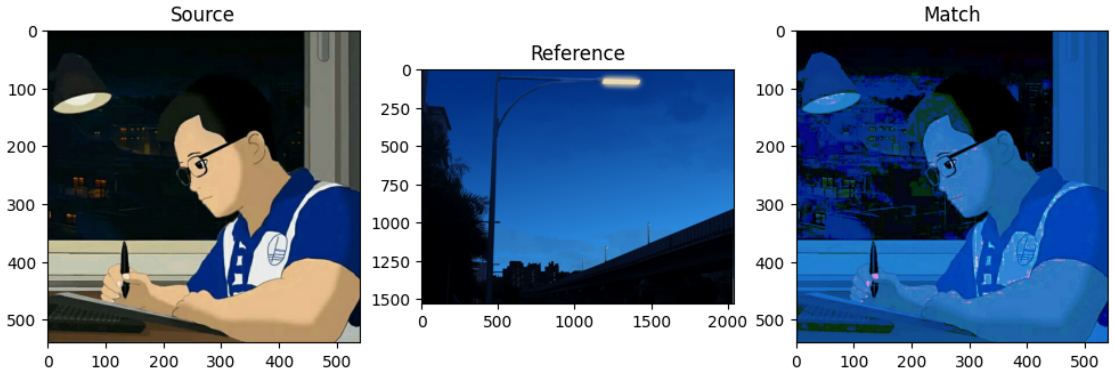
[3]:
```
import cv2
import numpy as np
from skimage import exposure
import random
import matplotlib.pyplot as plt
```

Histogram Matching

[4]:
```
src = cv2.imread("image.png")
src = cv2.cvtColor(src, cv2.COLOR_BGR2RGB)
plt.figure(figsize = (12,12))
plt.subplot(1,3,1)
plt.title("Source")
plt.imshow(src)
ref = cv2.imread("image1.png")
ref = cv2.cvtColor(ref, cv2.COLOR_BGR2RGB)
plt.subplot(1,3,2)
plt.title("Reference")
plt.imshow(ref)
multi = True if src.shape[-1]> 1 else False
matched = exposure.match_histograms (src, ref, multichannel=multi)
plt.subplot(1,3,3)
plt.title("Match")
plt.imshow(matched)
```

```
<ipython-input-4-a220249e576d>:13: FutureWarning: `multichannel` is a deprecated
argument name for `match_histograms`. It will be removed in version 1.0. Please
use `channel_axis` instead.
  matched = exposure.match_histograms (src, ref, multichannel=multi)
```

[4]:
```
<matplotlib.image.AxesImage at 0x7a421dbdff70>
```

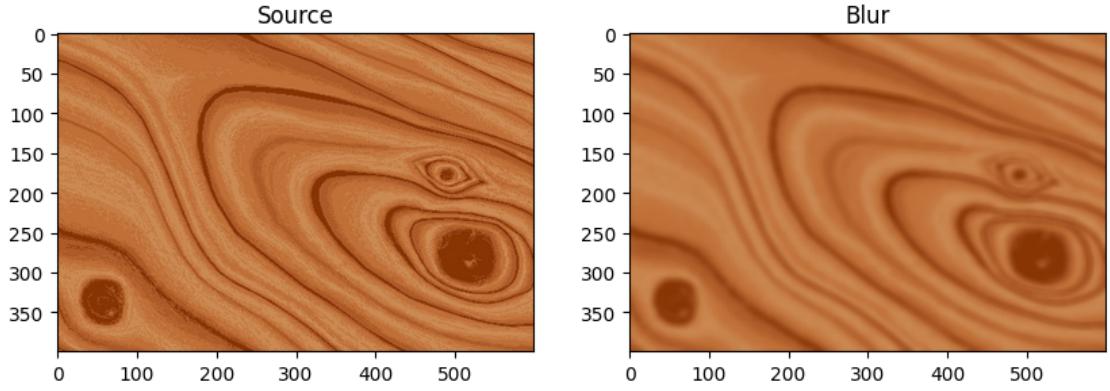


[5]:
```
img = cv2.imread("wood.png")
img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
```

BLUR

[6]:
```
img_blur = cv2.blur(img,(10,10))
plt.figure(figsize = (10,10))
plt.subplot(1,2,1)
plt.title("Source")
plt.imshow(img)
plt.subplot(1,2,2)
plt.title("Blur")
plt.imshow(img_blur)
```

[6]: <matplotlib.image.AxesImage at 0x7a41e1dfd630>

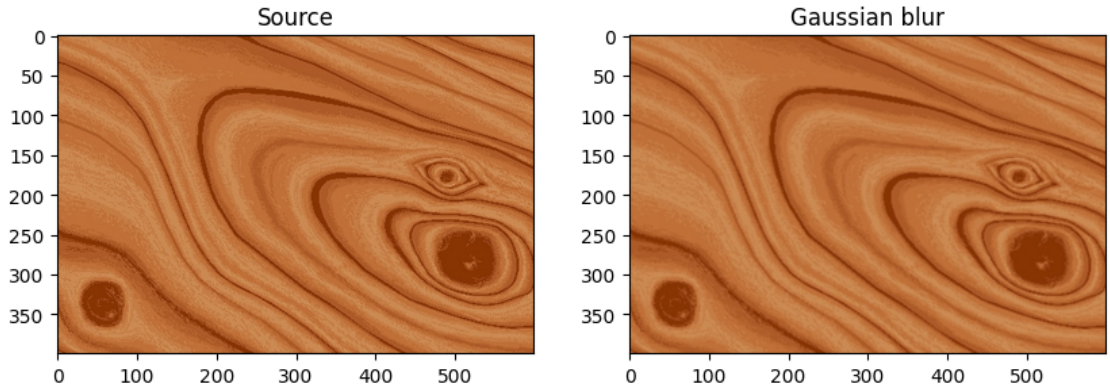


GAUSSIAN_BLUR

[7]:
```
img_gau = cv2.GaussianBlur(img,(3,3),0)
plt.figure(figsize = (10,10))
```

```
plt.subplot(1,2,1)
plt.title("Source")
plt.imshow(img)
plt.subplot(1,2,2)
plt.title("Gaussian blur")
plt.imshow(img_gau)
```

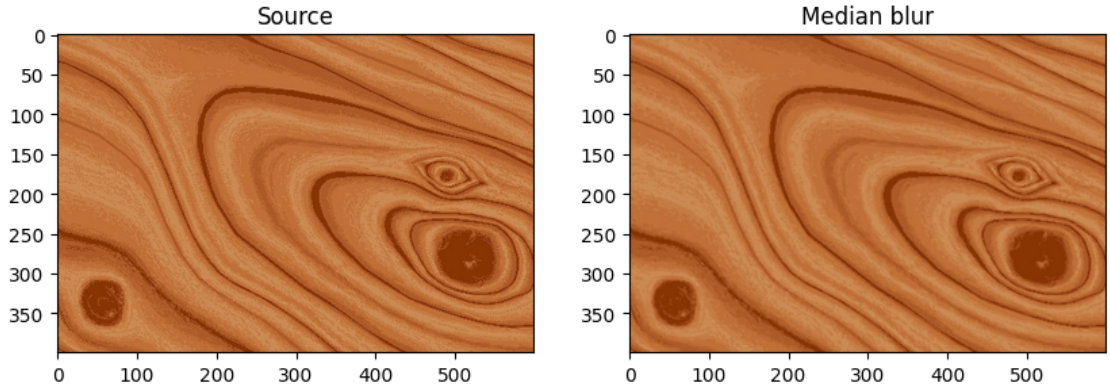
[7]: <matplotlib.image.AxesImage at 0x7a41e045e9b0>



MEDIAN_BLUR

[8]:
```
img_median = cv2.medianBlur(img,3)
plt.figure(figsize = (10,10))
plt.subplot(1,2,1)
plt.title("Source")
plt.imshow(img)
plt.subplot(1,2,2)
plt.title("Median blur")
plt.imshow(img_median)
```

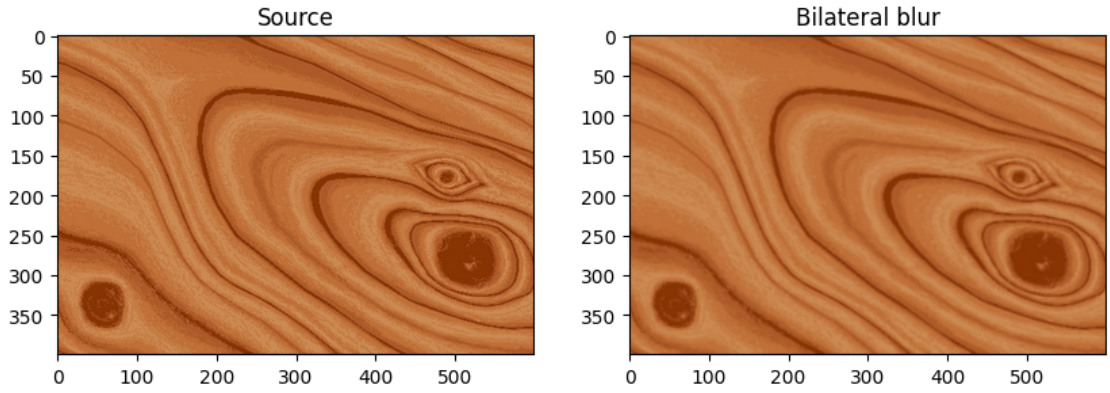
[8]: <matplotlib.image.AxesImage at 0x7a41e03d0ac0>



BILATERAL_BLUR

[9]:
```
img_bila = cv2.bilateralFilter(img,5,180,180)
plt.figure(figsize = (10,10))
plt.subplot(1,2,1)
plt.title("Source")
plt.imshow(img)
plt.subplot(1,2,2)
plt.title("Bilateral blur")
plt.imshow(img_bila)
```

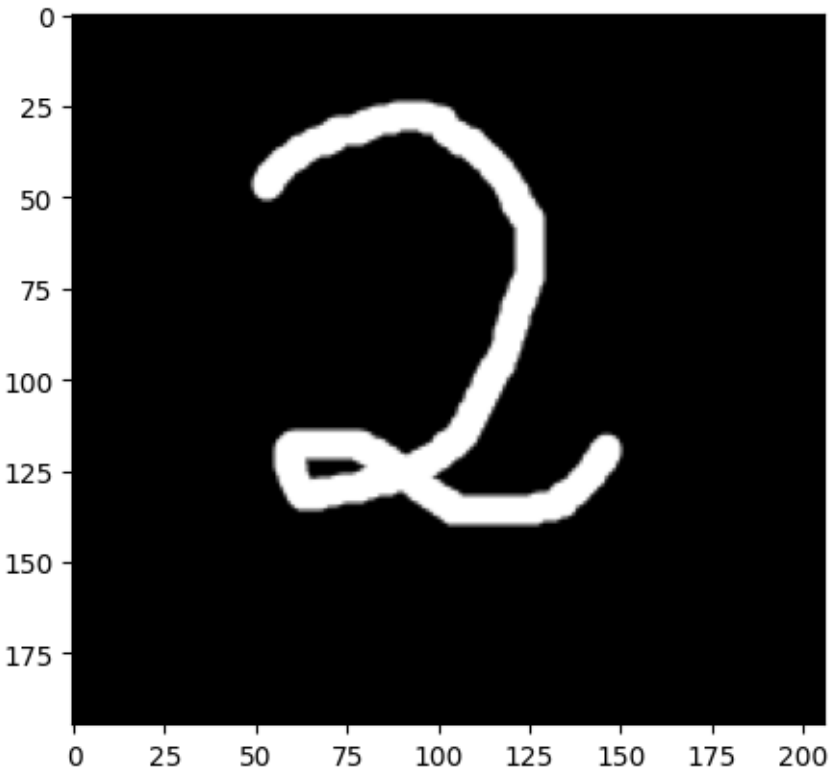
[9]:
```
<matplotlib.image.AxesImage at 0x7a41e02ca6e0>
```



Read Image, create filter

[10]:
```
img = cv2.imread('number.png')
img_gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
# plt.figure(figsize = (10, 10))
plt.imshow(img_gray, cmap = 'gray')
```

[10]:
```
<matplotlib.image.AxesImage at 0x7a41e01a4910>
```



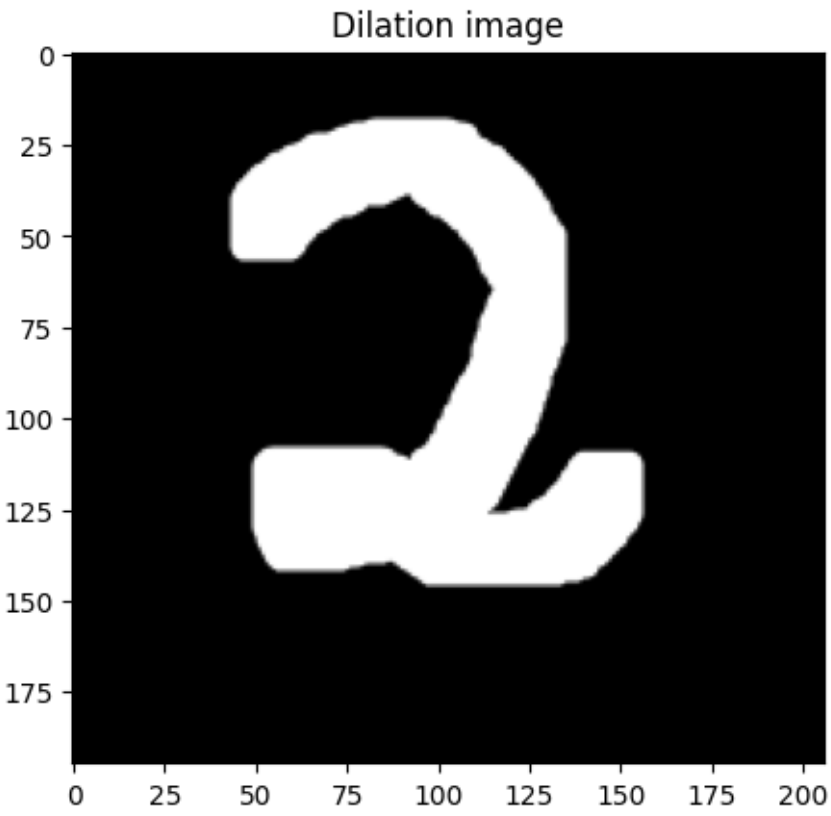
[11]:
```
kernel = np.ones((5,5),np.uint8)
print(kernel)
```

```
[[1 1 1 1 1]
 [1 1 1 1 1]
 [1 1 1 1 1]
 [1 1 1 1 1]
 [1 1 1 1 1]]
```

Dilate Image:

[12]:
```
dilation = cv2.dilate (img_gray, kernel, iterations = 3)
plt.title("Dilation image")
plt.imshow(dilation, cmap = 'gray')
```

[12]: <matplotlib.image.AxesImage at 0x7a41e01a6890>

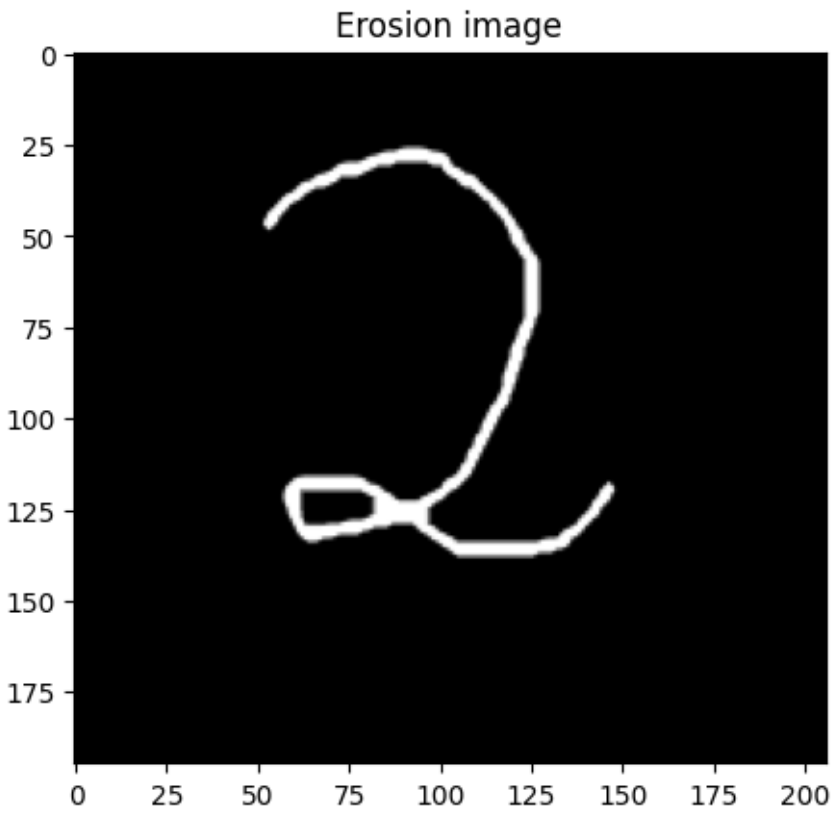


Erosion Image:

[13]:
```
erosion = cv2.erode (img_gray, kernel, iterations = 1)
print (erosion.shape)
plt.title("Erosion image")
plt.imshow(erosion, cmap = 'gray')
```

```
(195, 206)
```

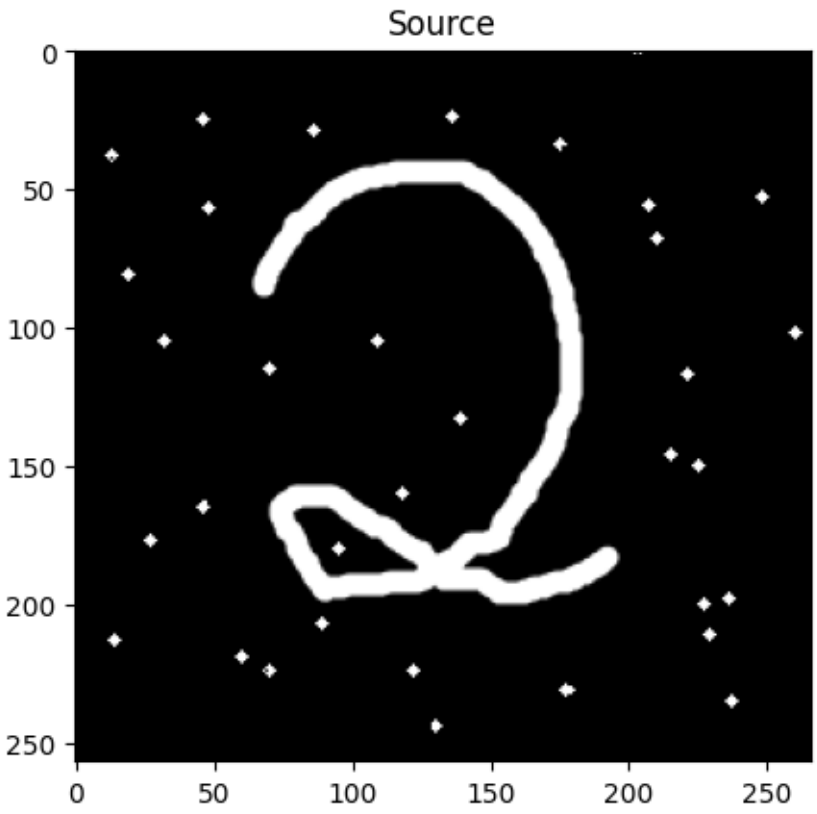
[13]:
```
<matplotlib.image.AxesImage at 0x7a41e00aad70>
```



Opening : erosion followed by dilation

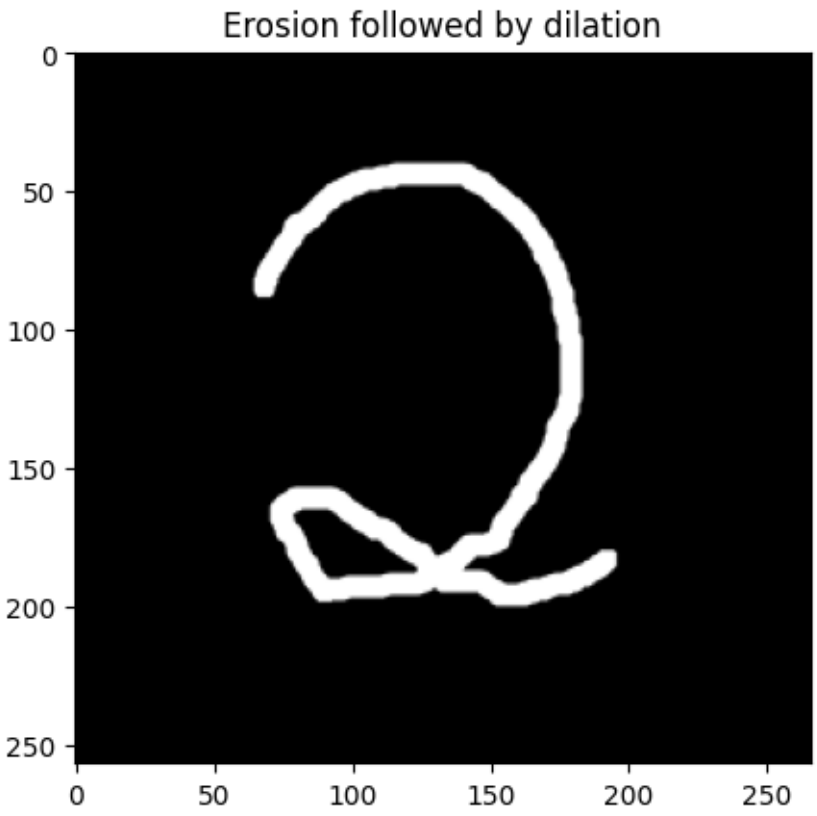
[14]:
```
img = cv2.imread('erosion.png')
img_gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
plt.title("Source")
plt.imshow(img_gray, cmap = 'gray')
```

[14]:
```
<matplotlib.image.AxesImage at 0x7a41e01335b0>
```



[15]:
```
opening = cv2.morphologyEx(img_gray, cv2.MORPH_OPEN, kernel)
plt.title("Erosion followed by dilation")
plt.imshow(opening, cmap = 'gray')
```

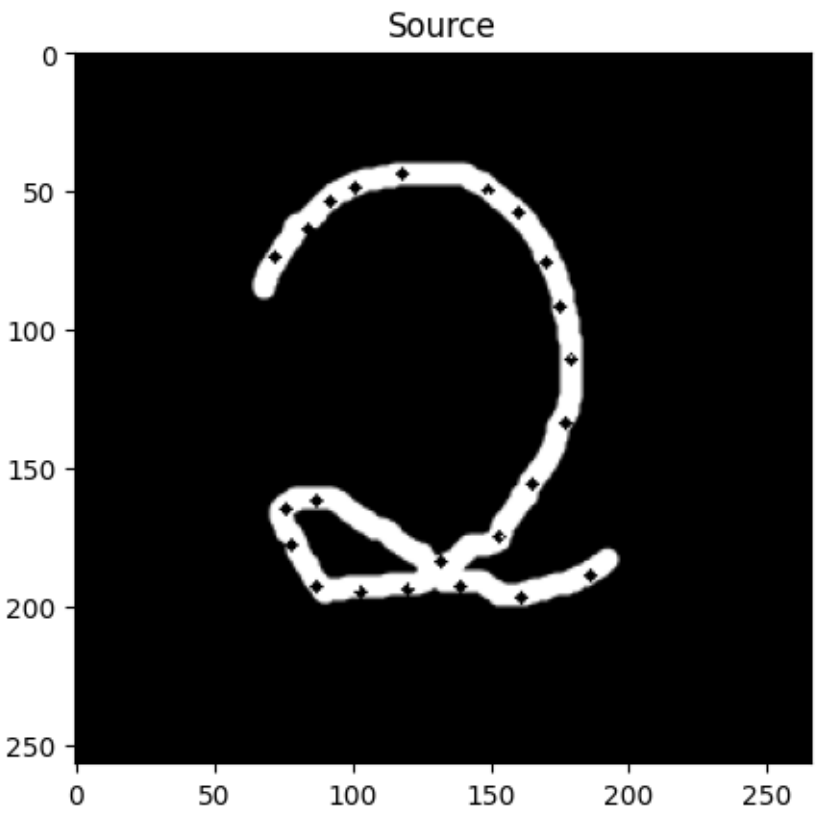
[15]: <matplotlib.image.AxesImage at 0x7a41dff76830>



Opening : dilation followed by erosion

[16]:
```
img = cv2.imread('dilation.png')
img_gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
plt.title("Source")
plt.imshow(img_gray, cmap = 'gray')
```

[16]: <matplotlib.image.AxesImage at 0x7a41dffff1f0>



[17]:
```
closing = cv2.morphologyEx(img_gray, cv2.MORPH_CLOSE, kernel)
plt.title("Dilation followed by erosion")
plt.imshow(closing, cmap = 'gray')
```

[17]: <matplotlib.image.AxesImage at 0x7a41dfe77100>

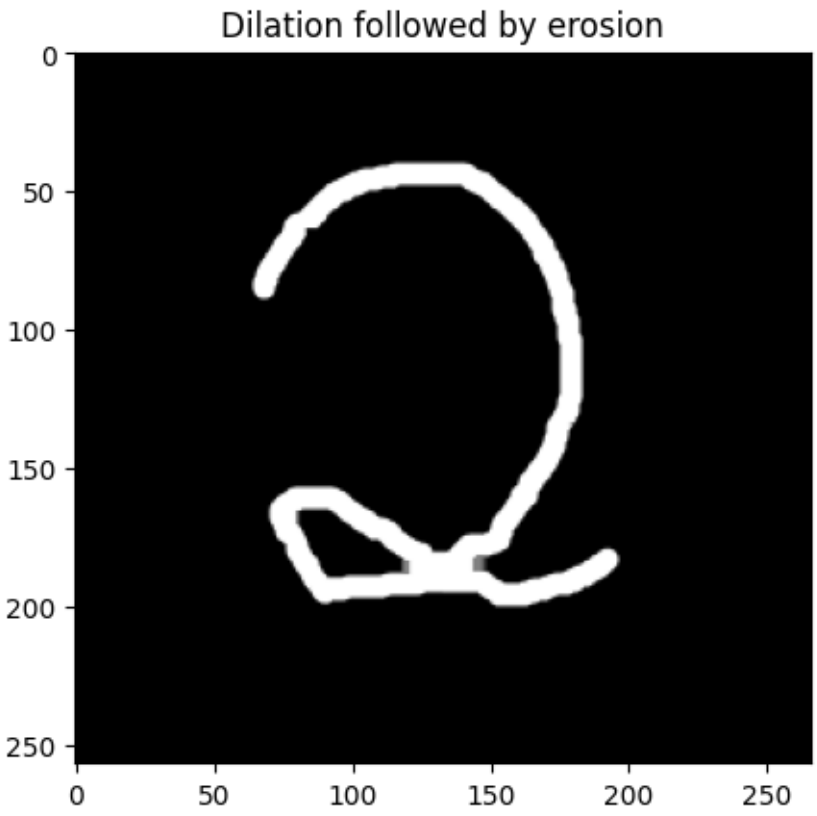


IMAGE GRADIENT:

[18]:
```
img = cv2.imread('chest.png')
img_gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
plt.title("Source turned gray")
plt.imshow(img_gray, cmap = 'gray')
```

[18]: <matplotlib.image.AxesImage at 0x7a41dfe771f0>

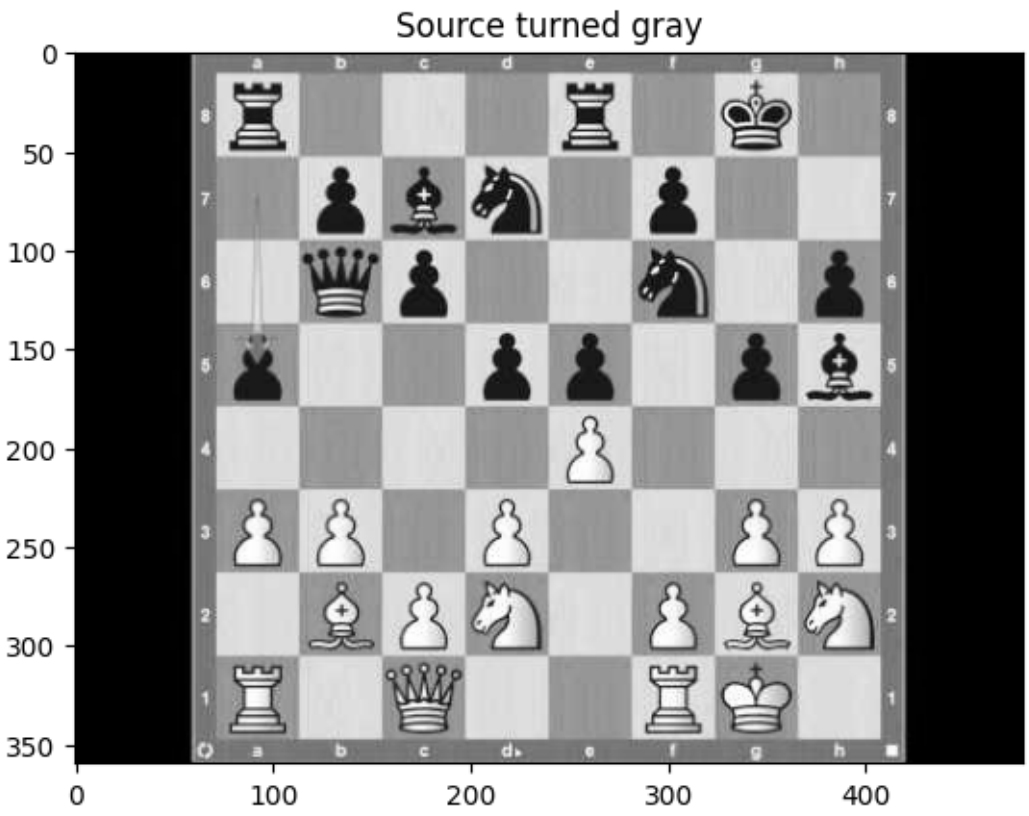


IMAGE GRADIENT: sobel x

[19]:
```
# sobel x
sobelx = cv2.Sobel (img_gray, cv2.CV_64F, 1, 0, ksize=1)
plt.title("Sobel x")
plt.imshow(sobelx, cmap = 'gray')
```

[19]: <matplotlib.image.AxesImage at 0x7a41dfeefaf0>

IMAGE GRADIENT: sobel y

[20]:
```
# sobel y
sobely = cv2.Sobel (img_gray, cv2.CV_64F, 0, 1, ksize=1)
plt.title("Sobel y")
plt.imshow(sobely, cmap = 'gray')
```

[20]: <matplotlib.image.AxesImage at 0x7a41dfded2d0>

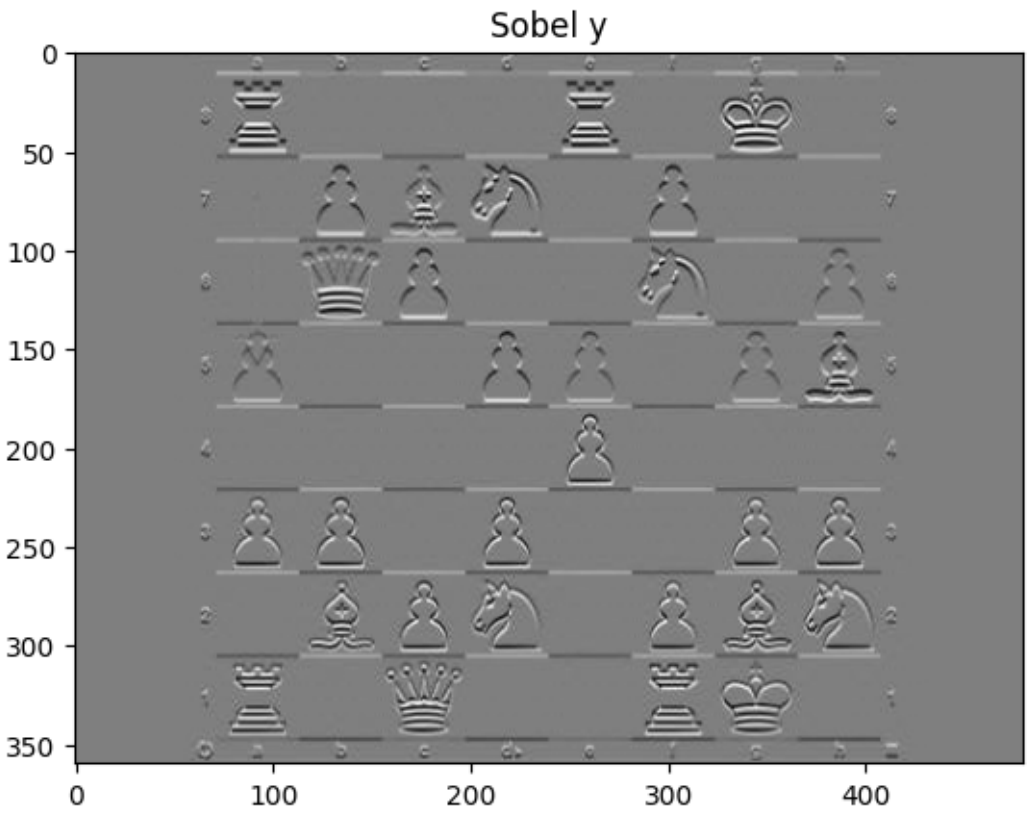


IMAGE GRADIENT: addWeight sobel_x & sobel_y

[21]:
```
# cộng logic 2 ảnh sobel 2 trục với tỷ lệ 50:50
dst = cv2.addWeighted(sobelx, 0.5, sobely, 0.5, 0.0)
plt.title("AddWeight sobel x & sobel y")
plt.imshow(dst, cmap ='gray')
print(dst.shape)
```

```
(360, 480)
```

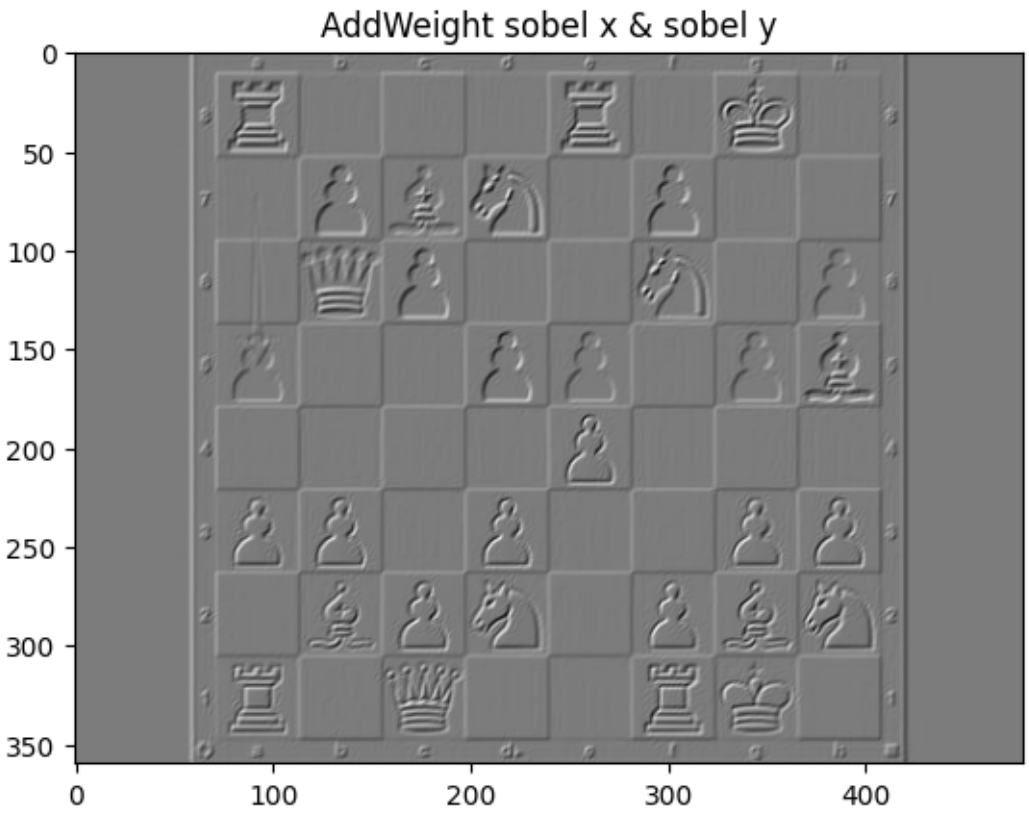
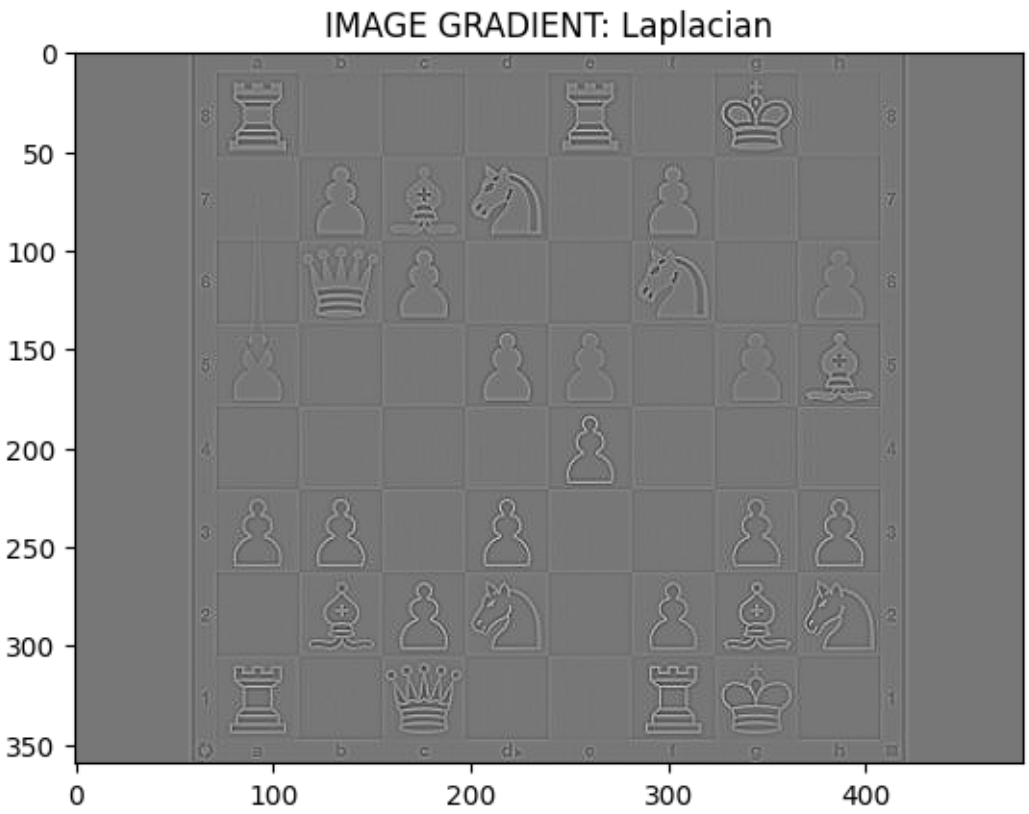


IMAGE GRADIENT: Laplacian

[22]:
```
# laplacian
laplacian = cv2.Laplacian (img_gray, cv2.CV_64F)
plt.title("IMAGE GRADIENT: Laplacian")
plt.imshow(laplacian, cmap = 'gray')
```

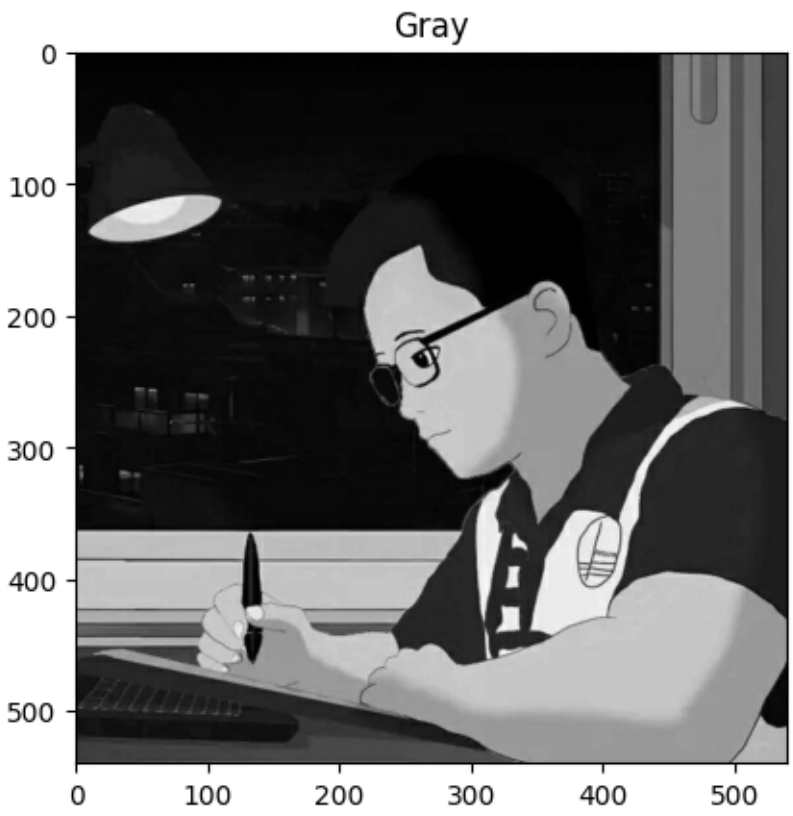
[22]:
```
<matplotlib.image.AxesImage at 0x7a41dfc61e40>
```



Sharpen Images:

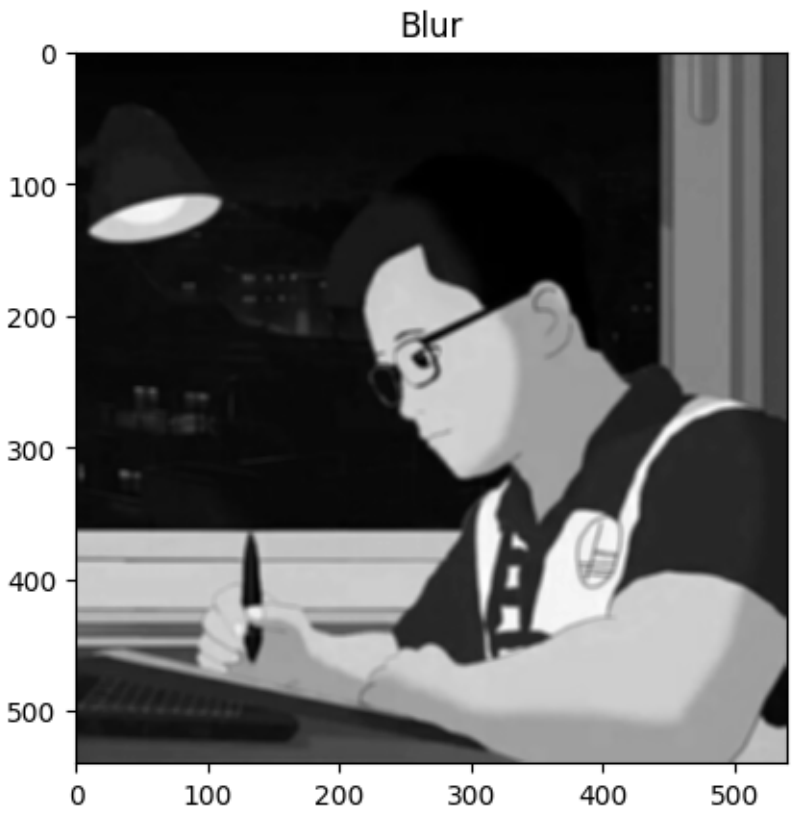
[23]:
```
img = cv2.imread("image.png")
img_gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
plt.title("Gray")
plt.imshow(img_gray, cmap='gray')
```

[23]: <matplotlib.image.AxesImage at 0x7a41dfcbdd20>



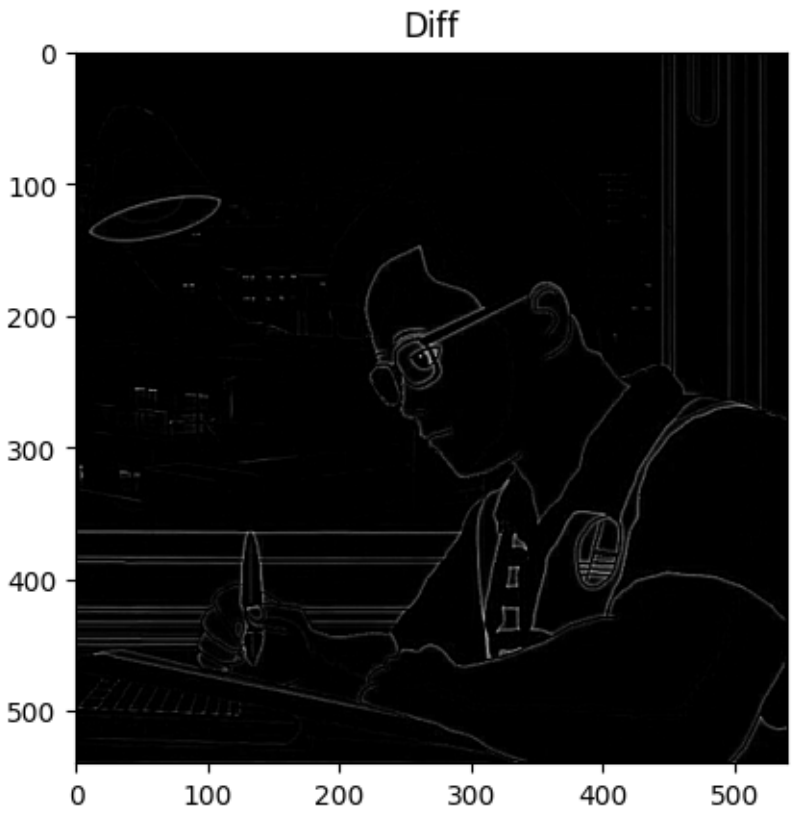
[24]:
```
# Tạo ảnh blur
img_blur = cv2.blur(img_gray,(5,5))
plt.title("Blur")
plt.imshow(img_blur, cmap='gray')
```

[24]: <matplotlib.image.AxesImage at 0x7a41dfb5e800>



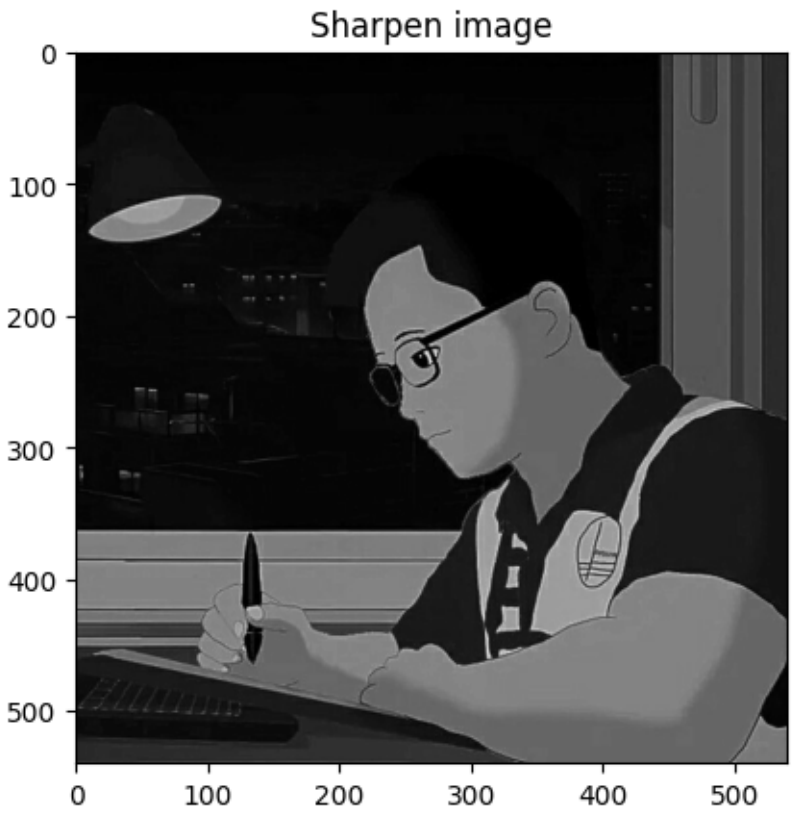
[25]:
```
# Trừ logic ảnh gray và ảnh blur
diff = cv2.subtract(img_gray, img_blur)
plt.title("Diff")
plt.imshow(diff, cmap='gray')
```

[25]: <matplotlib.image.AxesImage at 0x7a41e0150610>



[26]:
```
# Xuất ảnh cuối cùng bằng cách cộng logic giữa ảnh gray và ảnh trừ với tỷ lệ 50:
↪50
final = cv2.addWeighted(img_gray, 0.5, diff, 0.5, 0.0)
plt.title("Sharpen image")
plt.imshow(final, cmap = 'gray')
```

[26]:
```
<matplotlib.image.AxesImage at 0x7a41e043a0b0>
```



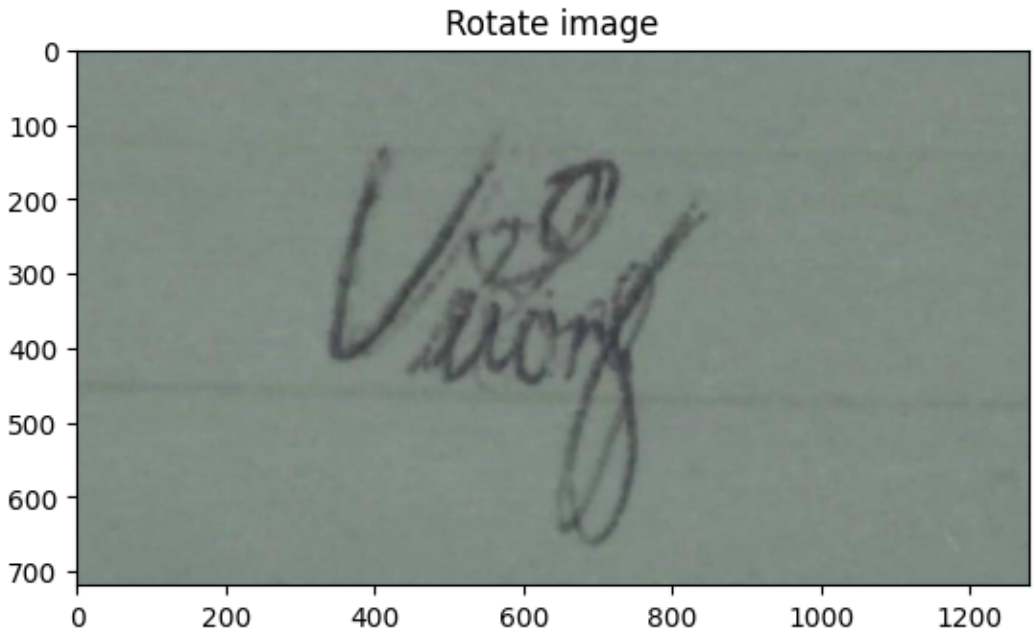
Rotate Images:

[27]:
```
img = cv2.imread('signature.png')
img_gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
```

[28]:
```
# Lấy kích thước của bức hình (h, w)
(h, w) = img.shape[:2]

# Tính toán tọa độ của điểm trung tâm (cX, cY) của bức hình
# bằng cách chia kích thước của bức hình cho 2
(cX, cY) = (w // 2, h // 2)

# Tạo ma trận biến đổi xoay (M) với tâm xoay là (cX, cY) và góc xoay ngẫu nhiên␣
 ↪trong khoảng -5 đến 5 độ
M = cv2.getRotationMatrix2D((cX, cY), random.randint(-5, 5), 1.0)

# Áp dụng ma trận biến đổi (M) để xoay bức hình (img)
rotated = cv2.warpAffine(img, M, (w, h))

# Hiển thị bức hình sau khi đã xoay
plt.title("Rotate image")
```

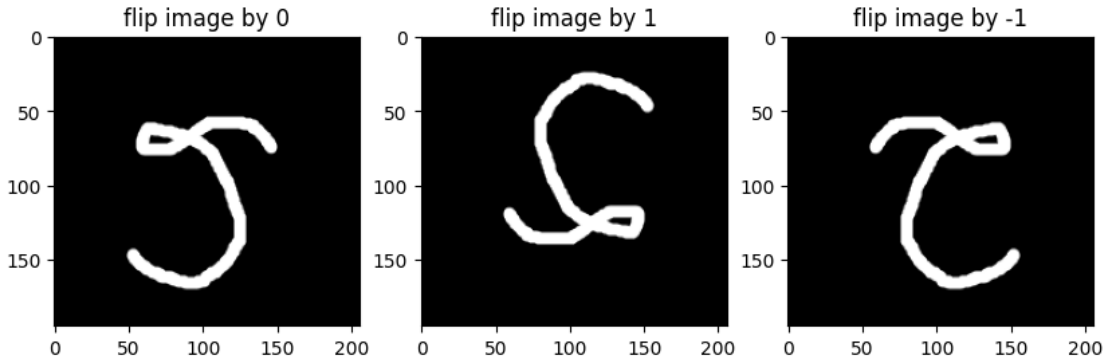
```
plt.imshow(rotated)
```

[28]: <matplotlib.image.AxesImage at 0x7a41dff3d330>



Flip Images:

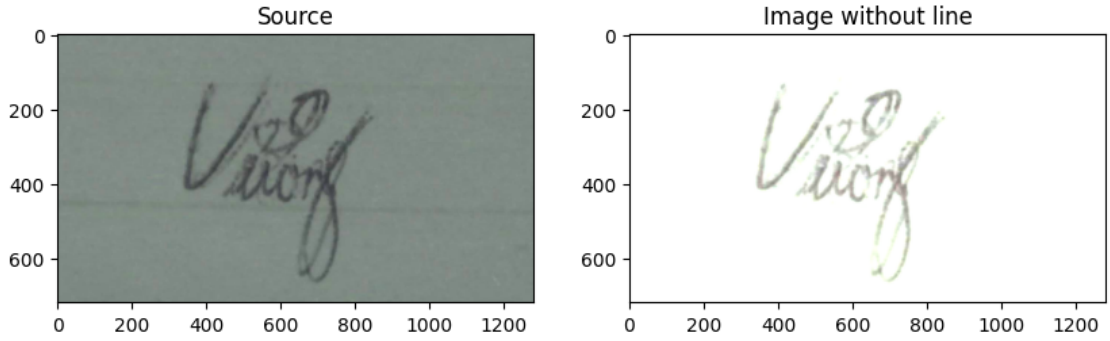
[29]:
```
img = cv2.imread('number.png')
img_gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
i=1
indice = [0,1,-1]
plt.figure(figsize = (10,10))
for index in indice:
  a = cv2.flip(img,index)
  plt.subplot(1,3,i)
  plt.title(f'flip image by {indice[i-1]}')
  plt.imshow(a)
  i+=1
```



Bonus: Chụp một bức hình có ghi tên lên trang giấy có dòng kẻ ngang. Tạo một filter của riêng mình và sử dụng cv2.filter2D để loại bỏ dòng kẻ (chỉ giữ lại chữ viết trên giấy)

[61]:
```
# Đọc ảnh từ file
image = cv2.imread('signature.png')

# Chuyển ảnh sang ảnh grayscale
rgb = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)

# Tạo một filter (kernel) để xác định dòng kẻ ngang
kernel = np.array([[0, -0.4, 0],
                   [1, 1, 1],
                   [0, -0.4, 0]])

# Áp dụng filter lên ảnh để loại bỏ dòng kẻ
filtered_image = cv2.filter2D(rgb, -1, kernel)

# Hiển thị ảnh gốc và ảnh đã xử lý
plt.figure(figsize = (10,10))
plt.subplot(1,2,1)
plt.title("Source")
plt.imshow(image)
plt.subplot(1,2,2)
plt.title("Image without line")
plt.imshow(filtered_image)
```

[61]:
```
<matplotlib.image.AxesImage at 0x7a41de816320>
```


Source
Image without line
0
200
400
600
800
1000
1200