1 Image Segmentation and Histogram Plotting for Lung X-ray Image

1.1 Introduction

In this method, we aim to segment a lung X-ray image and plot histograms for the original image, binary mask, and segmented lung region. The image segmentation is performed using morphological opening and closing operations in OpenCV library. The histograms are plotted using the matplotlib library.

1.2 Code

The following Python code is used to segment the lung region and plot histograms for the X-ray image:

```
import cv2
import numpy as np
from matplotlib import pyplot as plt

# Load the X-ray image
img = cv2.imread('CHNCXR_0621_1.png', 0)

# Threshold the image to create a binary mask
ret, mask = cv2.threshold(img, 140, 255, cv2.THRESH_BINARY_INV)

# Perform morphological opening on the mask to remove small noise
kernel = np.ones((7, 7), np.uint8)
opening = cv2.morphologyEx(mask, cv2.MORPH_OPEN, kernel)

# Perform morphological closing on the mask to fill in any holes
closing = cv2.morphologyEx(opening, cv2.MORPH_CLOSE, kernel)

# Plot histograms for each image
fig, ax = plt.subplots(2, 3, figsize=(12, 8))

# Plot histogram for original image
ax[0, 0].imshow(img, cmap='gray')
ax[0, 0].set_title('Original Image')
ax[1, 0].hist(img.ravel(), 256, [0, 256])
ax[1, 0].set_title('Histogram')

# Plot histogram for binary mask
ax[0, 1].imshow(mask, cmap='gray')
ax[0, 1].set_title('Binary Mask')
ax[1, 1].hist(mask.ravel(), 256, [0, 256])
ax[1, 1].set_title('Histogram')

# Plot histogram for segmented lung
ax[0, 2].imshow(closing, cmap='gray')
ax[0, 2].set_title('Segmented Lung')
ax[1, 2].hist(closing.ravel(), 256, [0, 256])
ax[1, 2].set_title('Histogram')

plt.show()
plt.savefig('obs.png')
```

1.3 Results

The code produces a set of subplots, where the top row shows the X-ray image, binary mask, and segmented lung region, respectively, and the bottom row shows the corresponding histograms. The resulting image and histograms are saved as a PNG file named "obs.png". The segmentation of the lung region helps to isolate the area of interest and makes it easier to identify any abnormalities or diseases present in the image.

1.4 Conclusion

In this method, we have demonstrated how to use morphological opening and closing operations in OpenCV library to segment a lung X-ray image and plot histograms for the original image, binary mask, and segmented lung region. This method can be used to preprocess X-ray images and prepare them for further analysis or diagnosis.