Indian Institute of Technology Delhi

COL 780 (Computer Practices)

Assignment 1

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Methods Used

First Converted the image to Gray Scale Image and then used Median and Gaussian Filter to smoothen the Image. After smoothening the Image use Adaptive Threshold to find the masks. Erode and Dilate the threshold Image to remove the noise while maintaining the figures. Find the List of Closed Contours for this thresholds Image. From these contours select the one which can best represent the Gall Bladder by having conditions on Contour Area and location of centroid. Fill the above selected Contour. Dilate the Image to make up for the thinning of the Gall Bladder .
Average IOU Score :- 0.8422205917959644

Things tried

Histogram Equalization

In this implementation I tried doing Histogram Equalization so that the contrast between the Gall Bladder and other part become more clear. But with the contrast getting clear I was getting some extra contours also which was overall decreasing the IOU score by detecting the wrong regions. The IOU score was good but the precision was very less that's why I changes the solution.

Smoothing of Image

Instead of using only Median and Gaussian Blurs, I tried all the possible combination of Mean,Median,Gaussian and Bilateral Filters of different Sizes to get the best threshold masks and judged the quality of filter on the basis of Image that I get after threshold masks.

Edge Detection

For Edge Detection I tried three techniques:

1) Laplacian Edge Detector

Initially for the Edge Detection I used the Laplacian Edge Detector but all the Edges were not getting Detected Properly.

2) Threshold

In this I tried to find the mask of the Image using threshold function by specifying the low and high threshold from fine tuning and then finding contours on this Image. The results were satisfactory but it was not able to detect the Gall Bladder all the time

3) Gaussian Adaptive Threshold

In this method instead of using Mean Adaptive Threshold I used Gaussian Adaptive Threshold to find the mask. Some extra patches were being detected and if used High Smoothing before then the Gall Bladder gets decrease in Area. Hence there was a trade off between getting removing the extra Patches in mask and maintain the full area of Bladder.

Miscellaneous

1) Morphological(Opening)

After getting the Mask of the Image to remove the Noise I used the cv2.morphologyEx(). Although the Results should have been same if used Opening or do Erosion followed by Dilation, I preferred the Latter one.

2) Final Image Dilation

As we have done heavy smoothening of the original Image the Bladder we get is smaller that the original Bladder. To compensate for that the final image is dilated to make up for that Loss.

Validation Score

IoU for image 0000.jpg = 0.8452
IoU for image 0001.jpg = 0.9040
IoU for image 0002.jpg = 0.8658
IoU for image 0003.jpg = 0.7929
IoU for image 0004.jpg = 0.8823
IoU for image 0005.jpg = 0.7494
IoU for image 0006.jpg = 0.8712
IoU for image 0007.jpg = 0.8701
IoU for image 0008.jpg = 0.8471
IoU for image 0009.jpg = 0.7937
Average IoU = 0.8422205917959644

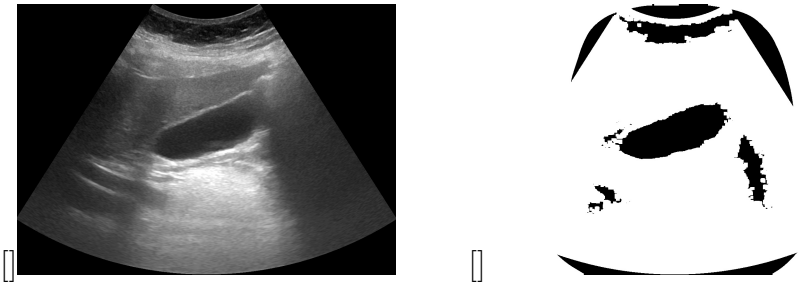

Figure 1: Original Image and Adaptive threshold Image

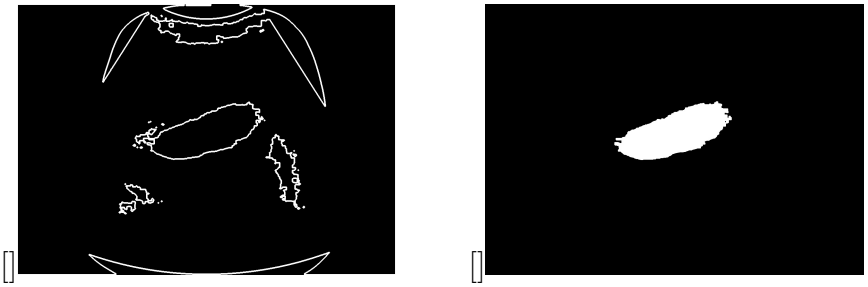

Figure 2: After finding Contours in the Threshold Image and Final Mask

Snapshots