Performance Evaluation of Different Segmentation Techniques in Medical Imaging

Abstract:

Image segmentation techniques is very crucial in terms of medical image processing. Accurate segmentation can reduce the risk of false diagnosis of a disease. Therefore, medical image segmentation is gaining great interest in the medical image processing and other real-life applications. Several segmentation approaches are considered in different research articles and the idea is to develop the performance and to find out the accurate organs or pixels that are of interest in terms of diagnosis. Choosing an appropriate and accurate segmentation techniques can give a doctor huge confidence as it is considering an automatic image analysis procedure to detect the object or portion of the image. In this paper, different medical image segmentation techniques are used to detect small portions from brain MR image for confirming the occurrences of brain tumor in the image.

Problem Statement:

The idea is to find out the specific portions of the image by considering the white pixels of the image. To identify the pixels several segmentation techniques can be considered in terms of medical image analysis like MRI, CT scans, etc. Accurate segmentation can increase the performance of detecting and diagnosis of a disease. Performance comparison of the different segmentation techniques by using brain MR image dataset is used in this project.

Approach:

Image segmentation consider several techniques to find out the specific segment of an image where each segmentation approach come up with its own features. The techniques can be categorized as three different parts like edge-based, region-based and pixel-based. In this project, different segmentation approaches are used for brain image analysis and segmentation. The following steps I have followed to find out the white pixels of the brain MR image by applying segmentation techniques:

- Read a brain MR image from database
- Convert the brain MRI RGB image to Gray scale image
- Median filtering approach is considered to filter certain portion of the brain image
- Edge detection and thresholding approach is observed
- Background and foreground detection are applied based on morphological operation
- Erosion and dilation of the image is performed
- Apply watershed segmentation techniques for brain MR image
- Apply canny edge detection segmentation techniques for brain MR image
- Apply k-means segmentation techniques for brain MR image

- Deep convolutional neural network is use for segmentation purpose for lung nodule detection from lung cancer image.

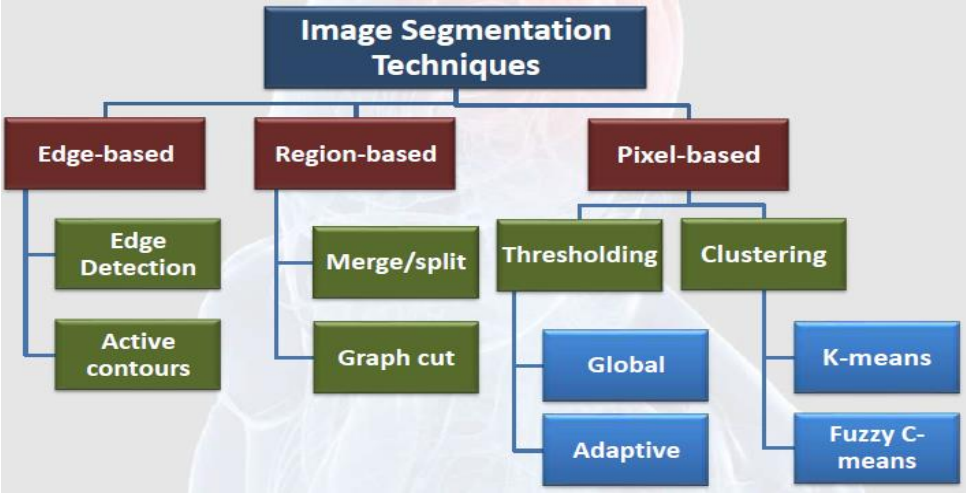

Fig.1: Image Segmentation Techniques

Results:

In this work, we have demonstrated the perfomance comaprison of different segmenation techniques for biomedical image analysis like brain MRI and lung CT scan images. By considering the biomedical image of brain and lung from MRI and CT scans and applying different segmentation techniques mentioned above, we found the following results:

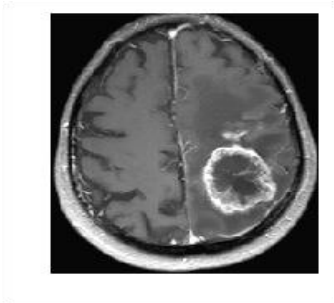

Fig.2: Brain MR image

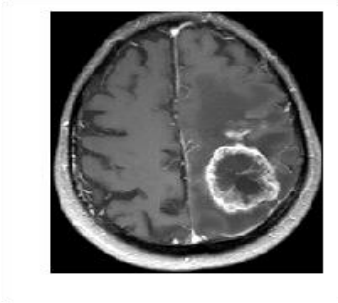

Fig.3: Grayscale Conversion

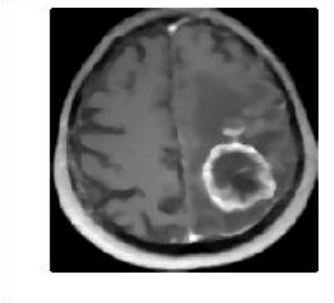

Fig.4: Median Filtering

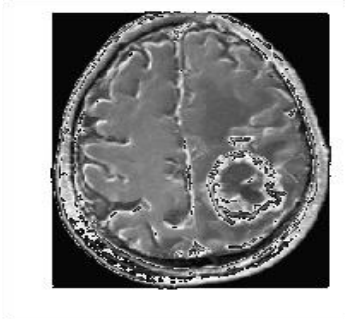

Fig.5: Edge Detection

Fig.6: Threshoding

Fig.7: Background & Foreground Detection

Fig.8: Dialation and

Fig.9: Watershed segmentation

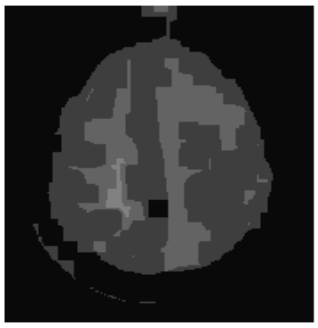

Fig.10: K-means clustering

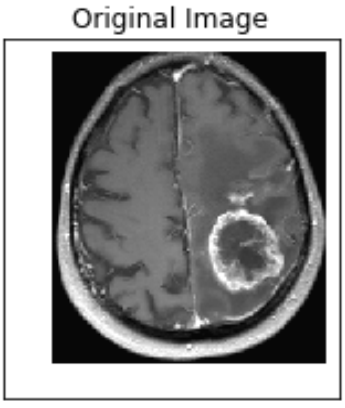

Fig.11: Canny Edge Detection

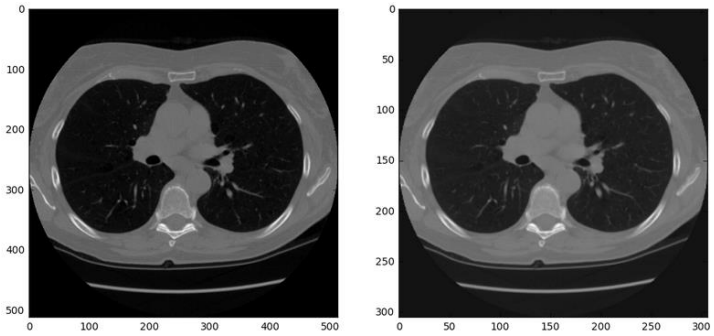

Fig.12: Lung Cancer Image Dataset

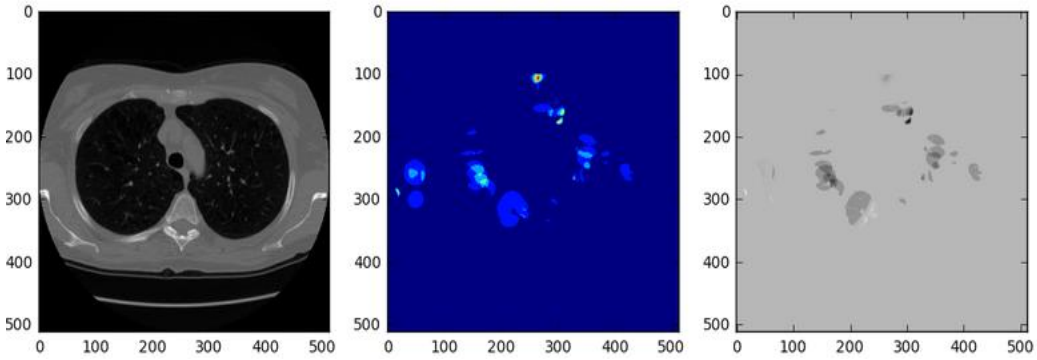

Fig.13: Lung Cancer Segmentaion using CNN and heatmap

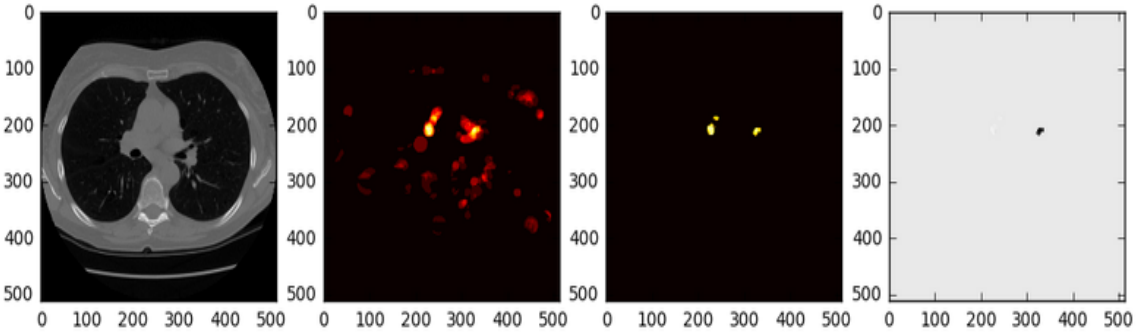

Fig.14: Lung Cancer Predicted output using Deep Learning

References:

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GitHub link: Performance evaluation of different segmentation techniques in medical imaging has been uploaded in the following link:

https://github.com/kamrul3000/CV_8980_Team-6/