**Automatic lung segmentation based on Graph**

**Cut using a distance-constrained energy**

**Abstract:**

Lung segmentation serves to ensure that all the parts of the lungs are considered during pulmonary image analysis by isolating the lung from the surrounding anatomy in the image. Research has shown that computed tomography (CT) images greatly improve the accuracy of the diagnosis obtained by a physician for lung cancer detection. Therefore, inspired by the success of Graph Cut in image segmentation and given those manual methods of analysing CT images are tedious and time consuming, an automatic segmentation method based on Graph Cut is proposed which makes use of a distance-constrained energy (DCE). Graph Cut produces globally optimal solutions by modelling the image data and spatial relationship among the pixels. However, several anatomical regions in the thoracic CT image have pixel intensity values similar to the lungs, leading to results where the lung tissue and all these regions are included in the segmentation result. The global energy function is, therefore, further constrained by using the distance of pixels from a coarsely segmented region of the CT image containing the lungs. The proposed method, utilising the DCE function, shows significant improvement over using the unconstrained energy function in segmenting the lungs from the CT images using Graph Cut.

**Existing System**

That lung cancer is one of the major causes of worldwide death , early detection increases the chances of reducing mortality through early medical intervention. However, advances in CT technology resulting in faster acquisition time and clearer images have also led to *data explosion* [6] meaning that physicians have a lot of images to analyze before making diagnosis for each patient. Lung segmentation is usually treated as a binary labeling problem where the lung and non-lung pixels are to be separated into their respective classes due to the contrast created by the dark lungs and the bright surrounding structures in a CT image which has inspired several thresholding-based segmentation methods.

**Disadvantages**

Manual analysis, therefore, becomes laborious and time-consuming leading to fatigue and reduced attention span which can adversely affect the physicians diagnosis

The drawback of thresholding is the dependence on the pixel information to perform segmentation.

**Proposed Work**

In this work, an automatic segmentation framework based on Graph Cut which makes use of a distance-constrained energy (DCE) function to produce topological restrained solutions is presented. This energy is so-called because it includes an additional term to penalise pixels based on their Euclidean distance from a coarsely estimated region containing the lungs. This term ensures that labels are assigned only to the pixels of the lung even in the presence of other anatomical regions with similar appearance model to the lung. The Euclidean distance has been specified to make it clear that the ‘distance’ referred to in this work is the distance between two points, and not distance as a measure of dissimilarity between two regions. Therefore, any metric which measures the distance between points or regions can be used. The contribution of this work is the creation of an automatic method of segmenting the lungs using Graph Cut which produces topographically constrained solutions to accurately identify the lungs in a CT image

**Advantages**

**Conclusion**

This paper put forward an automatic lung segmentation algorithm based on Graph Cut. The novelty of this work lies in the creation of a Graph Cut framework which produces unconstrained solutions which is done by including an additional term to constrain the solution based on the distance of pixels from roughly estimated locations of the lungs. The performance of the proposed method has been directly compared to the performance of the framework, to show the effect of the inclusion of the additional term and the performance of the segmentation framework. The proposed framework was tested on CT images from two publicly available Lung Cancer databases to show its ability to segment images acquired under different conditions. Due to the differences in experimental setup among the methods in the literature, an indirect comparison was made with other methods in literature. With the results obtained in this work, future endeavor will involve incorporating the segmentation framework into a CAD system for lung cancer detection.