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Lung tumor segmentation algorithm

Selin Uzelaltinbulat[a], Buse Ugur[b]*

[a]Computer Engineering Department, Near East University, POBOX:99138, Nicosia, North Cyprus, Mersin 10, Turkey
[b]Biomedical Engineering Department, Near East University, POBOX:99138, Nicosia, North Cyprus, Mersin 10, Turkey

Abstract

This paper is a development of an algorithm based medical image processing to segment the lung tumor in CT images due to the lack of such algorithms and approaches used to detect tumor where most of researches involve machine learning to solve such segmentation problem. The work involves different image processing tools which successfully achieved the required goals when combined and successively applied. The segmentation system comprises of different stages to finally reach its target which is to segment the lung tumor. Image pre-processing takes place first where some enhancement techniques are used to enhance and reduce noise in images. The next stage is where the different parts in the images are seperated to be able to segment the tumor in later stages. In this phase threshold was selected automatically which assures the right selection of all images since the tumor have different gray-levels intensities in each image. Another technique was also used here to remove the tumor from the thresholded image. Finally, the lung tumor is accurately segmented by subtracting the thresholded and the other image.

1. Introduction

The lungs are the parts of our body that we use to breathe. They supply oxygen to the organs and tissues of the body. The lungs are divided into areas called lobes. The right lung has three lobes and the left lung has two. Lung cancer is the type of cancer which unchecks the growth of unusual cells either in one or in both the lungs. These anomalous cells do not perform the functions of healthy human cells and do not mature into normal cells. This

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* Corresponding author. Tel.: +90-533-862-9324.
  E-mail address:buse.ugur@neu.edu.tr

abnormality affects the proper regular functioning of the lung of supplying oxygen to the human body through blood. All though there are many advances in treatment procedures, the lung cancer which is at an advanced stage or late stage is not often easily curable Pataer et al. (2012).

There are two main types of primary lung cancer which one is known as the most common type, Non-small cell lung cancer (NSCLC) and the other one is Small cell lung cancer (SCLC) .The treatment of these two types of lung cancers is quite different as they behave in different ways and respond to treatments differently. The most common known of lung tumor is non-small cell lung cancer (NSCLC), as one of genuine ailments bringing on death for human beings. Computer-aided diagnosis and survival prediction of NSCLC is of great sign of cancer in diagnosis and treatment of people suffering from lung cancer Wang et al. (2014). The prognosis of lung malignancy is poor, in many nations only 10 percent of survival rate for about five-year. Two major types of NSCLC are adenocarcinoma which is about 40% and squamous cell carcinoma about 25 - 30% Wang et al. (2014). This study is a development of an image processing algorithm for accurate segmentation of the lung tumor.

The developed approach is purely image processing where it uses different image preparing tools to reach its target: lung tumor segmentation. The segmentation system can be mainly divided into three main stages. During the first stage, the CT images are smoothed and enhanced using some image enhancement techniques such as median filtering and image erosion. This helps in reducing the noise in an image and clearly smoothes its edges. Secondly, the image is to be partitioned so that each part of it is separated from the other. This is achieved by using thresholding which eliminated the intensities which are lower than an automatically selected threshold. As a result of thresholding, an image of tumor and clavicles is remained. The thresholded image also undergoes a technique which helps in removing all parts in the image keeping only the tumor. The third part of the segmentation system is to extract the tumor by subtracting the thresholded image from the cleaned image which results in an image that contains only a tumor. Experimentally, the system is tested using many tumor and non-tumor lung images it outperforms the related systems listed in the state of art Chen and Chen (2009).

2. The proposed system

In this study, a Lung Tumor Segmentation System is designed. The system is a model which found in image processing that combines different image processing techniques to accomplish its goal that is the segmentation of the lung tumors placed into the lung and segment them on the original image using threshold.

Lung Tumor Segmentation System is based upon different image processing techniques used for segmenting the lung tumor into a lung. The lung image database is an on-line CT image dataset available for the researchers in the field of digital image processing. Firstly, removing the noise from images, erosion and median filter are applied to the system respectively. Afterwards, thresholding is applied to the filtered image which is one of the most common techniques used in CT images. Threshold value is a specific value that turns a grayscale image into a binary image due to thresholding method. Then, binary areas are opened to remove small objects from threshold images. In last method, in order to create tumor cells alone, difference between filtered image and small objects removed from the images are taken into account.