Volume 5, Issue 2, February 2015 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Tuberculosis Screening Using Graph Cut and Cavity Segmentation for Chest Radiographs

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Abstract-Tuberculosis is one of the most health problem in this world. It mainly affects in lungs The symptoms of Tbs may vary depending on what type of tuberculosis may occur. The starting stage of disease may be symptom free, it is inactive stage. In active stage, some symptoms like slight fever , night sweat, weight loss, and fatigue will appear. In this paper we present graph cut and cavity segmentation for chest radiographs. Graph cut segmentation is used in two stages that is lung shape model calculation and lung boundary detection. cavity segmentation is mainly used in where the TB is particularly affected in lungs. Cavity segmentation used in hessian features and contour segmentation.

Index term- segmentation, classification, chest radiographs, graph cut, cavity.

I. Introduction

Tuberculosis (TB) is the second most common cause of death from an infectious disease worldwide, according to HIV, with a mortality rate of over 1.2 million people in 2010 [1]. TB is an infectious disease. By the bacillus Mycobacterium tuberculosis caused the lung usually It spreads through the air when people with active TB distribute coughing, sneezing or otherwise infectious bacteria Automated detection and segmentation of cavities is a less explored research area. Shen et al. [4] proposed a detection system for cavities in chest radiographs for screening of TB. Their system is based on a supervised learning approach in which candidates are segmented using a mean shift segmentation technique with adaptive thresholding for initial contour placement followed by segmentation using a snake model. Segmented candidates are then classified as cavity or non cavity candidate using Bayesian classifier trained on gradient inverse coefficient of variation and circularity measure features. The technique was tested on only 16 cavity chest radiographs. Threshold on Tanimoto overlapping measure has been used to classify detected cavity regions as true or false positives. The accuracy of contour segmentation of cavities has not been mentioned in the work . Xu et al. [6] proposed cavity segmentation based on an improved edge-based fluid vector flow snake model. This was validated on 20 chest radiographs and resulted in a Jaccard overlapping degree of 68.8%. In clinical studies, the cure rates of over 90% have been documented [1]. Unfortunately, the diagnosis of TB is still a major challenge. The definitive test for TB is the identification of Mycobacterium tuberculosis in a clinical sputum sample or pus, which is the current gold standard [3], [2]. However, it may take several months to identify these slow-growing organism in the laboratory. Another technique is sputum smear microscopy, in which bacteria in sputum samples are observed under a microscope. This technique was developed more than 100 years ago [1]. In addition, to determine multiple skin tests on the immune response, whether an individual is contracted TB available. Skin tests are not always reliable. The latest development for the detection of molecular diagnostic tests is that are fast and accurate, and are highly sensitive and specific. However, further financial support for these tests to be required commonplace [1], [3], [2]. In this paper, we present an automated approach to detect TB manifestations in chest radiographs (CXRS), based on our previous work in lung segmentation and lung disease classification [4], [5], [6]. An automated approach to reading X-ray allows mass screening of large populations that are not managed manually. A postero anterior radiograph (x-ray) of a patient's chest is a mandatory part of every evaluation for TB [7]. The chest radiograph includes all breast anatomy and provides a high yield due to the low cost and hand. [8] Therefore, it would be an important step towards more powerful TB diagnostic products radiographs reliable screening system for TB detection. HIV and TB co-infections are very common due to the weakening of the immune system. It is therefore important, in order to identify patients with TB infections, not only to cure the TB infection itself, but also to avoid drug incompatibilities. Medical personnel with little background Radiology need to be able to operate the screening system. The target platform for our automated system, portable X-ray scanner to allow the screening of large parts of the population in rural areas. At-risk individuals are recognized by our system then referred to a large hospital for treatment.

II. Related Work

Evidence of lung regions in the chest X-ray images is an important step in the computer-aided diagnosis applications such as tuberculosis or lung disease screening. One of the important first steps of the system is to accurately determine the lung regions in chest radiographs. In this paper, we present a graph-cut based robust lungs detection system developed for this project. Processing of X-ray images of the breast poses some challenges. For example, for lung segmentation, the strong edges on the chest and collarbone region cause local minima for most minimization approaches. Segmentation of the lung apex is also a non-trivial problem because of varying intensity collarbone. Other challenges include the segmentation of small costophrenic angle so that adjustments to the anatomical shape variations such as different cardiac dimensions or other pathology, and X-ray imaging proved inhomogeneities [12] .The use of image processing techniques and computer aided diagnosis (CAD) has proven to be effective for the improvement of the radiologist diagnosis, in particular in the case of lung nodule detection. In this paper we describe a method for processing postero anterior chest radiographs, the segments of the lung field and a number of nodule candidate regions with low thickness and a high sensitivity ratio [35] extracted. The method is in finding abnormal signs of diffuse structural nature as it is to occurs shield against tuberculosis (TB) in the breast masses. The program starts with the automatic segmentation of lung fields, with active shape models. The segmentation is used to divide the lung regions in overlapping regions of different size. Texture features extracted from each region, on the moments of responses to a multi-scale filter bank. Additional "difference functions" are obtained by subtracting the feature vectors of corresponding regions in the left and right lung fields. A individual training set is constructed for each region [6]. In this paper, our automated approach for the detection of tuberculosis in conventional postero-anterior chest radiographs. We extract the lung area first with a graph cut segmentation method and cavity segmentation method. For this lung area, we compute a set of texture and shape features, the X-rays in order to be classified as a binary normal or abnormal use.

III. METHOD

In this section, our implemented methods for segmenting lung function calculation and classification are.We propose a two step method to segment the cavity borders. First, a pixel classifier is trained to detect the border pixels of the cavity. Cavity border typically has a distinct fuzzy appearance on the chest radiograph. The pixel classifier assigns each pixel a likelihood of belonging to the cavity border. This likelihood map is then used as input cost image for dynamic programming to trace the optimal path in the polar transformed image space. This constructed path corresponds to the cavity border in image space. Graph cut segmentation is A graph cut segmentation can be employed computer vision problems that can be formulated in terms of energy minimization. "graph cuts" is applied specifically to those models which employ a max-flow/min-cut optimization.

A. Graph cut Segmentation

Graph cut segmentation is used in two stages that is (i) average calculation of lung model (ii)lung boundary detection.In very first to select the training set based on a simple similarity measure. To calculate the intensity projection of the histogram equalized images in horizontal and vertical directions. If suppose similarity in measure, use average of the Bhattacharyya coefficient. we perform graph cut segmentation it uses for min cut and max flow algorithm.

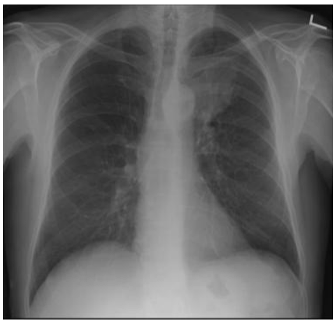

Fig 1: example for normal chest radiographs

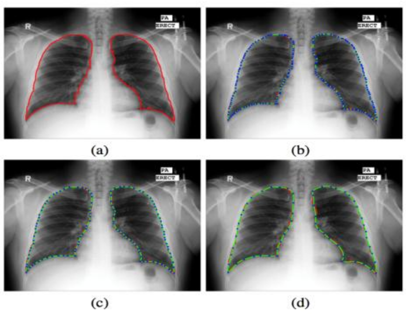

Fig 2: different type of graph cut segmentation for chest radiographs

B. Cavity Segmentation

In cavity segmentation,the features are used to calculate at pixel level to capture texture, shape and location of cavity borders. The chest radiographs are sub sampled by a factor of two to speed up feature computation process. Then the texture features is used to filtere with multi scale feature for gaussian derivatives. To extract the hessian features, the feature appears in broken line. It segments the chest radiographs.Location feature is used to find where the TB is located in lungs. Finally we use ontour segmentation and classification part to find cavity area.

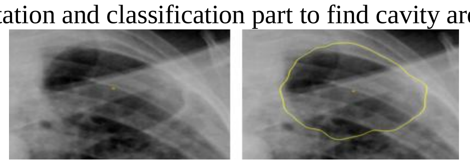

Fig 3example for cavity segmentation

IV. CONCLUSIONS

We have proposed a novel technique which automatically segment cavities based on dynamic programming which uses the likelihood map output of pixel classifier as cost function. We have validated our results with those obtained by three human expert readers on a large dataset including prominent as well as subtle cavities. We have presented a robust lung

boundary detection method that is based on a simple lung model calculation and a graph cut segmentation algorithm. For our experiments, we used a publicly available chest x-ray data set. We measured around 91% segmentation accuracy for this set which is comparable to the performance of state-of-the-art algorithms
(95%) [4] and human-observer scores (94%).

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