Fundamentals of Tuberculosis and its Reviews

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Abstract

Tuberculosis is an infectious disease cause by bacterium and it is mainly affects the lungs. Recently it kills three million people a year. In very first Aristotle was to say that tuberculosis is an airborne disease. It is able to spread from one person to another. The symptoms of Tb is may vary depending on what type of tuberculosis may occur The starting stage of disease means may be symptom free, it is called as inactive stage. TB is active stage means slight fever, night sweat, weight loss, and fatigue is appear. In this survey paper we discussed various types of TB diseases and segmentation methods. The proposed computer aided diagnostic system for TB screening, which is ready for field deployment, achieves a performance of human experts. We achieve an area under the ROCcurve (AUC) of 90 %(81% of accuracy) for the first set and an (AUC) of 95% (86% of accuracy) for the second set.

Keywords: Computer Aided System, Segmentation

I. INTRODUCTION

TUBERCLOSIS (TB) is the second most cause of death from an infectious disease worldwide, after HIV, with a death rate of over 1.2 million people in 2010 [1]. TB is an infectious disease caused by the bacillus Mycobacterium tuberculosis, which typically affects the lungs. It spreads through the air when people with active TB cough, sneeze, or otherwise expel infectious bacteria. TB is most common in Africa and Southeast Asia, where widespread poverty and malnourishment reduce resistance to the disease. Moreover, infections in low immune-compromised HIV/AIDS patients have intensified the problem [3]. The increasing appearance of multi-drug resistant TB has further created an urgent need for a cost effective screening technology to monitor progress during treatment. Several antibiotics exist for treating TB. While death rates are high when left untreated, treatment with antibiotics greatly improves the chances of survival. In clinical trials, cure rates over 90% have been documented [1]. Unfortunately, diagnosing TB is still a major challenge. The definitive test for TB is the identification of Mycobacterium tuberculosis in a clinical sputum or pus sample [3], [2]. it may take several months to identify this slow-growing organism in the laboratory. the next 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 poster 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.

II. TYPES OF TB

Normally TB is two types. A) Mycobacterium T.B. can present itself in the human body in different forms effecting anywhere from "the intestines, bones, joints, skin, and the genitourinary, lymphatic, and nervous systems" B) Avain TB. Avian which is carried by birds. It is transmitted by ingestion and inhalation of aerosolized infectious organisms from feces. An Oral ingestion of food and water contaminated with feces is the most common method of infection. Once ingested, the organism spreads throughout the bird's body and is shed in large numbers in the feces. If the bacterium is inhaled, pulmonary lesions and skin invasions may occur. The transmission of avian TB is from bird to human not from human to human. C) Bovine Tb which is carried by cattle. people reduce Bovine TB today ,by eating food that has been contaminated by the bacteria or from drinking un-pasteurized milk from cows that are infected with the virus. Bovine TB is most likely going to effect the joints and bones.

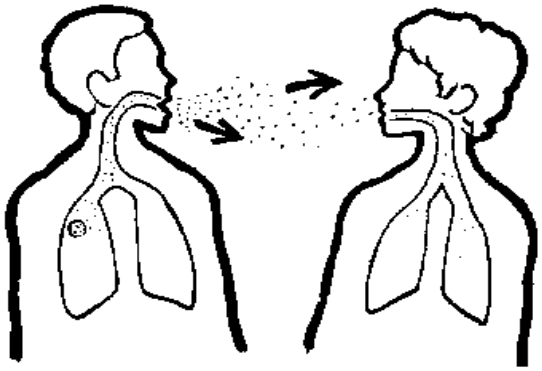

Fig. 1: Airborne transmission for TB

The physical symptoms of Tb is

Fig. 2: and Fig. 3: shoes an example of tuberculosis of the skin it is normally referred to as Warty T.B. and someone will only contract this type of tuberculosis if they have had prior exposure to tuberculosis.

III. SEGMENTATION

Image segmentation refers to the process of partitioning a digital image into multiple segments i.e. set of pixels in a region are similar according to some homogeneity criteria such as colour, intensity or texture, so as to locate and identify objects and boundaries in an image. In Practical application of image segmentation range from filtering of noisy images, medical applications such as Locate tumors and other pathologies, Measure tissue volumes, Computer guided surgery, Diagnosis, Treatment planning, study of anatomical structure. A graph cut segmentation can be employed to efficiently solve a wide variety of low-level computer vision problems such as image smoothing, the stereo correspondence problem, and that can be formulated in terms of energy minimization. Graph cut is employing a max-flow/min-cut optimization.

A. Reviews on Segmentation:

bram van ginneken , 2000 ,et.al,[6]present the algorithms for the automatic delineation of lung fields in chest radiographs is develop a rule-based scheme and pixel classification. Rule-based approach is the observation that the borders between anatomical structures in chest radiographs largely coincide with edges and ridges in the image. Segmentation can also be treated as a pixel classification problem by calculating feature vector for each pixel in the input image. Output is the anatomical class. Although different types of classifiers will obviously lead to different results, the performance of these segmentation algorithms will depend mostly on the features of the input vector. As features we use pixel location, pixel intensity, entropy, and the corrected location computed from a scaling and translation computed from the rule based scheme. A hybrid system that combines both approaches. The performance of hybrid scheme turns out to be accurate and robust; the accuracy is 0.969 ± 0.00803, and above 94% for all 115 test images.

Stefan jaeger, 2011, et al, [4] present the detection of TB and other diseases in CXRs as a pattern-recognition problem. The algorithms are developed by using x-rays from the Japanese Society of Radiology Technology database. The preprocessing step first enhanced the contrast of the image using a histogram equalization technique. Next step include lung field extraction from the other structures in the x-raysuch as the heart, clavicles, and ribs based on an adaptive segmentation method. Deviations from the lung shape and increased lung opacity indicate abnormalities, such as consolidations or nodules. These abnormalities with a bag-of-features approach that included descriptors for shape and texture. To detect nodules, for example first applied a Gaussian filter and computed the Eigen values of the Hessian matrix. Then computed a multi-scale similarity measure that responds to spherical ‘blobs’ with high curvature. Finally these features are used to train a binary classifier that discriminates between

normal and abnormal CXRs. The implementation of a preliminary system that is capable of detecting some manifestations of disease in CXRs. Novel algorithms can be implemented on any portable x-ray unit.

HaithemBoussaid, 2011, et.al, [7] present a machine learning approach to improve shape detection accuracy in medical images with deformable contour models (DCMs).DCMs can efficiently recover globally optimal solutions that take into account constraints on shape and appearance in the model fitting criterion. This model can also deal with global scale variations by operating in a multi-scale pyramid. The main contribution consists in formulating the task of learning the DCM score function as a large-margin structured prediction problem. The algorithm trains DCMs in an joint manner all the parameters are learned simultaneously, while use rich local features for landmark localization. Then evaluate a method on lung field, heart, and clavicle segmentation tasks using 247 standard posterior-anterior (PA) chest radiographs from the Segmentation in Chest Radiographs (SCR) benchmark. DCMs systematically outperform the state of the art methods according to a host of validation measures including the overlap coefficient, mean contour distance and pixel error rate.

stefan jaeger ,2012 et al ,[2]present the tuberculosis detection.Tuberculosis (TB) is a major health threat in many regions of the world. Modern diagnostic techniques are often too slow or too expensive for highly-populated developing countries that bear the brunt of the disease. To reduce the burden of the disease, use an automated approach for detecting TB chest radiographs. The results produced by our TB screening system.Then also use a more sophisticated lung segmentation by combining multiple segmentation masks. First segment the lung field using a combination of an intensity mask, a statistical lung model mask, and a Log Gabor mask. then extract a set of features for shapes, curvatures, and textures from the segmented lung field. Using the extracted features, we train a support vector machine that distinguishes between normal and abnormal x-rays.

candemir, 2012, et al, [3] present the graph cut based lung segmentation method that detects the lungs with high accuracy. The method consists of two stages: (I) average lung shape model calculation, and (ii) lung boundary detection based on graph cut. Segmentation in medical imaging has challenges such as poor contrast, distortions caused by the acquisition equipment, and anatomical shape variations due to diseases. A segmentation algorithm without a priori knowledge about the objects may not produce satisfactory results on medical images. In order to provide a priori lung location is incorporate a static lung shape model into the system. A set of training masks to learn the lung shape model. Instead of using all training mask to select the training set based on a simple shape similarity measure in order to increase the lung shape model accuracy. First calculate the intensity projection of the histogram-equalized images in the vertical and the horizontal directions. The second stage of the system is detecting the lung boundary of x-ray images using image properties and the lung shape model.

H.B Rachana, 2013, et.al[8]present TB detection is based on sputum examination microscopically by using Ziehl- Neelsen stain (ZN-stain) method. The developed algorithm detects the TB bacilli automatically. This automated system reduces fatigue by providing images on the screen and avoiding visual inspection of microscopic images. The system has a high degree of accuracy, specificity and better speed in detecting TB bacilli. The method is simple and inexpensive for use in rural/remote areas in the emerging economies. Segmentation algorithm is developed to automate the process of detection of TB using digital microscopic images of different subjects. A performance comparison of clustering and thresholding algorithms for segmenting TB bacilli in ZN-stained tissue slide images is carried out. The results presented showed that a more convincing segmentation performance has been achieved by using the clustering methods, as compared to the thresholding method. These results also suggest that k-mean clustering is the best method for segmenting the bacilli, as it is highly sensitive to the TB pixels.

IV. CONCLUSION

An automated system that screens CXRs main document for manifestations of TB. The system is currently set up for practical use in Kenya, where it will be part of a mobile system for TB screening in remote areas. When given a CXR as input, the system first segments the lung region using an optimization method based on graph cut. This method combines intensity information with personalized lung atlas models derived from the training set. Then compute a set of shape, edge, and texture features as input to a binary classifier which then classifies the given input image into either normal or abnormal. We achieve an AUC of 90% and 95% for both sets.

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