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Detection of Tuberculosis using Lung Segmentation Technique

[1]Raisa Mujawar, [2] Shashikant Hippargi
[1] P.G. Student, [2] Associate Professor
[1][2]Department of Electronics & Telecommunication Engineering, NBNSCOE Engineering College,

***Abstract:*-- TB is the second cause of death due to infectious diseases in the world. Though TB can be completely cured if detected at early stage the problem is the unavailability of reliable detection methods. If TB not detected and hence not treated properly it takes lives of the patients. It mainly affects weak immune persons like childrens, old age people, HIV patients etc. Though TB infection can affect any parts of the body it mostly affects lungs of the patients. To detect lung TB X-rays of chest is used. Diagnosing TB using chest X-rays is most cheapest method along with it other tests are also required. This paper presents a method for automatic detection of TB using chest X-rays .Here image processing is used to improve the performance of the existing methods.The performance is tried to improve using different segmentation method.The syetm takes patients X-rays as input and processes it and give result as the case is TB positive or negative.**

***Index Terms*—Diagnosing, Segmentation, TB, X-ray.**

I. INTRODUCTION

TUBERCULOSIS (TB) is the second leading cause of death from an infectious disease worldwide, after HIV, with a mortality rate of over 1.2 million people in 2010. With about one-third of the world's population having latent TB, and an estimated nine million new cases occurring every year, TB is a major global health problem. 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 prevalent in sub-Saharan Africa and Southeast Asia, where widespread poverty and malnutrition reduce resistance to the disease. Moreover, opportunistic infections in immune compromised HIV/AIDS patients have exacerbated the problem. 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 mortality 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. 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, which is the current gold standard. However, it may take several months to identify this 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. In addition, several skin tests based on immune response are available for determining whether an individual has contracted TB. However, skin tests are not always reliable. The latest development for detection is molecular diagnostic tests that are fast and accurate, and that are highly sensitive and specific. However, further financial support is required for these tests to become common place. This project present an automated approach for detecting TB manifestations in chest X-rays (CXRs). An automated approach to X-ray reading allows mass screening of large populations that could not be managed manually. A poster anterior radiograph (X-ray) of a patient's chest is a mandatory part of every evaluation for TB. The chest radiograph includes all thoracic anatomy and provides a high yield, given the low cost and single source. In this project first the lung segmentation is done then its features are extracted using filters. Required features are selected using feature selection method. The selected features are classified using a binary classifier, which outputs result as TB positive or negative.

The work in this paper is divided in three stages.
1) Lung Segmentation
2) Feature extraction
3) Classification.

Lung segmentation is done using Chan Vese. This model begin with a contour in the image plane defining an initial segmentation, and then it evolve this contour according to some evolution equation. The goal is to evolve the contour in such a way that it stops on the boundaries of the foreground region. The Chan-Vese algorithm evolves this contour via a level set method. Thereafter, features of image

are extracted. For feature extraction texture features are selected. Finally, the set of selection criteria is applied to classifier who separates out TB positive and negative case.
Paper is organized as follows. Section I describes problem statement. Section II describes methodology of the system with flow diagram of the system. The flow diagram represents the step of the algorithm. Section III presents experimental results showing results of images tested it shows result after segmentation and feature extraction. Finally Section IV presents conclusion.

II. PROBLEM STATEMENT

Here the performance of system is to be increased with performance closer to human performance with performance percentage above 90% by using different image segmentation methods.

III. METHODOLOGY

***The proposed system is as shown in following fig*.**
The steps are
1)Lung Segmentation
2)Features selection & extraction
3) Classification.

1) Segmentation:

Here segmentation is done using Chan Vese segmentation algorithm. Chan Vese is active contour method .Active contour is most efficient method as it is able to segment many types of images that is difficult by classical methods like tresholding and gradient based method.

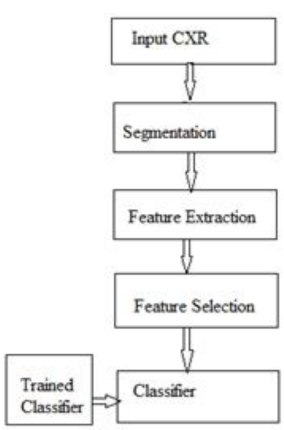

Fig.1 Proposed System

In Chan-vese model it begins with a contour in the image plane defining an initial segmentation, and then it evolves this contour according to some evolution equation. The goal is to evolve the contour in such a way that it stops on the boundaries of the foreground region. The Chan-Vese algorithm evolves this contour via a level set method. Level set define some function ϕ (i, j , t) (the level-set function), where (i, j) are coordinates in the image plane and t is an artificial "time." At any given time, the level set function simultaneously defines an edge contour and a segmentation of the image. The edge contour is taken to be the zero level set{(i,j)s.t._(i, j , t)= 0}, and the segmentation is given by the two regions $\{\phi \geq 0\}$ and $\{\phi < 0\}$. The level set function will be evolved according to some partial differential equation, and hopefully will reach a steady state limt $t \to \infty$ that gives a useful segmentation of the image.

Here MATLAB code for segmentation using Chen-vese is

```
bw = active contour(BI, mask, 100, 'Chan-Vese')
```

2. Feature Extraction:

Extraction of feature means use of unique features such as colour, edge, shape, and texture to detect. A set of filters with different frequencies and orientations will be used for extracting useful features from an image.

3. Feature Selection:

Feature selection methods provides us a way of reducing computation time, improving prediction performance, and a better understanding of the data in machine learning or pattern recognition applications. It identifies the subset of features by preserving only the most important predictors and filtering or excluding all others.

4. Classification:

To detect abnormal CXRs with TB, system use a support vector machine (SVM), which classifies the computed feature vectors into either normal or abnormal.

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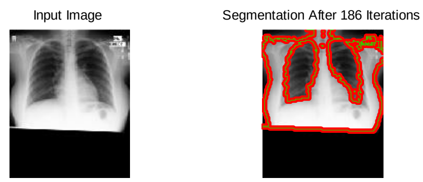
RESULT



Segmentation In Progress....Ple

Fig.(a)

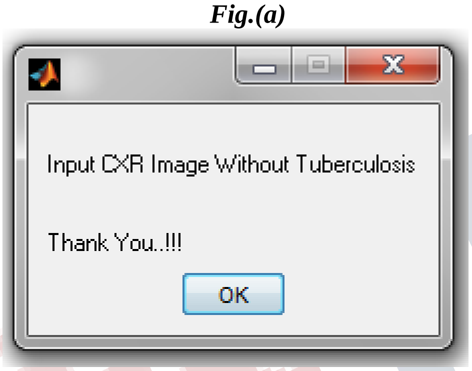


Fig.(b)

Fig.a .It shows the original image and image after segmentation.
Fig. b shows the result as whether the image is TB positive case or negative case.

IV. CONCLUSION

We have used Chan Vese algorithm to achieve better segmentation and the performance of the system is improved with results closer to human performance.

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