Chapter 21
Automatic Lung Tuberculosis Detection Model Using Thorax Radiography Image

Sudhir Kumar Mohapatra
https://orcid.org/0000-0003-3065-3881
Addis Ababa Science and Technology University, Ethiopia

ABSTRACT

Tuberculosis (TB) is a communal disease with high death and disease rates worldwide. The chest radiograph (CXR) is commonly used in diagnostic solutions for lung TB. Automatic computer-aided solutions to identify TB using CXRs and can advance the efficiency of the diagnostic of TB. In this chapter, an automatic TB detection model using CXR image is proposed. By identifying open issues include how detect the lung region automatically and what are the features, one can identify if a given CXR image is infected or normal using three public datasets such as Schengen, Montgomery Country (MC), and JSRT. The possible textural features of a lung object are obtained from the first-order and second-order gray level co-occurrence matrix (GLCM) statistical features. The performance of the proposed model was evaluated using accuracy, sensitivity, and specificity, and the model achieved AUC 91%, 62%, 71%, and 81% on Schengen, JSRT, MC, and combined datasets.

INTRODUCTION

The beginning of image processing methods times back to the late 1960s and early 1970s and was used in medical imaging, astronomy and remote earth resources observation. Meanwhile, digital image processing has been growing dynamically. Almost all application areas are now using digital image processing techniques ranging from robotic vision, product inspection to scientific research (Gonzales et al., 2002). In medical field image processing has a plays a vital role. Image processing is used for disease detection, identification, prevention and prediction.

DOI: 10.4018/978-1-6684-7544-7.ch021

The preventive medication can be characterized as primary, secondary, or else tertiary (McPhee et al.,2017). Primary prevention goals to eliminate or decrease disease threat factors or vulnerability. For example, vaccination, giving up or not starting something to the danger that used in activities or actions for both individual and public. Secondary prevention practices inspire timely discovery of disease or ancestor states at the subclinical stage. For example, Papsmear to detect certain biological infections, measurement of blood pressure. Such methods focus on the subclinical and the early clinical stage. Tertiary prevention measures contain the caution of established disease, with efforts made to restore to maximum function, minimalize the dangerous effects of a disease, and avoid disease correlated difficulties. Beyond these above levels of preventive medication, developing population centered information systems create it highly probable to combine prevention and care giving that new attention on the opportunities for realizing well and more reasonable delivery of healthiness (Starfield et al.,2008). The tool for supplementary examination is focus on the level of the competence where the action takes place (McPhee et al.,2017). Once there is no test center available, either for outpatient or inpatient care, fast analysis tests may be made obtainable (for malaria, HIV, etc.). A laboratory and material necessity is a system for certain diseases, such as TB.

The secondary prevention mechanism can be automated for early detection and diagnosis when if the occurrence of primary prevention is unsuccessful. According to the World Health Organization (WHO) (World Health Organization, 2013), TB is the second most communal cause of death in the globe along with HIV/AIDS. A great occurrence of TB anywhere in the world poses dangers to the healthiness of people elsewhere. While the application of current knowledge and methods for the diagnosis, handling, and prevention of TB can create an influence (Kwan et al,,2011). TB is a highly contagious, persistent disease considered by the development of tough grimy nodules, or tubercles because it spread by air. The disease is most often produced by the bacterium Mycobacterium TB; typically happens in the lungs, but it also can spread to the other organs like skeleton or bone. Since its signs and symptoms are simply confused with those of many other mainly respiratory diseases, TB can be hard to diagnose. Communal symptoms are cough, night sweats, chest pain, and breathlessness. 90% of those infected with TB mount a real immune response and certainly not develop the disease (H. Communities,2019).

In general and radiological point of view (Burrill et al., 2007), TB has exposed a renaissance in non-endemic residents in current years, a case that has indorsed to influences such as increased relocation or migration and the HIV widespread. While the thorax is most often involved, TB may involve any of a number of organ systems (like respiratory, central nervous, cardiac, gastrointestinal, musculoskeletal, and genitourinary systems), and appropriate analysis of the disease is extremely risky and challenging, meanwhile, late action is allied with severe sickness.

TB is hard to diagnose since the signs and symptoms are alike to those produced by other diseases like lung cancer, pneumonia, allergic broncho pulmonaryaspergillosis, sarcoidosis, allergic alveolitis, pneumoconiosis, silicosis, anorexia nervosa, diabetes mellitus, hyperthyroidism, and Mediastinial.

The challenges during TB test or diagnosis and can be non-technical or technical (Dheda et al.,2013).

Technical aspects:-

- Antibody information in patients through active TB overlay with patients with presumed latent TB infection (a significant facet of TB control in low drain locations),
- Antigens can be differentially stated in different body sections,
- Overlap TB symptoms with others' diseases symptoms like coughing and night sweet,