

Pneumothorax identification through X ray analysis

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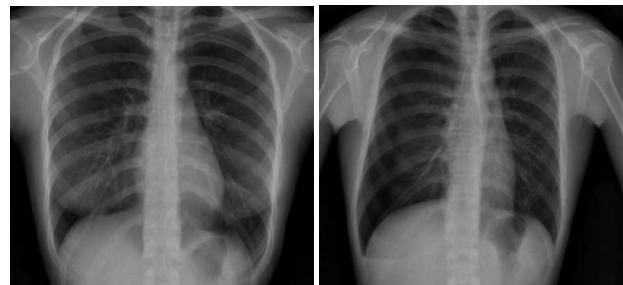
1. Introduction

Pneumothorax is a common respiratory disease that threatens life and leads to death if untreated. It can occur in many clinical settings and in patients of any age. This pathology consists in the entrance of air into the interpleural space, between the parietal and visceral pleura. Pneumothorax can be of different magnitudes, from a small pleuritic discomfort with a little difficulty to breathe, to a deadly medical emergency with respiratory collapse, which requires immediate medical intervention. Moreover, pneumothorax can also be of different types, which depend on the way they were caused. Spontaneous pneumothorax is one of these types, it can be caused by smoking, family history of the condition, effects of lung disease and even a common cold. Traumatic pneumothorax can be caused by surgeries and traumas that involve penetration of the pleura, this type of pneumothorax may result in hypoxia, shock and even death.[1]

An study made on Japanese patients from the Tsuchiura Kyodo General Hospital, showed that, from a population of 100,000 males and 100,000 females, there are between 7-18 and 1-6 cases of spontaneous pneumothorax in males and females, respectively. The average age at which patients present this disorder is approximately 43 years. 48% of pneumothoraxes were on the left side of the chest, and 1.2% with bilateral pneumothoraxes. [2]

Consequently, the design and development of this project is important because of the prevalence of the pathology and the requirement of a fast diagnosis in the radiology department. The purpose of this work is to develop a robust automated classification method that allows the rapid detection of pneumothorax in X-ray images that would assist the doctors in the analysis and rapid diagnosis of this disease.

With the above in mind, in Figure 1 we can see two X-ray thorax images, healthy lungs(a) and lungs with pneumothorax(b). We can evidence in the image that the lungs look similar and have little differences. Thus, as we mentioned, the (b) image has pneumothorax, but it's difficult to identify if we compare it to the healthy lungs. With this in mind, our program will detect this disease through the intensity of the image, in order to make the doctors' diagnosis easier.



(a) normal lungs

(b) pneumothorax X-Ray

Figure 1. Normal and pneumothorax lungs [3]

1.1. Main Objective

The purpose of this project is to develop a program that identifies pneumothorax diseases through chest X-ray images. By doing this program we minimize the time for the diagnosis and guarantee the fastest assistance for the patient.

2. Data

In order to work with documented X-ray thorax images data we used the database found at the *RNSA Pneumonia Detection Challenge* [4]. This database will provide us dif-

ferent images identified with patients IDs on DICOM format. Also, this images have annotations of the disease that each patient has and it's methodology of evaluation, meaning images destined to train and test the algorithm designed with different levels of stages. With this in mind, even though the database has the main target to focus the challenge to provide images with annotations of having and not having pneumonia, we will use this images as the test negatives and the ones documented with pneumothorax as positives. In the next table we show an example of the information that we have for each image in the database [5]:

Table 1. Example data base

ImageIndex	FindingLabels	PatientID	O. Image	...
013 ₀ 02.png	Pneumothorax	13	3056	
027 ₀ 00.png	Emphysema	27	2990	
016 ₀ 00.png	NoFinding	71	2992	

With all of the above in mind, the total database consumes 3GB of computer memory and it will be managed by an external memory.

References

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