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A Comparative Study of Edge Detection Techniques for Detection of Glass Opacities In X-Ray of COVID-19

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Abstract— A lung X-ray is essential for accurately identifying COVID-19. Here, enhanced fuzzy edge extraction with non-maximum suppression and adaptive threshold (FENSAT) has been used to extract clinical data of infected lungs while suppressing slight noises in the chest for COVID-19 identification and pattern analysis. The suggested method can identify more precise and crisp clinical edges of peripheral ground-glass opacity that first appeared in COVID-19 patients as compared to traditional classical edge extraction operators. It has been demonstrated through quantitative analysis that the suggested method outperforms current methods.

Keywords: Edge detection Techniques, FENSAT, Enhancement, Covid-19, quantitative analysis.

I. INTRODUCTION

The COVID-19 test is currently impossible to administer due to widespread diagnosis system inaccessibility; panic is being generated. We must rely on alternate methods of determination because COVID-19 testing kits are not widely available. We can use X-rays to examine a patient's lung strength since COVID-19 attacks the epithelial cells lining our respiratory tract. X-ray scans are often used by doctors to assess cases of pneumonia, inflammation of the lung, abscesses, and swollen lymph nodes. Additionally, as practically all hospitals have X-ray imaging equipment, it might be able to test for COVID-19 using X-rays rather than specialized test kits. Once more, a disadvantage is that X-ray examinations take a long time and need a radiology master, which is important when patients are ill [1][2].

II. DATASET

Images from a chest X-ray were employed in this work because radiologists frequently use this view of radiography for clinical diagnosis. One database was created by combining six distinct sub-databases. The COVID-19 database was gathered using publicly accessible GitHub databases, whereas the standard chest X-ray databases were produced from publicly accessible Kaggle databases. For this paper, I shot 199 images with COVID-19 and 199 images without it[3].

Fig.1. Normal & Covid Affeted X- ray Dataset

The most basic thresholding techniques substitute a black pixel for each pixel in a picture if its intensity is less than a certain constant T, and a white pixel for any image intensity that exceeds that constant. The technique of enhancing an image's quality and information content prior to processing is known as image enhancement. Contrast enhancement, spatial filtering, density slicing, and FCC are typical procedures [4][5].

Stretching or enhancing contrast is accomplished by linear transformation, which increases the

grey level's initial range. In this work, I enhanced X-ray images using histogram equalization. The improved Covid-19 X-ray image is shown in the accompanying figure [6][7].

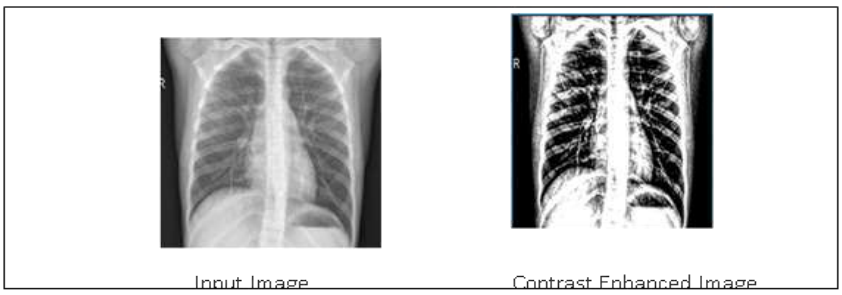


Fig. 2 Enhancement of X-ray Image

IV.IMAGE SEGMENTATION

In digital image processing and analysis, image segmentation is a widely used technique that divides a picture into various portions or areas, usually depending on the properties of the image's pixels. Segmenting an image could include grouping pixel sections according to color or shape similarity, or it could entail dividing the foreground from the background. Based on threshold The process of splitting an image into several parts with correlated characteristics like contrast, brightness, color, and grey level is called segmentation [8][9].

By determining the region of interest, accurate segmentation of medical images is a crucial first step in the identification of diseases. We have divided the chest X-ray pictures according to the grey level thresholding since a COVID-19 patient's lungs have a lot of white areas. By turning grey pixels into white pixels and then back into black pixels, all of the grey areas are distinguished from one another. This makes it simple to distinguish between aberrant and normal chest X-ray images [10][11].

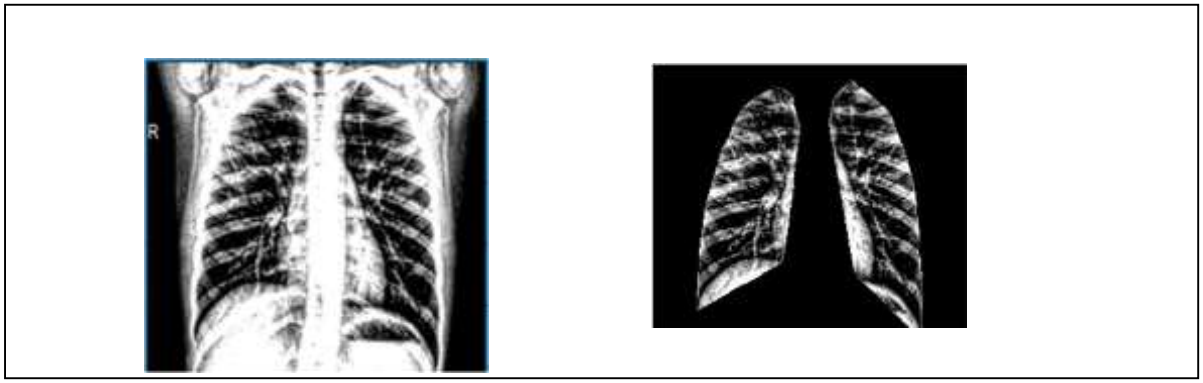
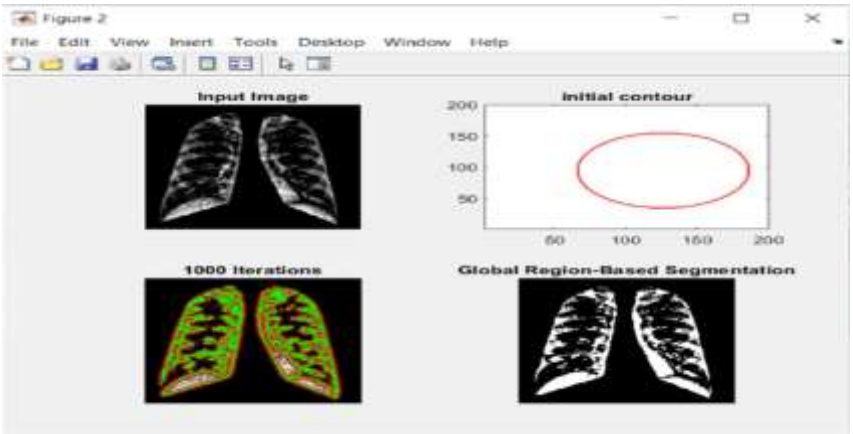


Fig. 3. Segmented Image

Chan-Vese Segmentation:

The Chan-Vese segmentation technique is intended for objects without distinct borders [12][13]. Using level sets that are iteratively evolved, this algorithm minimises an energy that is defined by weighted values corresponding to the total of the differences in intensity from the average value outside the segmented region, the total of the differences from the average value inside the segmented region, and a term that depends on the segmented region's boundary length [14][15].



V CONCLUSION & FUTURE SCOPE

The COVID-19 pandemic is becoming more and more widespread every day, and a quick bulk test of cases may be necessary. In order to automatically forecast COVID-19 patients, we employed image enhancement and segmentation techniques in this research using chest X-ray pictures from normal COVID-19 patients. Given our results, it is anticipated that radiologists' enhanced ability to identify Covid-19 early on will aid them in clinical practice decision-making. Future improvement work on these X-ray images will continue to use categorization approaches.

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