

Extraction of significant features using GLDM for Covid-19 prediction

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Abstract

Although Covid-19 caused by the SARS-COV-2 virus, is a deadliest disease, many people experienced mild symptoms and were recovered soon. In this paper, coronavirus can be easily detected using CT scan images of affected patients. Initially, images are pre-processed by filters like Median filter and Noise adaptive fuzzy switching median filter, and then the quality measurements like MSE, and PSNR are calculated. After preprocessing, segmentation is done by K-means and Robust self sparse fuzzy clustering algorithm, and then the parameters like LMSE and NAE are calculated. Finally, to get optimum results, feature extraction using GLDM is performed which helps in identifying whether it's a normal lung disease like pneumonia or the patient is affected by covid.

Keywords: GLDM, Pneumonia, Preprocessing, Segmentation, SARS-COV-2

1. Introduction

Coronavirus spread due to the air contaminated by airborne particles containing the virus. So by maintaining 6 feet distance and wearing a mask would be recommended by doctors to prevent from covid. More number of variants have been discovered like delta, Omega, etc. In this paper by using various steps in image processing like preprocessing, segmentation, and feature extraction covid affected patients can be easily detected.

2. Literature Review

X.Ouyang (2020) proposed a method of Dual-sampling attention network using a 3D convolutional network and it automatically diagnoses the covid-19. It has higher distortion when it comes under the visual information of the classification task. S.Hu et al (2020)

proposed deep learning strategy. It has better detection and it is not discriminative enough, training is also required for this algorithm

S.Tabik et al (2020) proposed an SD Net methodology for detecting covid-19 based on chest X-ray images. It uses deep learning neural networks and here certain improvement is required for the segmentation process. A.A.R.Alsaeedy et al (2020) proposed a method for detecting the spread of covid-9 using an existing cellular wireless network. It detects the region that potentially contributes to the spread of covid-19 and the accuracy has to be still improved for better results.

J.D.Arias Londono et al (2020) proposed an Artificial intelligence method for detecting the covid virus, using CNN and the accuracy is more than 90 percent. S.Roy et al (2020) proposed a deep learning classification for covid-19 using point-of-care lung ultrasound. Here, data gathering is a challenge and also result has some noise.

3. Proposed System

Input image datasets (CT scans) are taken from the Brazilian Hospital, Sao Paulo. The framework of the proposed system is shown in the below figure.

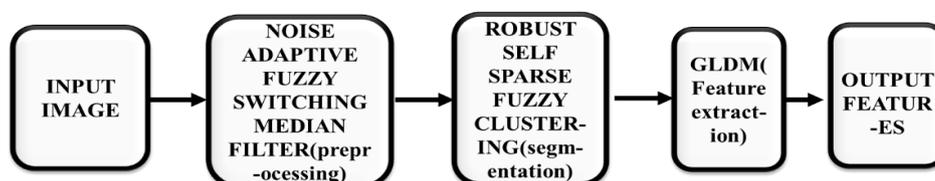


Figure 1. Framework of the proposed system

3.1 Preprocessing

Image noise is normally removed in preprocessing step. Here, in this paper, two filtration techniques are used namely, Median filter, Noise Adaptive fuzzy switching median filter. And certain Quality measurement parameters are taken to find out the better filtration method.

3.1.1 Median Filter

It is a non-linear filtration process to remove noise from the image. Pixel values are arranged from ascending to descending order and the middle value is taken out for calculation for better results. Median pixel values are then replaced in neighbouring pixels.

3.1.2 Noise Adaptive Fuzzy Switching Median Filter

It is a hybrid filter and removes the corrupted pixels from the image and the processing time is also less. MSE and PSNR are the two quality measurements used. In mean square error, the error value has to be low and in Peak signal, to noise ratio the value has to be high for a better quality of the image.

3.2 Segmentation

Image is partitioned into meaningful regions or segments is known as image segmentation and has to solve the problem, the pixel clustering which represents the segmentation. In this paper, the Least Mean square error and Normalised absolute error are the two parameters that are used to find out the better segmentation.

3.2.1 K-Means Clustering Algorithm

It is a clustering-based segmentation, and the K number of the cluster is formed, nearby clusters are formed into a group and faraway clusters are formed into another group. And hence the regions are segmented into the meaningful region.

3.2.2 Robust Self Sparse Fuzzy Clustering Segmentation

It is a clustering-based segmentation. RSSFCA segmentation is done even if the pixel size is high. It also overcomes over-segmentation.

3.3 Feature Extraction

In this paper, the GLDM method is used to extract the features after segmentation. Here the pixel distance depends on the center pixel. Small dependency matrix, large dependency matrix, and Dependency variance are some of the features extracted.

4. Results and Discussion

In preprocessing by calculating MSE and PSNR, Noise adaptive fuzzy switching median filter is better when compared to the median filter. And in segmentation by calculating LMSE and NAE, Robust self sparse fuzzy clustering segmentation is better when compared to the K-means clustering.



Figure 2. Filtration Result

Table 1. MSE and PSNR values

Median filter	MSE	5.41
	PSNR	23.12
Noise adaptive fuzzy switching median filter	MSE	5.3
	PSNR	33.63

From the above Quality measurement, NAFSMF has the lowest error and highest PSNR values and the graphical representation shows the result of preprocessing.

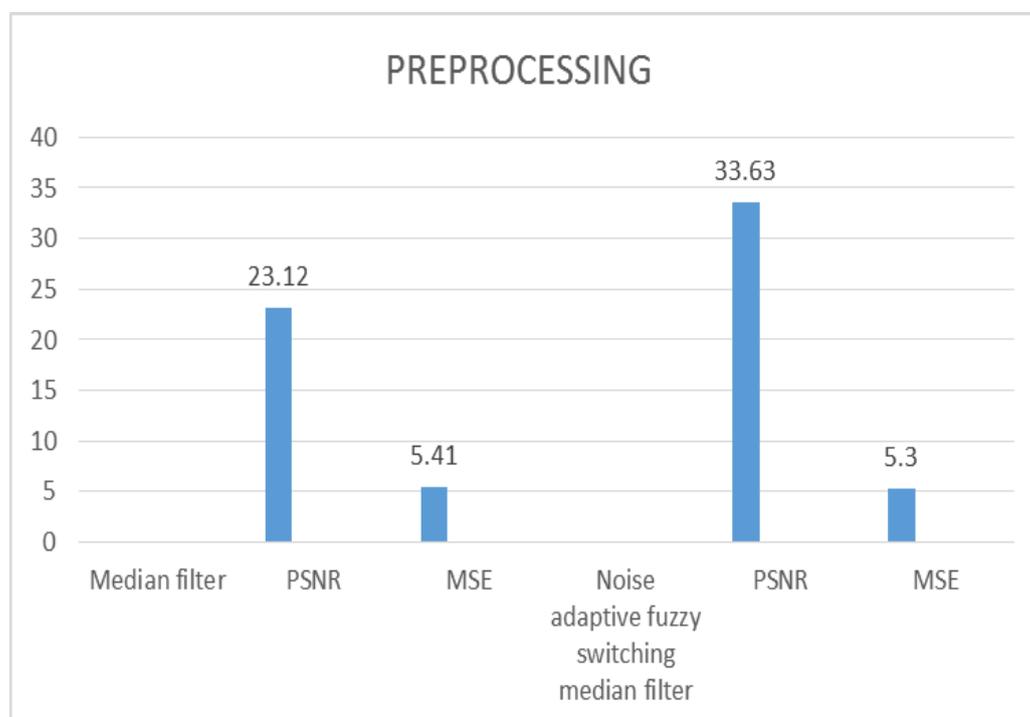


Figure 3. Comparison of Median and NAFSM filter

In segmentation, RSSFCA has a better value for NAE and the lowest error in LMSE, and the results for segmentation are given below.

Table 2. LMSE and NAE values

K-Means Clustering	LMSE	3.7
	NAE	254
RSSFCA	LMSE	1.5
	NAE	156.5

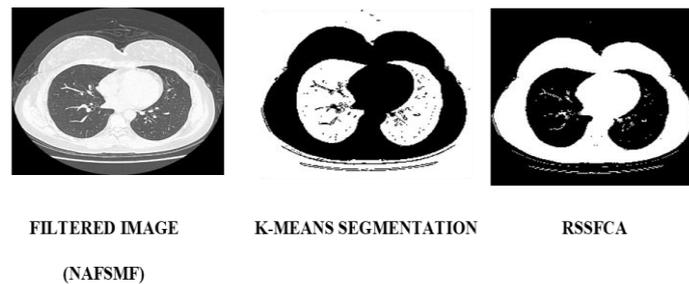


Figure 4. Segmentation result

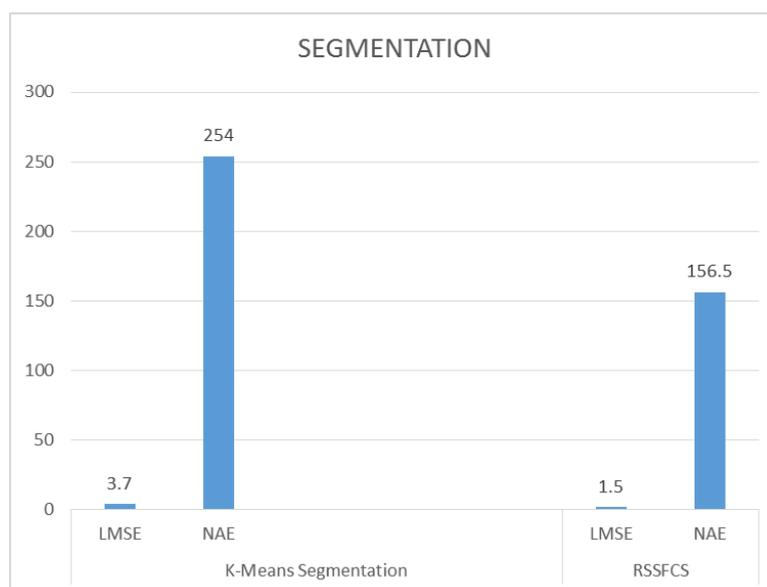


Figure 5. Comparison of K-Means and RSSFCA Segmentation

Table 3. GLDM features

Features	Segmented image
Small Dependence Emphasis (SDE)	0.203
Large Dependence Emphasis (LDE)	1.158
Dependence Variance (DV)	4.8

Finally from RSSFCA segmented image features are extracted using the GLDM method.

5. Conclusion

In this paper, using CT scan as input image, Preprocessing, Segmentation, and Feature extraction are performed to determine if the person is affected by coronavirus. NAFSMF and RSSFCA are chosen as the best filtration in comparison by calculating certain parameters like PSNR, MSE, LMSE, and NAE. And finally, features are extracted by using the GLDM method, and the output features are obtained.

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