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COMPARATIVE ANALYSIS OF FILTERING TECHNIQUES IN CORONA VIRUS PREDICTION SYSTEM

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Abstract - *Many countries are challenged by the medical sources essential for COVID-19 prediction which requires the evolution of a less-cost, quick tool to determine and identify the virus successfully for a substantial number of tests. `Therefore, a chest CT scan image is a convenient candidate tool that the images developed by the scans should be analyzed precisely and rapidly if bulk numbers of tests are to be treated. Many pre-processing techniques in image processing have been used including image resizing, image enhancement, converting to gray scale, image augmentation etc. To get good accuracy and good results in predicting COVID19, the images used in diagnosing the disease should undergo noise reduction. In this paper we are detailing about pre-processing techniques like mean filter, median filter and Gaussian filter.*

Key Words: **COVID-19, Mean filter, Median filter, Gaussian Filter**

1. INTRODUCTION

Since December 2019, a COVID-19 termed as severe acute respiratory syndrome coronavirus 2 (SARs-CoV- -2) has led to a fatal disease termed as coronavirus disease (COVID-19). While COVID-19 begin in the city Wuhan, China, the whole world is presently steadily enduring from the disease. SARs-CoV-2(severe acute respiratory syndrome) has caused more harmful effects and it killed 773 people, and Middle East respiratory syndrome (MERS-CoV) causing death of 857 people.

As this COVID-19 has many harmful effects and severe transmission capacity, it is necessary to detect the COVID-19 widespread. If the proper projection of the disease is done, then it allows a country to respond pertinently for the near future. However, this prediction of this COVID-19 disease has many many challenges. Many of these challenges it includes are no proper treatment, no proper tracking of infected people and no proper information in the available datasets. Hence, it is important to predict COVID-19.

1.1 symptoms and measures

The common symptoms of COVID-19 are fever, coughing and sneezing, fever, and difficulty in breathing. Along with these symptoms the other symptoms also include are hearing problems, diarrhea, chest pains, a loss of sense of smell and nasal congestion are experienced. The World health organization has released some preventive measures to avoid infection from COVID-19 virus. The precautionary measures are avoiding handshaking, covering the face with a cloth or mask, enforcing a lockdown and following social distancing.

2. METHODOLOGY

Figure-1 depicts block diagram of Corona Virus Prediction System using CNN and SVM.

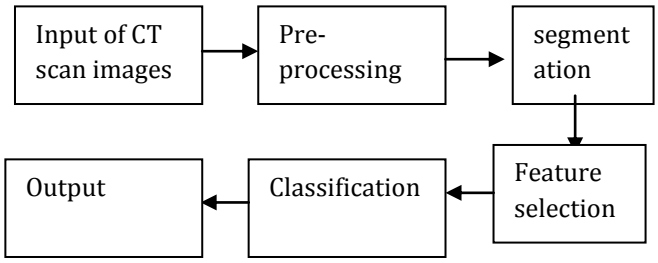

Figure -1: Methodology of proposed system

Preprocessing

The input used here is CT scan images. In image processing-processing is important step because this step helps in extracting right amount of information. In many CT scan images, there is variety of noises which leads to extract wrong information.

First, the original CT scan RGB image is converted to grayscale image. Once the grayscale image is obtained, filters are applied one after another to reduce noise. Mean and median filters are applied to remove high frequency content

present in the image. Then Gaussian noise is removed by applying Gaussian filter in the image. In this pre-processing, multi-level thresholding based on support vector machines is used.

The pre-processing steps are described below.

1. Conversion of given RGB to greyscale.
2. Application of mean filter.
3. Application of median filter.
4. Application of Gaussian filter.

Conversion of given RGB to greyscale

The process of transforming the RGB image to greyscale image is carried out by using the formulae

$$G' = ((0.3 * R) + (0.59 * G) + (0.11 * B))$$

Where, G' = grey pixel intensities.

R = Red pixel intensities.

G = Green pixel intensities.

B = Blue pixel intensities.

The reason behind this conversion to grey scale image is as grey scale images are sufficient for many tasks and they support only 8-bit images.

Application of Mean filter

Mean filter is regarded as uncomplicated and uninvolved belonging to the category of linear filters. By using local averaging operations, it is implemented. In this mean filter the sum of all values in local neighborhood is replaced by value of each pixel.

$$h[i,j] = \frac{1}{M} \sum_{(k,l)\in N} f[k,l]$$

Here, M represents in the neighborhood N the total number of all pixels.

Consider an example, taking a 3 x 3 neighborhood of [i,j] provides the below equation

$$h[i,j] = \frac{1}{9} \sum_{k=i-1}^{i+1} \sum_{l=j-1}^{j+1} f[k,l]$$

Suppose in convolution mask if g[i,j] = 1/9 for all [i,j] then the convolution operation decreases its local averaging operation.

Application of median filter

Local averaging filters have their own drawbacks. As the pixel intensity values in an image are breeched out by sharp blurring. So, an alternative approach is required that is obtained by using median filter. Median filters are considered as non-linear digital filtering technique which is used to eradicate noise from a signal or an image.

The formula used to calculate median filter is given below

$$Median\ Filter = \frac{a\left(\frac{N}{2}\right) + a\left(\frac{N}{2}+1\right)}{2}$$

Where N= total number of pixels in an image.

Application of Gaussian filter.

Gaussian filters are with weights which is associated with in the class of all linear smoothening filters. In this the weights are selected

as per the Gaussian function. The noise caused by normal distribution are easily removed by Gaussian filter.

The gaussian function in one dimension is given below

$$g(x) = e^{-\frac{x^2}{2\sigma^2}}$$

Gaussian filter uses kernel to convolute over the image pixels to obtain the noise free image. The above equation if formed by the Gaussian gradient descent. The filter can pass all over the image or the part of image that needs to be blurred.

3. RESULTS AND ANALYSIS

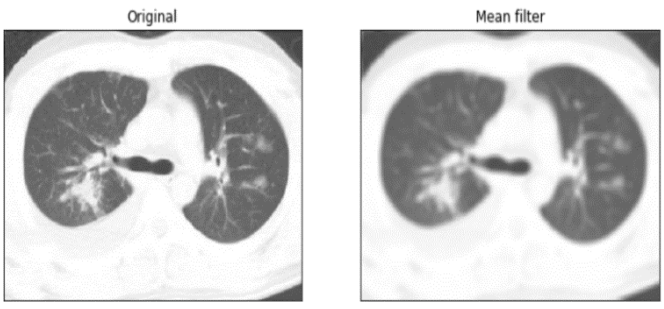

Figure 2 – Application of Mean filter

Mean filter, which is also known as convolution filter. The intensity variations among the pixels are balanced by using this method. Hence reducing the noise

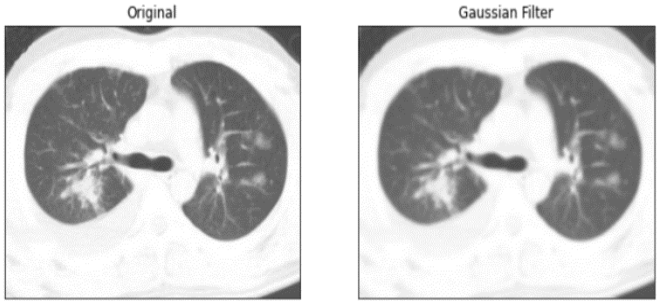

Figure 3- Application of gaussian filter

Figure 3 shows the application of the gaussian filter. which helps in removing the gaussian noise in the image and then making the image noise free. The application of gaussian filter takes place right after mean filter i.e., after balancing the intensities of the pixels.

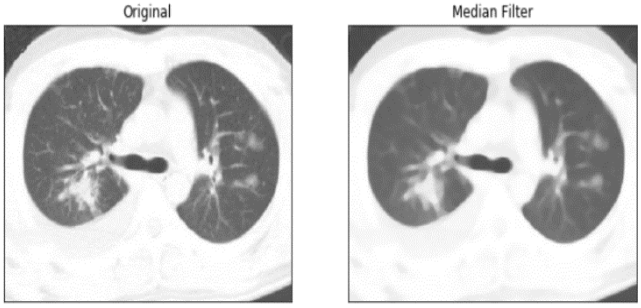

Figure 4: Application of Median filter

Figure 4 shows the image in the left is the original image and at the right is the image which is filtered by using median filter. The noises which are filtered here are salt and pepper noises.

4. CONCLUSIONS

Up to now, a total of 433 CT Scan images have been examined for the prediction of COVID-19 using deep learning methods. This article emphasizes the importance of the filtering techniques in COVID-19 prediction system. Noises present in the image makes image unclear and blurry. This can cause multiple obstacles in pre-processing techniques. These noises can be reduced by using some filters.

Hence, in this paper we have discussed three kinds of filters i.e., mean, median and gaussian filters. By using these filters, the output achieved with good result and accuracy of 99.9%.

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