

# Various Feasible Maneuvers for the Analysis of an Image for Retrieval of Information and Optimization

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**Abstract-** Image Processing in the present scenario is becoming a vital tool in many fields of medical imaging in which the primary objective is for the diagnosing of a disease and aids to predict various stages. In this paper, the different methods of image processing and variety of tactics for the image analysis are proposed. Through image processing various operations such as determining image values, optimizing contrast, color correction, correcting non-uniform illumination, Geometric transformations, image arithmetic and many other neighborhood operations are possible to carry over. Processing of the images not only in the time domain but also in the frequency domain is done for extraction of more information. By forming binary images with the separation of background images, the features of principle images can be obtained. Thresholding, Morphological operations, Boolean operations are some of the analysis techniques used in this paper. Global measurements, feature measurement and classifications are the continuous steps followed by thresholding so that the complete information resided in an image can be precisely extracted.

**Keywords – Contrast, Illumination, Geometric transformation, Neighborhood operation, Morphological operation**

## I. INTRODUCTION

Among all the five physical senses of human being, seeing sense gets more importance than any other. Our brain observes much when any information is available in the form of visible signals. At that time of seeing an image, our brain will capture the information as a photograph taken by our eyes then it is taken for realization. In general all available images are in analog format on which a limited number of processing is only possible.

Image Processing is basically a method to convert analog signal into digital form and to perform some operations on it in view of getting an enhanced image and to extract some useful information from it. Image Processing has become an advanced research topic in engineering and computer science disciplines. Particularly in medical field it plays a vital role as it is used to identify different stages of dangerous diseases and for proper diagnosis. Many such areas of application includes

- Medical image processing
- Feature detection, extraction, and analysis
- Face detection
- Computer vision
- Speech recognition
- Speech synthesis
- Speech compression
- Remote sensing
- Audio noise suppression
- Automated map analysis
- Blind Source Separation

## II. IMAGE PROCESSING OPERATIONS

*It includes various types of operations like Pixel Operations, Arithmetic Operations, Logical Operations, Local Operations and Segmentation. Each different operation has distinct purpose and results.*

### A. Pixel Operation

#### i. Converting Color image into BW image:

*Some of the Arithmetic and all Logical operations need the image to be converted into Black and White pixels since it needs only Binary information in which the black color represents bit '0' and white color represents bit '1'. The figure 1 shows this operation.*



Fig. 1. Color image and BW image

#### ii. Inversion of an image:

*Some of the processing needs complement of the image for further analysis. This operation is done by subtracting the brightness value of each and every pixel from 256 which is the equivalent value of maximum brightness. The result obtained for this operation is given in figure 2.*



Fig. 2. Image and its inversion

#### iii. Adjusting the Brightness value:

*To have a clear analysis of variations the brightness value of range to a different one. The figure 3.*



*medical images are output for this*



*for finding minute increased by fixing the operation is shown in*

Fig. 3. Low and higher brightness images

#### iv. Finding Histogram Value of an Image:

*The Brightness information and how it is distributed are indicated by the Histogram of an image. Particularly for a grayscale image the distribution of pixels are given by the Histogram which is above the gray scale as given in figure 4.*



Fig. 4. Image and its Histogram Value

#### iv. Increasing the Contrast value of an Image:

*The equalization of pixels through their equivalent Histogram values, contrast of the image gets increased. Figure 5 shows the result.*



Fig. 5. Image and its contrast modified image

v. *Resizing of an Image:*

**An image taken in any of the size can easily be resized with different dimension. Figure 6 shows the corresponding result.**



Fig. 6. Original size image and resized image

**B. Arithmetic Operations**

i. *Addition of two images:*

**Images with equal size can be added and the resultant signal will have the brightness value which is the sum of their individual pixel brightness values. If both the images are with different sizes, then any of the images have to be resized with the size of other image before adding. The result of this arithmetic operation is shown in figure 8.**



Fig. 7. Image X Image Y



Fig. 8. Image X + Image Y

ii. *Subtraction of two images:*

**Images with equal size can be subtracted and the resultant signal will have the brightness value which is the difference between individual pixel brightness values. If both the images are with varied sizes, then any of the images is resized with the size of other image before subtraction. The result of this arithmetic operation is shown in figure 9 for the same two input images.**



Fig. 9. Image X - Image Y

iii. *Multiplication of two images:*

**Equal sized images can be multiplied pixel by pixel and the resultant signal will have the brightness value which represents the modulation of brighter image over the darker image. If they have size variation, then any one can be adjusted to have size of other image. The result of this arithmetic operation is shown in figure 10 for the same two input images.**



Fig. 10. Image X.\* Image Y

iv. *Division of two images:*

**Equal sized images can also be divided pixel by pixel and the resultant signal will have the brightness value which represents the removal of common features from both the images. If different sizes are available,**

anyone can be adjusted to have size of other image. The result of this arithmetic operation is shown in figure 11 for the same two input images.



Fig. 11. Image X / Image Y

### C. Logical Operations

Any of the logical operation is possible with individual pixels of images. Basically all the images used for this operation should be in the form of Binary to be involved.

#### i. Logical AND of two images:

Logical AND operation results in array of logical 1 or logical 0. Whenever all the involved images are with non-zero value at that common location of pixels then the corresponding position will take result as logical 1. Figure 12 shows the result of operation.



Fig. 12. AND(Image X, Image Y)

#### ii. Logical OR of two images:

Logical OR operation results in array of logical 1 or logical 0. Whenever any one of the involved images is with non-zero value at that common location of pixels then the corresponding position will take result as logical 1. Figure 13 shows the result of operation.



Fig. 13. OR(Image X, Image Y)

#### iii. Logical NOT of an image:

Logical NOT operation results in array of logical 1 or logical 0 which as complement of that particular position. Figure 14 shows the result of operation.



Fig. 14. NOT(Image Y)

#### iv. Logical XOR of two images:

Logical XOR operation results in array of logical 1 or logical 0 whenever either of the involved images is with non-zero value and the other one is at zero level at that common location of pixels then the corresponding position will take result as logical 1. Figure 15 shows the result of operation.



Fig. 15. XOR(Image X, Image Y)

### D. Local Operations

#### i. Mean filtering of image:

With mean filter, the resultant value of a pixel is calculated from arithmetic mean of the pixel values in its neighbourhood. Basically it is a low-pass linear filter, i.e. it can be used to hinder noise. The only disadvantage

of this filter is that edges get blurred. The only parameter of this operation is the 'radius', which actually is the half side length of a square defining the neighbourhood of a pixel. The bigger the radius, the better noise is inhibited, but also the edges get more blurred (figure 16).



Fig. 16. Image with Gaussian noise and mean filtered

#### ii. Median filtering of image:

When with the median filter, the final value of a pixel is the median of the pixel values from its neighborhood. The resulting image is then free from extreme pixel values. This filter is a non-linear low-pass filter, i.e. it can be used to remove noise. The disadvantage of its usage is also the blurring of edges. The important parameter of this operation is the 'radius', which is the half side length of a square defining its neighborhood. Here also the bigger radius is preferred with the advantage of edges getting less blurred (figure 17).



Fig. 17. Image with Gaussian noise and median filtered

### E. Morphological filtering of image

#### i. Dilation operation

The dilation operation is basically a maximum filter, i.e. the resultant pixel value is the maximum among all pixel values in its neighborhood. Bright objects are obtained by this filter, which will grow by expanding them from the edges. The dilation is the complementary operation to the erosion. It is possible to select simple structuring elements with different shapes and indicate their size. This is mostly used in editing of binary images.



Fig. 18. Different stages of dilation

#### ii. Erosion operation

Erosion operation is basically a minimum filter where the new pixel value is the minimum of the pixel values from its neighborhood. Bright objects are eroded by this filter. They get shrunk by ablating them at the edges. The erosion is the inverse operation to the dilation. The main parameter for this operation is a structuring element, defining the neighborhood of a pixel. It is possible to select simple structure element with different shapes and indicate their size.



Fig. 19. Original image and Image after erosion

#### IV.CONCLUSION

The above stated operations on the images are just samples of different operations which are possible. Other than these there are countless number of operations which are possible and all cannot be included now in these few pages. These stated image operations would be basic and important operations and one can understand and make use of these results for their research works. It makes satisfied if others feel it as useful.

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