Opening and Closing in Morphological Image Processing

E.Nagesh[1], P.Sushanth[2], K. Manish[3] and D.Rambabu[4]
[1, 2, 3]*Student, Dept of Computer Science and Engineering Sreenidhi Institute of Science and Technology*
[2]*Professor, Dept of Computer Science and Engineering Sreenidhi Institute of Science and Technology*

***Abstract*—Morphological Image Processing (MIP) is a helpful technique in digital image processing because it can rigorously quantify numerous geometrical structure attributes in a way that is consistent with human perception and intuition. The core of morphologic image processing technologies is geometry. It also has a geometry structural analysis of the image. We can uncover a relationship between each component of the image. When processing a picture using morphological theory In the morphological method, an image is studied in terms of a specific geometric shape called a structuring element, which allows us to all understand the image's structural qualities. Morphological processing helps easily filter and clutter from images, as well as transform them as per the size and shape of the interesting places Because it alters the underlying geometric form of an image, Linear Image Processing is sometimes preferred over Morphological Image Processing, even though Morphological Image Processing does not damage the image's information. Dilation, Erosion, Opening, and Closing operations are used here**

***Index Terms*—Image Processing, filter and cluster, Geometric forms, Linear, Morphological**

I. INTRODUCTION

A structuring element is a specified geometric shape that is used to characterize a two-valued image. The building blocks of Morphological Image Processing Morphology are a discipline of biology that studies animal and plant form and structure. A technique for extracting significant information from images that is particularly well-suited for the gathering and description of region shapes in morphological processing.

Interaction between Morphological and a variety to operations that reduce an object toward a more revealing design by hitting or fitting it with structuring characteristics. These structural components are shape primitives that have been constructed to represent a specific characteristic of the sample or noise. Morphological transformations are implemented on data Using various algebraic configurations, apply these structuring components to it. For binary pictures in forensics, morphological image processing techniques are applied.

II. METHODS

A. Existing Method-Linear image processing

Convolution and Fourier analysis are also used in linear image processing, just as they are in conventional DSP. Because images are encoded in the spatial range rather than the frequency range, convolution is the more fundamental of the two. Linear filtering can augment images in a variety of ways, including sharpening object edges, reducing random noise, compensating for illumination variations, and de-convolution to adjust for blur and motion.

i)Convolution:

Convolution is a technique for rebuilding a image by configuring a kernel to each pixel and its local neighbor throughout the entire image. The kernel is a value matrix whose size and values control the transformation of the convolution process action.

ii)Fourier analysis:

The idea was started by Joseph Fourier

The image is decomposed into cosine components using this tool. The output image is in the Fourier or frequency domain, whereas the input image is in the spatial domain.

B. Proposed Method-standard mathematical morphology

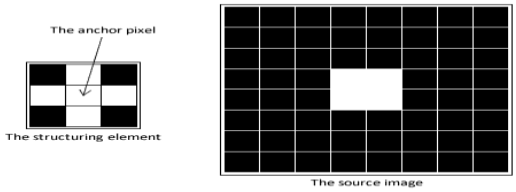
In contrast, mathematical morphology filters do nonlinear image processing. The relative rather than their numerical values, pixel values are ordered, is all that matters in these filters. When used to binary images, this trait of mathematical morphology filters makes them extremely effective (a computer image in which each pixel can only have two potential values).

III. CONCEPTS

I) STRUCTURING ELEMENT:

Square matrices are preferred more often than other types of matrices in which images are represented.

The Structuring Element is placed in every possible location in the binary image and compared to the pixel neighbourhood.



ex:

$$S1 = \begin{matrix} 1 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 1 \end{matrix}$$

II)HIT:

If any of its pixels is set to '1', a structural HIT and image are believed to be elements. The picture pixel that corresponds is also a '1'. (We also omit picture pixels where the associated structural element pixel is '0' in this case.)

III)FIT:

The structuring element is said to FIT the picture if each of the structuring element's pixels is set to '1', and the matching image pixel is also set to '1.'

IV)Erosion:

Objects shrink due to erosion. The quantity by which they shrink is determined by the structural element selected. Erosion reduces the size of removing or degrading the pixels around an object's boundaries

Fills the holes and smoothes the boundry liners

For binary images the erosion property is defined as:

$E(A, B) = A \ominus B$

Where, A is the image; B is the structuring element of order 3x3

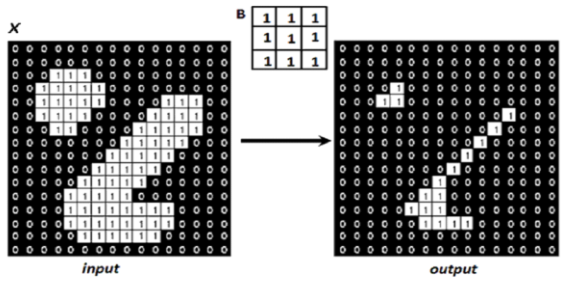


Figure 2. Effect of erosion using a 3X3 square structural element B.

V)Dilation:

Objects dilate or expand as a result of dilation. The structural factor determines the volume and manner in which they expand. By adding pixels to the margins of an item, dilation enlarges it. Dilation is a morphological technique that works on both binary and gray-scale images.. It aids in the extraction of gray-tone photos. It aids in the extraction of the image's outer edges.

Where A is the image; B is the structuring element of order 3x3.

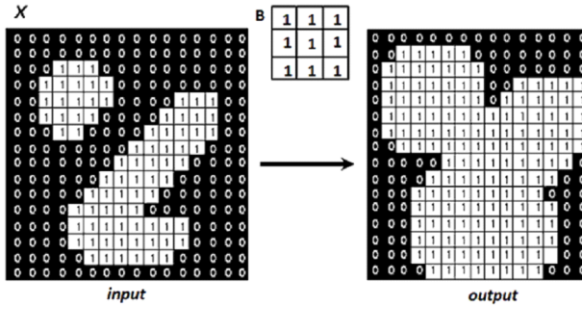


Figure 1. Effect of dilation using a 3X3 square structural element B.

V) OPENING:

opening is nothing but performing two major operations one after the other, the major operations are Dilation and Erosion.

These two operations should be performed in correct order, always erosion sholud be performed after dilation performing these operations is called opening.

This makes the image more clear

The binary formula is $A \circ B = (A \ominus B) B$

A=image, B=structring element.

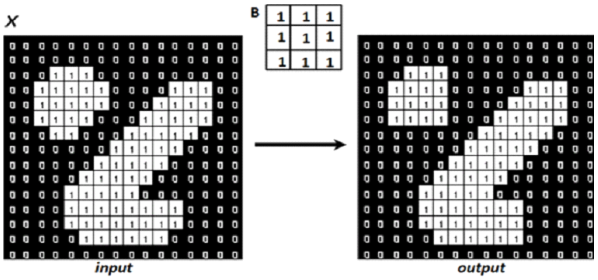


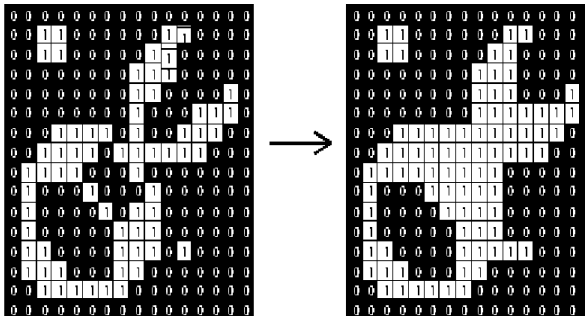
Figure 3. Effect of opening using a 3X3 square structural element B.

VI) CLOSING:

Closing is nothing but performing two major operations one after the other, the major operations are Dilation and Erosion.

These two operations should be performed in correct order, always dilation sholud be performed after erosion performing these operations is called opening

This makes the image more clear for binary inages the formula is defined as $A\bullet B = (A \quad B) \ominus B$, A=image, B=structring element.

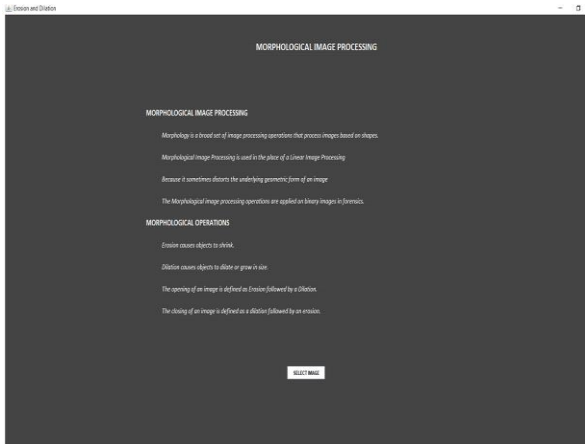


IV. IMPLENTATION

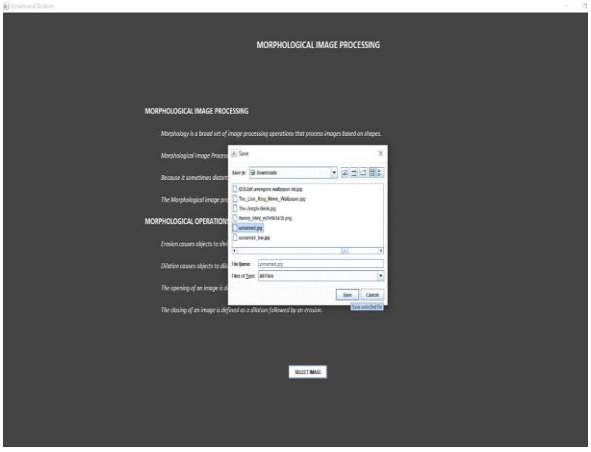
Implementation is done with the help of java,the application is coded in java with great user interface . The code can be veiwed in the following link:
ht HYPERLINK "https://drive.google.com/file/d/1C2r5_wbD3KmlHxvyMcX72U9bJa6IH7By/view?usp=sharing"tps://drive.google.com/file/d/1C2r5_wbD3KmlHxvyMcX72U9bJa6IH7By/view?usp=sharing

A) OUTPUT IMAGES:

1)Start Page:

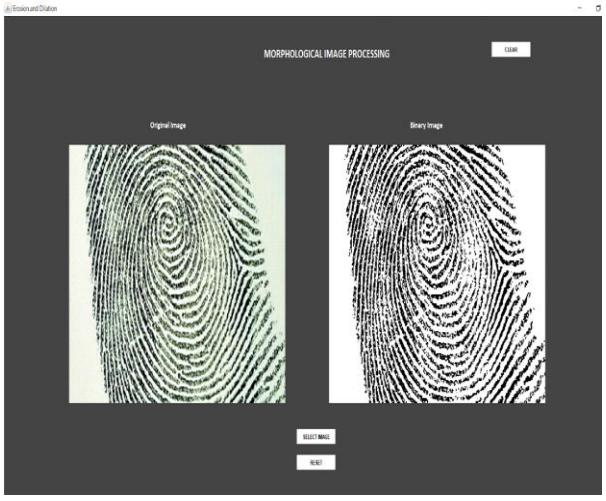


2)Image Selection:

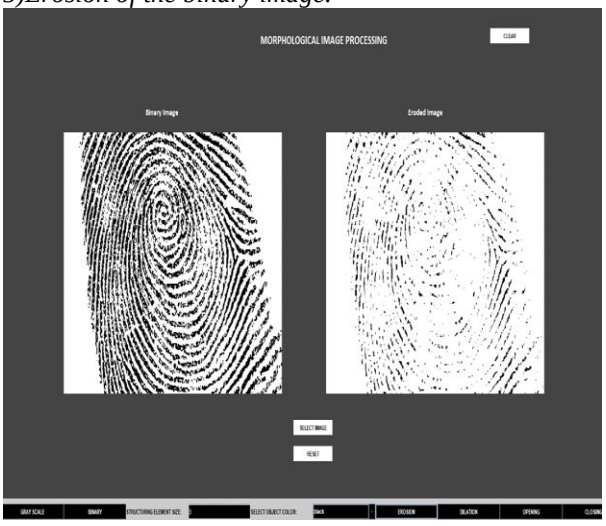


3)Conversion of original image into Gray Scale image:

4)Conversion of original image into Binary image:



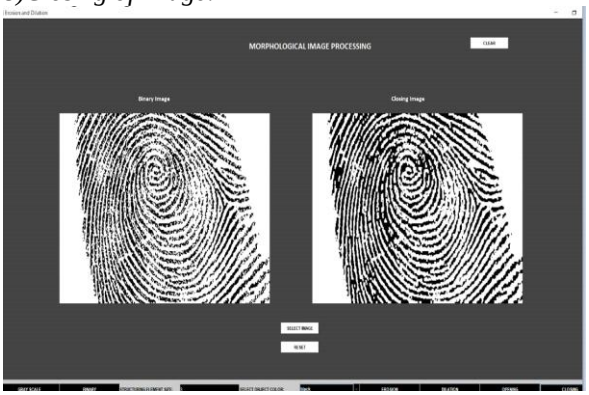
5)Erosion of the binary image:



6)Dilation of binary image:

7)Opening of the image

8)Closing of image:



VI. CONCLUSION

The foreground is preserved in the opening. The backdrop region is preserved by the closing. The morphological image processing method of opening and closing minimises noise in the image. The images can be saved and used in future CT or MRI scans have a set interslice resolution in medical imaging. Although ordinary lin-ear, cubic, or higher-degree interpolation functions can be used to construct intermediate slices, this method ignores the underlying structure of the scanned organs. The establishment of geometric correlation of features among successive pairs of scans allows for better results.

REFERENCE

[1] Wei Liu and Alexander C. Berg, “SSD: Single Shot MultiBox Detector”, Google Inc., Dec 2016.

[2] Andrew G. Howard, and Hartwig Adam, “MobileNets: Efficient Convolutional Neural Networks for Mobile Vision Applications”, Google Inc., 17 Apr 2017.

[3] Justin Lai, Sydney Maples, “Ammunition Detection: Developing a Real Time Gun Detection Classifier”, Stanford University, Feb 2017

[4] ShreyamshKamate, “UAV: Application of Object Detection and Tracking Techniques for Unmanned Aerial Vehicles”, Texas A&M University, 2015.

[5] Adrian Rosebrock, “Object detection with deep learning and OpenCV”, pyimagesearch.

[6] Mohana and H. V. R. Aradhya, "Elegant and efficient algorithms for real time object detection, counting and classification for video surveillance applications from single fixed camera," 2016 International Conference on Circuits, Controls, Communications and Computing (I4C), Bangalore, 2016, pp. 1-7.

[7] AkshayMangawati, Mohana, Mohammed Leesan, H. V. Ravish Aradhya, “Object Tracking Algorithms for video surveillance applications” International conference on communication and signal processing (ICCSP), India, 2018, pp. 0676-0680.

[8] Apoorva Raghunandan, Mohana, Pakala Raghav and H. V. Ravish Aradhya, “Object Detection Algorithms for video surveillance applications” International conference on communication and signal processing (ICCSP), India, 2018, pp. 0570-0575.

[9] Manjunath Jogin, Mohana, “Feature extraction using Convolution Neural Networks (CNN) and Deep Learning” 2018 IEEE International Conference On Recent Trends In Electronics Information Communication Technology, (RTEICT) 2018, India.

[10] Arka Prava Jana, Abhiraj Biswas, Mohana, “YOLO based Detection and a Classification of Objects in video records” 2018 IEEE

International Conference On Recent Trends In Electronics Information Communication Technology, (RTEICT) 2018, India.