Comparative Study of Morphological Operators Using Virtual Instrumentation

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Abstract: *This paper is dealing with technique for the analysis and processing of geometrical structures, based on set theory, lattice theory, topology, and random functions. Morphology is commonly applied to digital image processing, but it can be employed as well on graphs, surface meshes, solids, and many other spatial structures.The concepts such as size, shape,convexity, connectivity, and geodesic distance.The basic morphological operators are eroded, dilation, opening and closing.*

Keywords*: Image processing, Morphological operators,Labview*

1. INTRODUCTION

Morphological operations are affecting the form, structure or shape of an object. Applied on binary images black & white images – Images with only two colors like black and white. They are used in pre or post processing (filtering, thinning, and pruning) or for getting a representation or description of the shape of objects/regions. The two principal morphological operations are dilation and erosion .Dilation allows objects to expand, thus potentially filling in small holes and connecting disjoint objects. Erosion shrinks objects by etching away (eroding) their boundaries. These operations can be customized for an application by the proper selection of the structuring element, which determines exactly how the objects will be dilated or eroded.

The rapid adoption of the PC in the last 20 years catalyzed a revolution in instrumentation for test, measurement, and automation. One major development resulting from the ubiquity of the PC is the concept of virtual instrumentation, which offers several benefits to engineers and scientists who require increased productivity, accuracy, and performance.

A virtual instrument consists of an industry-standard computer or workstation equipped with powerful application software, Cost-effective hardware such as plug-in boards, and driver software, which together perform the functions of traditional instruments. Virtual instruments represent a fundamental shift from traditional hardware-centered instrumentation systems to software-centered systems that exploit the computing power, productivity, display, and connectivity capabilities of popular desktop computers and workstations. Although the PC and integrated circuit technology have experienced significant advances in the last two decades, it is software that truly provides the leverage to build on this powerful hardware foundation to create virtual instruments, providing better ways to innovate and significantly reduce cost. With virtual instruments, engineers and scientists build measurement and automation systems that suit their needs exactly (user-defined) instead of being limited by traditional fixed-function instruments (vendor-defined).

2. MORPHOLOGICAL OPERATORS

2.1 The Dilation

The dilation process is performed by laying the structuring element **B** on the image **A** and sliding it across the image in a manner similar to convolution. The difference is in the operation performed. It is best described in a sequence of steps:

1. If the origin of the structuring element coincides with a 'white' pixel in the image, there is no change; move to the next pixel.

2. If the origin of the structuring element coincides with a 'black' in the image, make black all pixels from the image covered by the structuring element.

$$A \oplus B \text{ --------(1)}$$

2.2 The Erosion

The erosion process is similar to dilation, but we turn pixels to 'white', not 'black'. As before, slide the structuring element across the image and then follow these steps:

1. If the origin of the structuring element coincides with a 'white' pixel in the image, there is no change; move to the next pixel.

2. If the origin of the structuring element coincides with a 'black' pixel in the image, and at least one of the 'black' pixels in the structuring element falls over a white pixel in the image, then change the 'black' pixel in the image (corresponding to the position on which the center of the structuring element falls) from 'black' to a 'white'.

$$A \ominus B \text{----------(2)}$$

2.3 Opening and Closing

These two basic operations, dilation and erosion, can be combined into more complex sequences. The most useful of these for morphological filtering are called opening and closing .Opening consists of an erosion followed by a dilation and can be used to eliminate all pixels in regions that are too small to contain the structuring element. In this case the structuring element is often called a probe, because it is probing the image looking for small objects to filter out of the image.

$$A \circ B = (A \ominus B) \oplus B \text{--------(3)}$$

3. METHODS

3.1 Morphological Transformation of Gray Level Images

These functions are applied to images that have more than two levels. These functions are used to modify the shape of the areas by extending the bright areas and reduce the dark areas, and vice-versa. The morphological transformation types encountered in this case are mainly the same as the ones used for the binary images: erosion, dilation, closing, opening etc.The function leads to a binary image by thresholding a gray scale image. Performs basic morphological transformations. All source images must be 8-bit binary images. The connected source image for a morphological transformation must have been created with a border (see IMAQ Create) capable of supporting the size of the structuring element as 3X3 (border=1), 5X5(border=2) and so on.
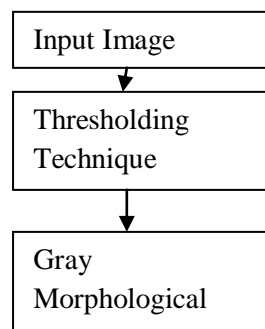
Input Image

↓

Thresholding Technique

↓

Gray Morphological

Figure 1. *Morphological Transformations*

The algorithm for Morphological operators as follows:
Step 1: Acquire the input image as medical image

Step 2:Read the input image

Step 3: Apply the Threshold techniques for the input image

Step 4: Threshold image is feedback to the morphological input image

Step 4: Apply gray level morphological operators

Step 5: Apply erode,dilate,open,close techniques

Step 6: Acquire the output image.
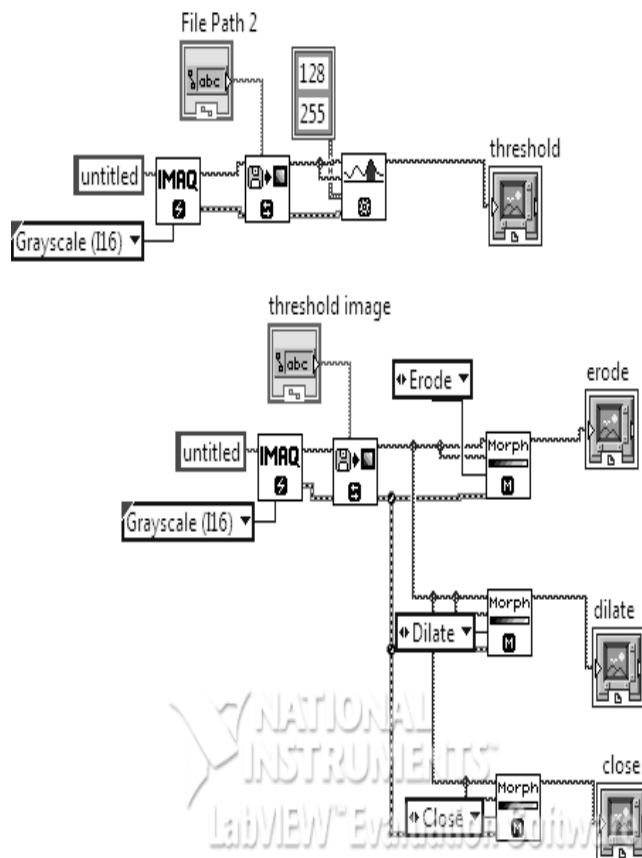
Step 7: stop

4. RESULT AND DISCUSSION

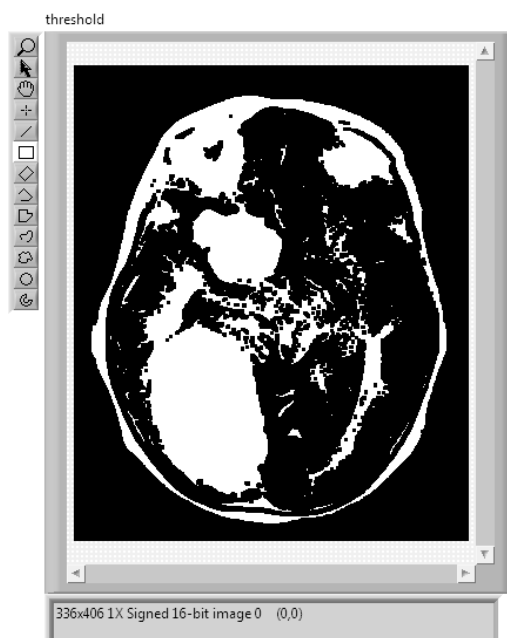**Figure 2.** *Block diagram of Morphological Transformation*

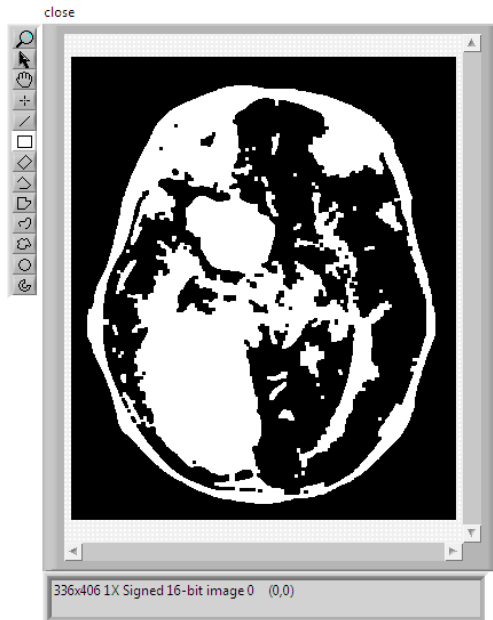
Figure 3. *Threshold output image*

Figure 4. *Close Morphological output*

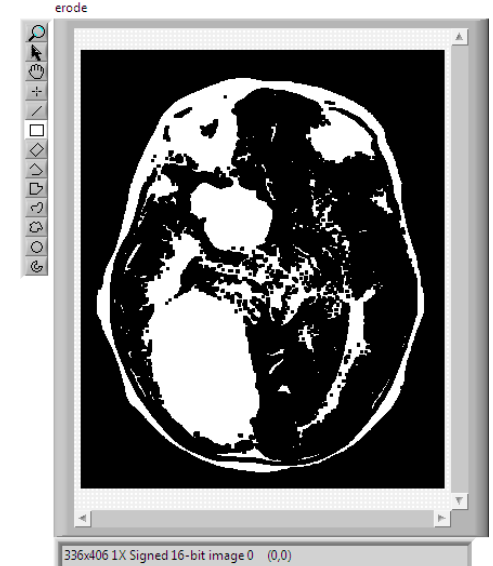**Figure 5.** *dilate Morphological output*

Figure 6. *Erode Morphological output*

The above figures show that the output of morphological operations. Here we have chosen the input image as Brain tumor image after that it can be done by thresholding techniques and finally the output of threshold image is given as morphological unit and apply various morphological operations,in this comparative analysis is carried over here.

5. CONCLUSION

In this paper, we proposed Morphological transformations using Gray level morphological for the tumor images using Labview software.This is the best technique for identifying the geometric edges in the tumor and also find the size of the tumor and future work is to be done with binary images.

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Naveeth Kumar R was born in Madurai, Tamilnadu in 1987. He received M.E degree Control and Instrumentation Engg in Anna, University of technology Coimbatore in 2011. He is currently working as an Assistant Professor in Department Of Electronics and Instrumentation Engg(KLNCE). He guided 6 UG projects and Published Conference Papers and Journals.His area of interest includes Image processing and Fuzzy logic.