Segmentation using Morphology

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ABSTRACT

- ✓ Image Segmentation plays vital role in Computer Vision and Digital Image Processing.
- ✓ It is the process of separating the digital image into distinct region(s) possessing homogeneous properties.
- ✓ The main objective of image segmentation is to extract various features of the image that are used for analysing, interpretation and understanding of images.
- ✓ Image segmentation is applied in various applications like medical imaging, shape detection, content-based image retrieval, robot vision, etc.
- ✓ Several techniques have been developed for image segmentation such as pixel-based segmentation, edge based segmentation and region based segmentation.
- ✓ Texture segmentation is the process of partitioning an image into regions with different textures containing similar group of pixels. Many types of textures are considered for analysis.

INTRODUCTION

Texture:

- ✓ A repeating pattern of local variations in image intensity, that is spatial variation in image intensity that I am considering.
- ✓ It is characterized by the spatial distribution of intensity levels in a neighbourhood and the texture cannot be defined for a point.
- ✓ A feature used to partition image into regions of interest and to classify those regions, that is, I can use the texture features.
- ✓ And the texture provides information on in the spatial arrangement of colour or intensities in an image.
- ✓ you can see, in this example, an image has 50 percent black and 50 percent white distribution of pixels.

- ✓ And texture consists of the texture primitives. The texture primitive is called the Texels.

Texels:

- ✓ A group of pixels having homogeneous property that is called the Texels.
- ✓ Based on the pixels, These are defined into different types of textures:

1. the fine textures
2. course textures
3. grain textures
4. smooth textures.

Texture Analysis:

- ✓ There are 4 primary issues in texture analysis,

1. texture classification
2. texture segmentation
3. texture synthesis,
4. shape from textures.

- ✓ So, we can consider these research directions in computer vision & Digital image processing.

TEXTURE ANALYSIS

- **Texture classification** is concerned with identifying a given textured region from a given set of texture classes.
  Each of these regions has unique texture characteristics.
  Statistical methods are extensively used.
  (e.g. GLCM, contrast, entropy, homogeneity)
- **Texture segmentation** is concerned with automatically determining the boundaries between various texture regions in an image. Partition into different regions where the texture is homogenous.
- **Texture synthesis** is the process of algorithmically constructing a large digital image from a small digital sample image by taking advantage of its structural content. Given a finite sample of some textures, the goal is to synthesize other samples from that texture.
- **Shape from texture:** Texture pattern variations give cue to estimate shape of a surface.

TEXTURE SEGMENTATION

- ✓ Texture segmentation has long been an important task in image processing.
- ✓ Basically, it aims at segmenting a textured image into several regions having the similar patterns.
- ✓ An effective and efficient texture segmentation method will be very useful in applications like the analysis of aerial images, biomedical images and seismic images as well as the automation of industrial applications.
- ✓ Like other segmentation problems, the segmentation of textures requires the choice of proper texture-specific features with good discriminative power.
- ✓ Generally speaking, texture feature extraction methods can be classified into three
  major categories, namely, statistical, structural and spectral.
  - Statistical: In statistical approaches, texture statistics such as the moments of the Gray-level histogram, or statistics based on Gray-level co-occurrence matrix are computed to discriminate different textures.
  - Structural: In structural approaches, “texture primitive”, the basic element of texture, is used to form more complex texture patterns by applying grammar rules, which specify how to generate texture patterns.
  - Spectral: In spectral approaches, the textured image is transformed into frequency domain. Then the extraction can be done by analysing the power spectrum.

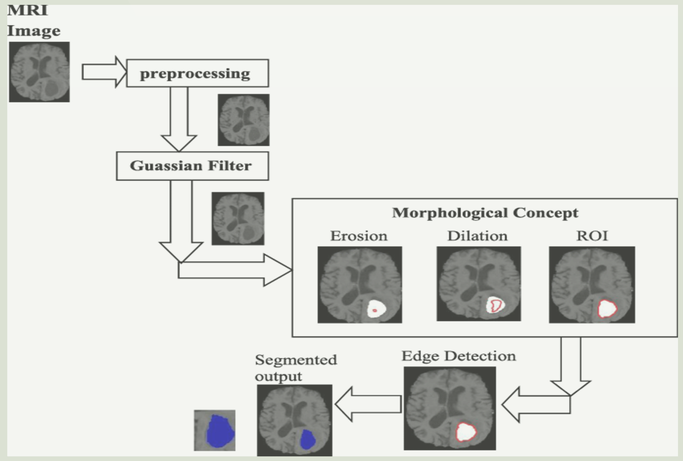

IMAGE: PRACTICAL USE OF MORPHOLOGICAL CONCEPT

METHODOLOGY

- For this particular demonstration purpose I have taken an gray scale image.
- In gray scale image looking two types of objects one is smaller and bigger black color
- You can now simply visualize one border line or one defined in between these two different state
- Now we want to flow of these by using morphological operation
- Now point to be noted here is our object is black and background is white that is differ thing of the morphological operation generally we took
- So, whenever we get these kind of situation to cooperate compliment but this is gray scale image properly we cant say compliment here we take maximum negative of this particular gray scale image
- Object is black and background is white then for differ morphological operation that required reverse thing
- Now to make one border line dividing these two differ texture
- One way is to redeem of all these small circles present in the left hand side
- I want to remove for small object but one to keep larger object remain in that .
- Generally we apply opening so erosion will remove for smaller objects but due to application of dilution what ever sinking happen due to in larger object to get back to original size
- So generally we apply opening but as here object is black first apply closing and then choose our this step structure element radius that radius is more than of small object but then structural element is lesser than these larger binary objects
- 7th line is structuring element of these step having radius 19 took in hit or trail method [particular radius must take where the smaller object will remove]
- 8th line is to closing the smaller objects generally we must take opening but we took closing because the object is black
- Now we want the border line so we join all this .bigger object to for one complete black part in this particular right hand side
- For joining we use closing but we used opening. For opening these side the structuring element is very high side so that all these white part presenting in between of all the objects also smaller
- So now output of the image is not complete black so now we convert ed into im binary for 0.9 for very high for thresholding for that the gray type will became black
- So now we can observe in the output image how border line is detected
- Now I want to plot the boundary part of original image to segment goes to texture.
- Now we will calculate the boundary
- We applied black white theory to get the boundary or perimeter or apply morphological operation that is original image imrode image.
- These step approaches will show that if we increase the value it will show the boundary thicker or else boundary will thinner .
- For superimpose our original image that inbuilt function ‘inbuilt over lay 'to boundary for that we gave color to boundary so for that we use ‘color map’[1 0 0].

RESULTS/OUTPUTS

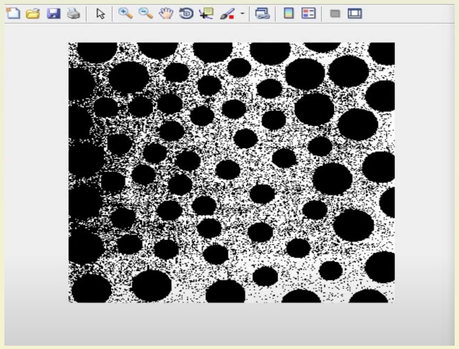

FIGURE-1(ORG)

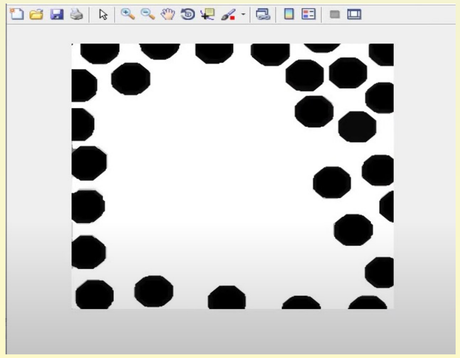

FIGURE-2

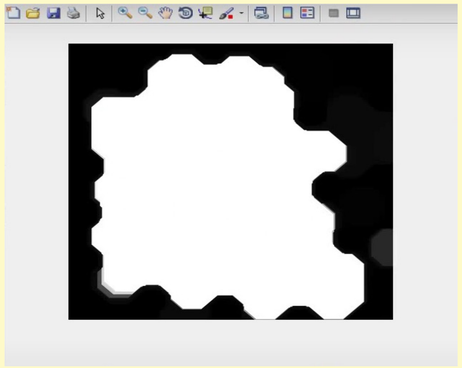

FIGURE-3

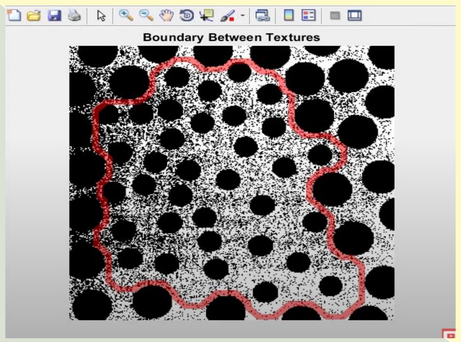

FIGURE-4 (FINAL O/P)