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Concept of Neural Networks in Image Processing

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ABSTRACT

Image Processing is the scrutiny and manipulation of a digitized image, in order to advance its feature. To forward the images over the network thinning (skeletonization) is done so as to reduce the processing time and to remove the image noise and unimportant features. Thinning mainly reduces thick digital image into thin skeleton. There are many thinning algos (like ZS algorithm that is Zheng and Suen algorithm) for getting a thinned image of a binary image. Neural networks are widely used in computer programming. They are used for pattern recognition and in biometric concepts. Neural network is based on giving multiple inputs and it learn from the past experiences but in this it is very difficult to code and give some instructions finally we will get some output on the basis of the input we are given.

In this paper, we propose thatusing neural network with skeletonization will help to get the better results to provide image without erosion, noise and reduction.

INTRODUCTION

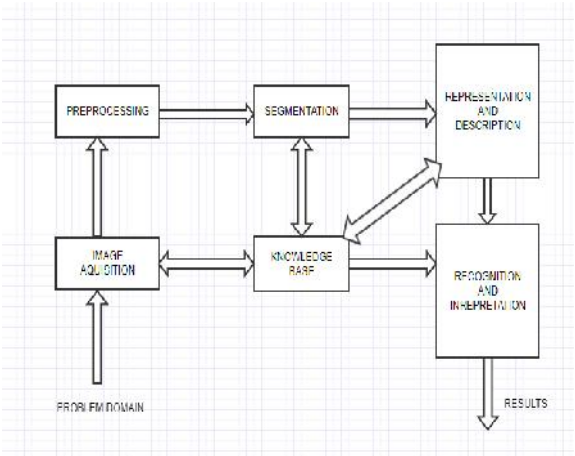
In image processing, image thinning is anessential preprocessing phase that has a vivacious character in numerous applications for instance pattern recognition, finger print classification, and medicalapplications. The thinning process converts a binary image(i.e. input) into a skeleton by tumbling the original image which comprisesvaried thicknesses to a thinned representation.

Purpose of Image Processing

The purpose of image processing is alienated into five groups. They are:

- Visualization: To observe that points which are not directly seen.
- Image sharpening and restoration: To get the image better in terms of noise and many more
- Image retrieval: Seeking the interest of the image
- Measurement of pattern: It helps to measure the points and objects in the image. For example in fingerprint classification.
- Image Recognition: To distinguish various points and objects that is in the image.

Fundamental Steps of Digital Image Processing:



Fundamental Steps of Digital Image Processing

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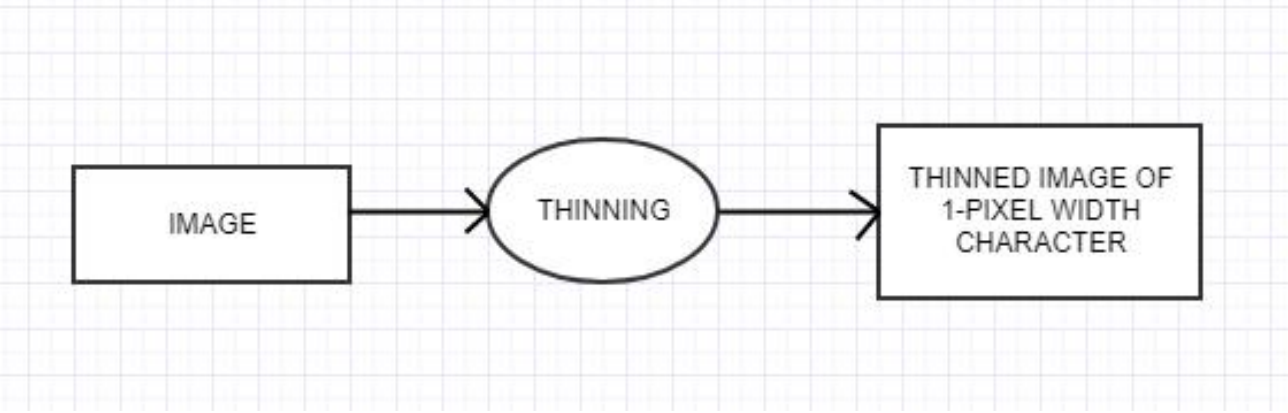
Problem Domain gives the input to the image acquisition.

- Image Acquisition: In this step the image is converted from the digital to analog form with the help of sensor image but the pre requirement is that image must be is in analog form.
- Pre-processing: After image enhancement and restoration pre-processing is done before segmentation. For extracting the components tools are used for the representation and proper shape of the image.
- Segmentation: Segmentation divides the image into its constituent and objects. When the object inaccessible in interested applicant then segmentation stops.
- Representation and Description: The output of the segmentation of the image is followed by this step. In representation decision is made which data should be used either boundary or complete.
- Boundary representation tells about the external parts like corners.
- Complete representation tells about the internal parts or shapes like texture.
- Representation transforms raw data into suitable form of processing.
- Description: It tells about the features of the selection with the help of attributes.
- Reorganization and Interpretation: It assigns the labels to the objects based upon some information according to its description.
- Knowledge Base: In the form of knowledge database, knowledge about problem domain is coded into image processing

Applications of Digital Image Processing

- Agricultural: This is widely application as the main use is in control of harvest, grading of food. The processing is done to check which quality of seeds are better and to compare the results so as to get better production.
- Communication: In this we consider mainly the video conferencing and the audio communication .In video conferencing image processing is used for face detection whereas for audio for speech recognition.
- Character Recognition: In this printed document and hand-written documents are recognized easily.

Skeletonization



Skeleton is significant shape descriptors in object demonstration and recognition. Skeletonization is the outcome of the thinning process. Goodness of the skeletonization is measured by the amount of skeleton extracted retain the topology of the shape without disturbance. Skeletonization is used in “preprocessing stage” for numerousapplications that is writer identification, script identification, (optical character recognition) OCR. The2 main approaches of skeletonization are“iterative and non-iterative approach”.

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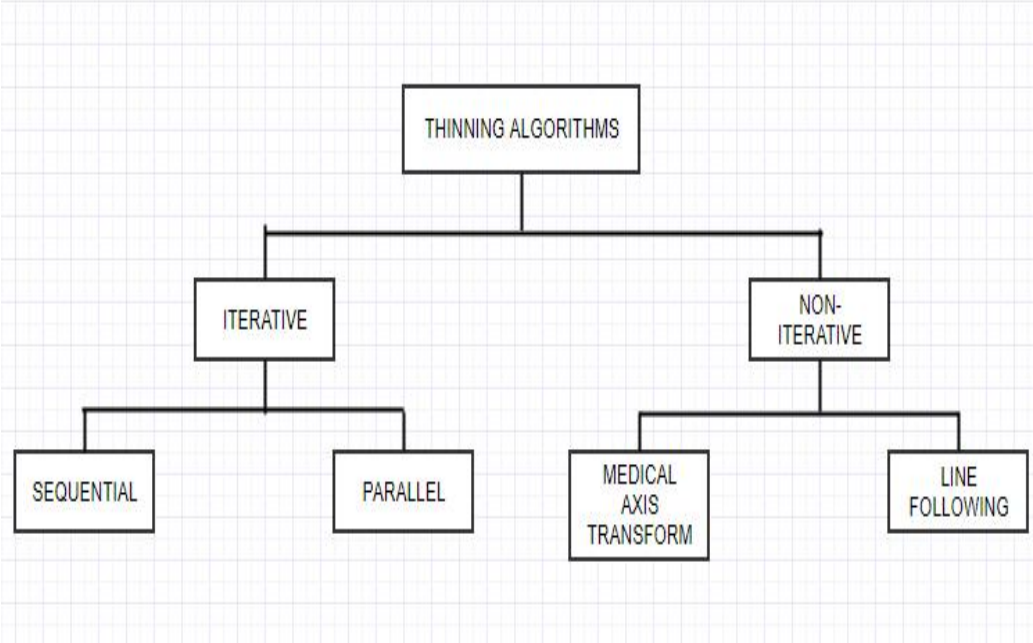

Iterative:

In each iteration, the iterative methods generate new boundary pixels by eliminating the existing boundary pixels. This process endures until skeleton is formed.

The Iterative method isalienated into sequential and parallel process by eliminating the contour pixels iteratively until it reaches to '1 pixel width'. Sequential and parallel thinning methods are alike in defining the wanted pixels or unwanted one, while different in eradicating time. In sequential the elimination of unwanted pixels starts in the recognizing wanted process. While in parallel the pixels are eliminated after recognizing all unwanted pixels.

Parallel iterative techniquecomprises 2 sub-iterations proposed by "Zhang and Suen". Contour peeling based on 8-neighbor pixels passes over each pixel. The algorithm retains the connectivity but 2-pixel width accords in some portion of a skeleton. Ahmed and Ward proposed a parallel iterative thinning method which is an enhancement of Zhang and Suen techniquebased on PTA2T template.

Manypresent thinning algorithms are parallel, but some "sequential thinning algorithms" have been projected and there is a hybrid one (i.e., removable points are marked in parallel then a sequential re–checking stage is required). In sequential, the elimination of unwanted pixels starts with the recognition of the wanted process, while in parallel the pixels are detached after recognizing all unwanted pixels.

Non-Iterative:

In this process the skeleton is produced directly without the examination of all the distinct pixels. By using this method several methods have been suggested for the extraction of skeleton, some methods are- neural networks, Voronoi diagrams and wavelet transforms.

These all algorithm performance can be measured by one factor thinning rate factor.

TR= 1- Thinning image/original image

TTC= represent total triangle count.

TTC (t) = It represent the triangle count of Thinned image.

TTC (O) =It represent triangle count of original image.

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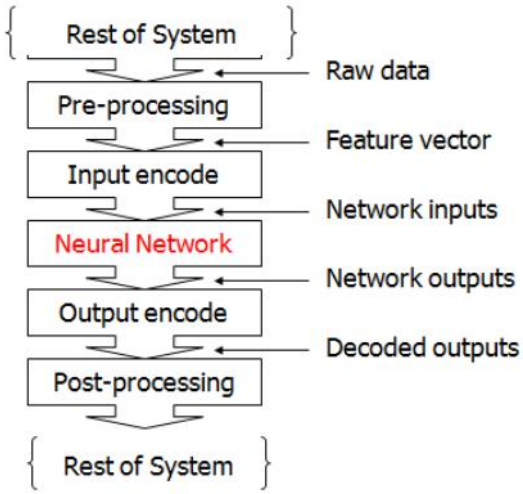
We can judge the results by saying that if TR=1 we can say that image is properly thinned. 11

TR=0 means the consequences are not up to mark as requisite or we can say that image is not appropriately thinned we have given that image output as the input next time.

Neural Networks for Skeletonization

Neural networks are mainly good enough for deriving complicated patterns that can't be done either by human or any another technique this is the main reason that we use neural network. For example:- In pattern recognition there is mainly a huge data use to process and there are very minor change in pattern we have to match in that neural network works we teach the neural in such a way that it work as "expert" in extracting the information. This technique helps us remove the thick points and stop when the extent is reached. But the main problem arises when we have to stop processing the image. This can be done by training the neural network. Neural networks learn by example. They can be trained to perform thinning operations effectively. They lessen the number of instructions which areto be executed. Hence they require less execution time and are quicker than the conventional thinning methods. They help us to remove both types of noise which cannot be removed in any type of thinning techniques.



CONCLUSION

In this we firstly discussed about the thinning process its types which are iterative and non-iterative. We will extend thinning with the help of neural network. The work done with it is very less. We give binary image as the input to the neural network. We cannot do programming which will be very complex but neural network will conclude from the last experience. If we do not use neural network with thinning algorithm it will not provide image without erosion, noise and reduction.

So, from this study we conclude that using neural network with skeletonization will help to get the better results by enhancing the Zhang and Suen algorithm.

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