Edge detection by using the Block Based Segmentation

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Abstract- Edge detection is the basic process of the image processing tool. Many methods are used for edge detection but these not suitable for all the applications. The older methods are canny edge detection, soble method and method used for image detection. The main drawback of this method is noisy condition. To overcome this problem we use block based segmentation is used. A block based segmentation algorithm for fingerprint images that employs morphological filters and a statistical measure called coefficient of variation (CV). The proposed method is performed in two passes where the foreground region, i.e., the region of interest (ROI), is coarsely separated from the background region in pass-1 based on CV and morphological open-close filters with reconstruction. In pass-2, region shrinking and merging is employed to provide further refinement in the shape of the ROI with the use of CV and average gray value. By using this technique we can minimize the noise in edge detection process.

Keywords- edge detection, Block matching method etc..

I. INTRODUCTION

Edge detection is the process in which the boundaries of the image recognized. The purpose of detecting sharp changes in image brightness is to capture important events and changes in properties of the world. In the ideal case, the result of applying an edge detector to an image may lead to a set of connected curves that indicate the boundaries of objects, the boundaries of surface markings as well as curves that correspond to discontinuities in surface orientation. The main problem in this process is that there are many factors which affect the image faces. The factors are face size, face expression, structural component and background of the image. Many other factors are also affecting the image detection. In the block matching algorithm the different pixel blocks to different degree, the contrast of the edge value of both the sides increases. It could choose different edge-detection thresholds for different contrast regions, so that it could detect the edges whose thinning degree are better.

As shown in the figure the face edges are detected. The edges are different in different condition. The advantage of edge detection is detecting all points of image in which brightness is sharply changes.

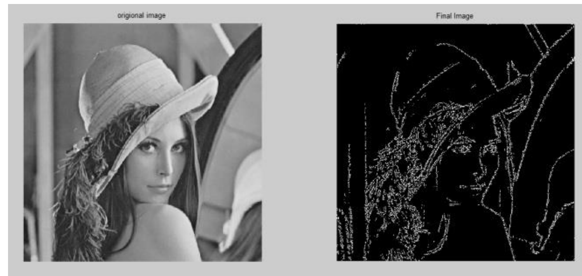

Figure 1. face edge detection.

II. BLOKED BASED SEGMENTATION

The expectation from an ideal edge detector is that any true edge point present in the image should not be messed and also the erroneously detection of any other edge point as edge should be reduced as much as possible. These two requirements are often having a trade off each other. The selection of a proper optimum threshold point is a minimum requirement of any edge detector. The threshold value should not be low as it can lead to the detection of noise as edges and also the threshold value as high causes some true edge points undetected. The SNR is improved when true edges are detected and false edges are avoided. The removal of false responses reduces the corrupted edges happened due to noise. The performance measure of edge detection operations are as follow The results can be compared visually as the eyes are behaving and acting like some sort of edge detection. Also the edge detection rate can be evaluated. The Figure of merit can also be evaluated. The canny edge detector is a combination of many steps. At first the convolution of the image with a smoothing filter (Gaussian) having standard deviation σ .Also this step is followed by a gradient computation on the resultant smoothed image. The geodesic dilation represented by

$$D_B^i(f, f_r) = \min(f \oplus B, f_r)\ i = 1,2,3, \ldots \ldots \quad (1)$$

$$E_B^i(f, f_r) = \min(f \ominus B, f_r)\ i = 1,2,3, \ldots \ldots \quad (2)$$

stopping criterion is

$$D_B^n(f, f_r) = D_B^{n-1}(f, f_r) \text{ and } E_B^n(f, f_r) = E_B^{n-1}(f, f_r)$$

Output of the last iteration known as dilation and erosion both are termed as $D_{rcc}(f, f_r)$ and $E_{rcc}(f, f_r)$.

$$D_{rcc}(f, f_r) = D_B^n(f, f_r) \quad (3)$$

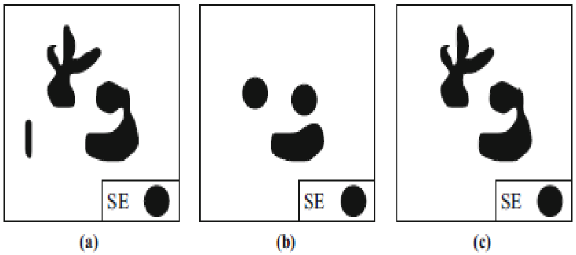

Fig. 2 Original image **b** Result of conventional openingusing a disk SE **c** Result ofopening with reconstruction using the same SE

$$E_{rcc}(f, f_r) = E_B^n(f, f_r) \quad (4)$$

Open by reconstruction and close by reconstruction both are two most important filtering operations denoted by $(f \circ B)_{rcc}$ and $(f \cdot B)_{rcc}$

$$(f \circ B)_{rcc} = D_{rcc}(f \circ B, f) \quad (5)$$

$$(f \cdot B)_{rcc} = E_{rcc}(f \cdot B, f) \quad (6)$$

Coefficient of Variation

It is defined as the amount of variability relative to the mean. It is the measure of spread. Due to less value of this it can be use in the place of SD(Standard Deviation). The main function is to compare spread data set which has different values. CV is formulated as the ratio of the standard deviation σ to the mean μ:

$$\text{Coefficient of Variation (CV)} = \frac{\sigma}{\mu} \quad (7)$$

Region Shrink–Merge

In the photo segmentation there are two very important technique Region developing and region splitting–merging, the region developing evaluated pixel smart is very popular. The region splitting merging splits or merges the image block by a block which having Quad-tree structure. As in the same manner the process for shrinking and merging based on the block traits without changing the location size as is completed in region splitting-merging technique.

Let f be a $N \times N$ that contains a set of image block $R_{GB,}$ = background

$R_{FG,}$ =foreground

Q = predefined criterion.

$R_{FG} = R_{FG} - \{R_{FG}^i\}$ if R_{FG}^iDoes not satisfy Q (8)

$R_{FG} = R_{FG} \cup \{R_{FG}^i\}$ if $\exists R_{neb}^j \in R_{BG}$ Satisfy Q $i \neq j$ (9)

Here $R_{FG}^j \in$ four or eight neighbor of R_{BG}^i

III. PROPOSED WORK

Combined Proposed Method

The complete process explains by the help of fingerprint image. The edges of the images are filtered out.

Selection of ROI Using CV

Take a fingerprint input in matrix form .the size of the matrix will be $N \times N$. Then selection of ROI will be done with the block wise CV.

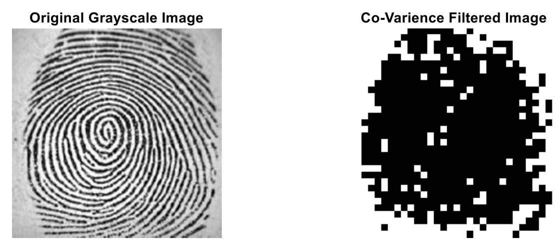

Fig. 3 Original image b) Primary selection of ROI using CV

Local CV is denoted by CV_L^i. Global CV is denoted byCV_G, that define the average of all the locally CV as;

$$CV_G = \sum_i^k i = 1 \; CV_L^i \quad \text{where}, k = \frac{N \times N}{n \times n} \quad (10)$$

Each sub image block represented by

$$f_{sub} \in \begin{cases} R_{FG} \text{if} \left(\frac{CV_L^i}{CV_G}\right) \leq 1 \\ R_{BG} \text{ otherwise} \end{cases} \quad (11)$$

Here $i = 1,2, \dots, k$.

The selection process of ROI based on CV affected by some previous area .so for remove the above problem a term is applied called connected factor. This factor is applied to the ROI and results are shown in figure 4. The connected factor represented by CC

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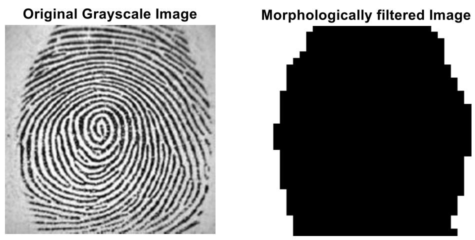

Fig. 4 Original image b) Primary selection of ROI using morphological filters

Selection of ROI Using Morphology

Main function of Morphology to reconstruction process which is used to find out the ROI from an input image. The input image is open in SE B1 and the output image is open as reconstruction in SE B2. Both are provide the circular path. The noisy pixel will be removed and the region have low contrast also removed, The output produces a blurred version of the input image by using the CV. It is noted that $B1 > B2$.

After the morphologically filtered image is divided into k sub-image blocks, $f_{sub}(n \times n)$, which calculate local average gray value.

$$AGV_L^i = \frac{\sum_{p=0}^{n-1}\sum_{q=0}^{n-1} f_{sub}^i\,(x_p, y_q)}{n \times n} \text{ where } i = 1, .. k \quad (12)$$

The set of local average gray values as:-

$$ACV_G = \sum_{i=1}^{k} AGV_L^i \quad (13)$$

For removing ROI, threshold value T set as is the ratio of AGV_L^i and ACV_G.

$$f_{sub} \in \begin{cases} R_{FG} \text{ if } T \leq 1 \\ R_{BG} \text{ otherwise} \end{cases} \quad (14)$$

Combining the Region of Interest

We obtained two areas by specific filtering techniques, these result can combined and we obtained the combined ROI. The complete process is shown in the figure. 5

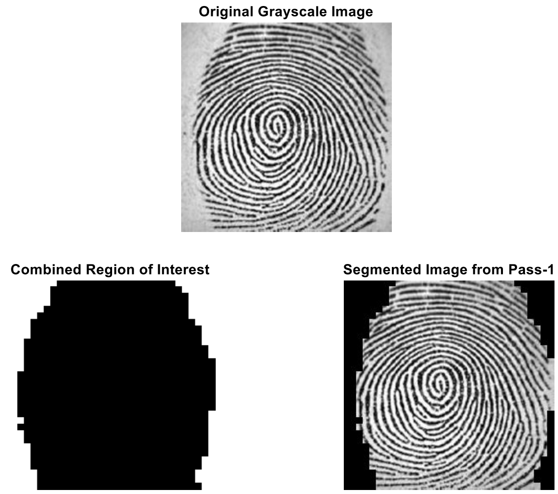

Fig. 5 Original image b) Combined ROI c) segmented image

IV. RESULTS

By using above methods the image which we obtained looks better. The comparison will be done with the other methods one by one. The testing case on the Gaussian noisy image, Canny filter image, sobel filtered image and salt & peeper noisy image. Above said method have many disadvantages like canny filter required a grey scale image as an input and sobel filter required high frequency across the edges. Some examples are shown below.

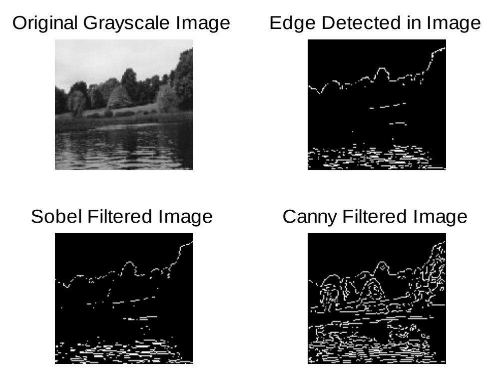

Fig.6 Original grayscale image

The image which is shown in figure 6 take as a input for the other methods and then find out the results one by one. Firstly Gaussian noisy image can be obtained

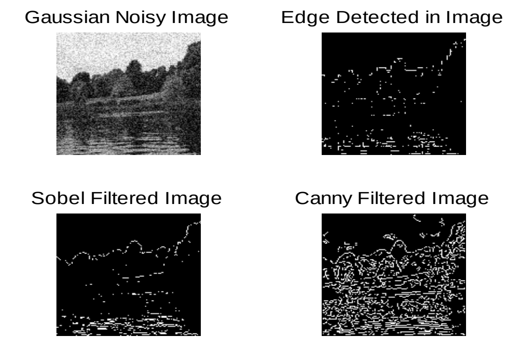

Fig.7. Gaussian noisy image

After that the output of sobel filtered image is obtain.

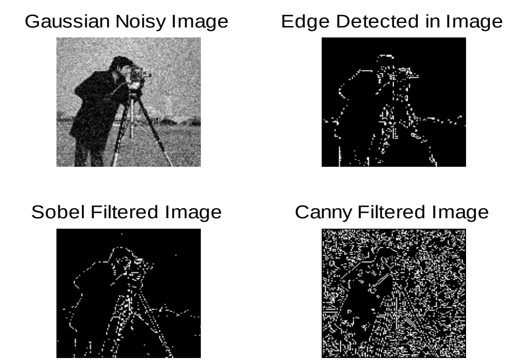

Fig.8 .Sobel filtered image

The next case will be Canny edge detector method and the output is shown in the figure 9

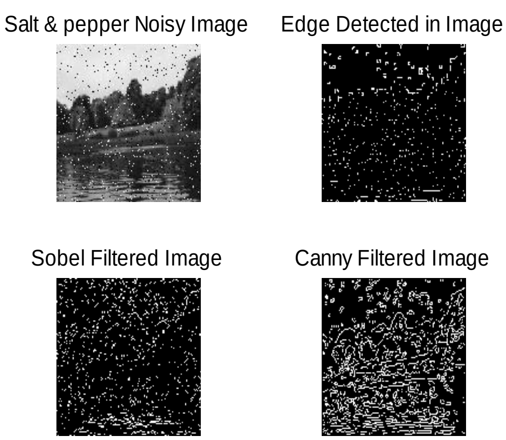

Fig.9. Canny filtered image

The next observation is salty and peeper noisy image

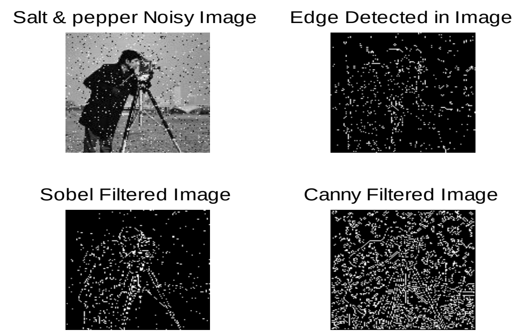

Fig.10.Salt & pepper noisy image

Then we take another image as a input which has edges. This image is also give the same result.

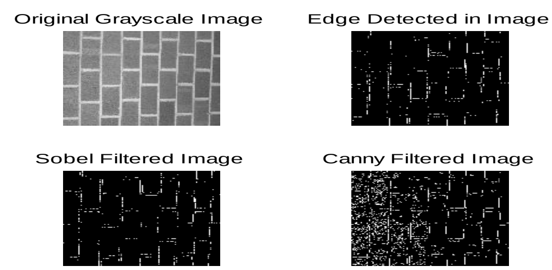

Fig.11.Original gray scale image

The output of Gaussian noisy image is shown below.

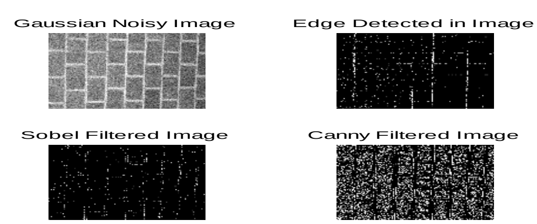

Fig 12.Gaussian noisy image

The output of canny filtered image is shown in figure 14.

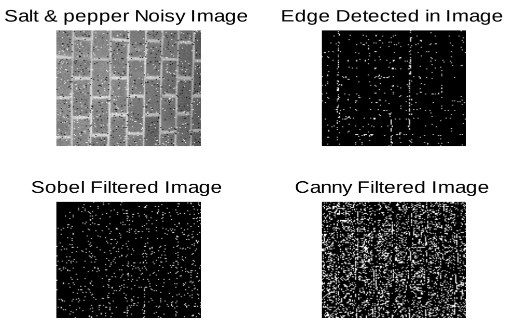

Fig.14.Canny filtered image

Some salt and pepper noisy image take as input which gives better result than this. The edges which are found by the above filters are not efficient and accurate. For better results we can use other image as a input.

V. CONCLUSION

In this paper we present the blocked base matching method for detection the edges of the image. The results are better than the previous methods like Canny edge detector or Gaussian noisy detector. Different examples are shown in the curve where the input is changed and with respect to the input output results are differ. The edges found by this method are accurate. Then other method comparison is also shown in the above figures.

VI. REFERENCES

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