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INVESTIGATION OF NOISE SENSITIVITY IN BY COMPARATIVE STUDY OF PEEK NOICE RATIO OF SOBEL, CANNY, PREWITT, ROBERT AND CANNY

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Abstract: Edge may be defined as discontinuities in image intensity from one pixel to another. Edges for an image(picture) are always the important characteristics that offer an indication for a higher frequency. Edges are boundaries between different textures. Edge detection is an image(picture) processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. Edge detection is used for image(picture) segmentation and data extraction in areas such as image(picture) processing, computer vision, and machine vision. Common edge detection algorithms include Sobel, Canny, Prewitt, Roberts, and fuzzy logic methods.

Keywords: Edge detection, Canny Edge detection, Sobal operator

[I] INTRODUCTION

The points at which image(picture) brightness changes sharply are typically organized into a set of curved line segments termed *edges*. The same problem of finding discontinuities in 1D signals is known as step detection and the problem of finding signal discontinuities over time is known as change detection. Edge detection is a fundamental tool in image(picture) processing, particularly in the areas of feature detection and feature extraction. Edge information in an image(picture) is found by looking at the relationship a pixel has with its neighborhoods. If a pixel's gray-level value is similar to those around it, there is probably not an edge at that point. If a pixel's has neighbors with widely varying gray levels, it may present an edge point.

Fig 1. Before Edge Detection

Fig 2. After Edge Detection

[II] EDGE DETECTION METHODS

- Many are implemented with convolution mask and based on discrete approximations to differential operators.
- Differential operations measure the rate of change in the image(picture) brightness function.
- Some operators return orientation information. Other only return information about the existence of an edge at each point.

Roberts Operator

- Mark edge point only
- No information about edge orientation

- Work best with binary images
- Primary disadvantage:
  - High sensitivity to noise
  - Few pixels are used to approximate the gradient

Implementation of Robert

```
a=imread('tulips.jpg');
b=im2double(a);
[m,n]=size(a);
L(1:m,1:n)=0
for i=1:m-2;
   for j=1:m-2;
      L(i,j)=-1*b(i,j)+0+0+1*b(i+1,j+1);
   end;
end;

M(1:m,1:n)=0
for i=1:m-2;
   for j=1:m-2;
      M(i,j)=0-1*b(i,j+1)+1*b(i+1,j)+0;
   end;
end;

figure;
subplot(2,2,1)
imshow(L)
title('Robert    Gx');
subplot(2,2,2)
imshow(M)
title('Robert    Gy');
N=M+L;
subplot(2,2,3)
imshow(N)
title('Robert    Gx+Gy');
subplot(2,2,4)
imshow(b)
title('Original Image');
```

Prewit Operator

The masks are as follows

$$y=\begin{bmatrix}-1 & -1 & -1\\ 0 & 0 & 0\\ 1 & 1 & 1\end{bmatrix} \qquad x=\begin{bmatrix}-1 & 0 & 1\\ -1 & 0 & 1\\ -1 & 0 & 1\end{bmatrix}$$

Edge Magnitude = $\sqrt{x^2+y^2}$

Edge Direction = $\tan^{-1}\left[\frac{y}{x}\right]$

```
%PREWIT
N(1:m,1:n)=0
for i=1:m-2;
   for j=1:m-2;
      N(i,j)=-1*b(i,j)-1*b(i,j+1)-
1*b(i,j+2)+0+0+0+1*b(i+2,j)+1*b(i+2,j+1)+1*b(i+2,
j+2);
   end;
end;
O(1:m,1:n)=0
for i=1:m-2;
   for j=1:m-2;
      O(i,j)=-1*b(i,j)+0+1*b(i,j+2)-
1*b(i+2,j)+0+1*b(i+1,j+2)-
1*b(i+2,j)+0+1*b(i+2,j+2);
   end;
end;
figure;
subplot(2,2,1)
imshow(N)
title('Prewit    Gx');
subplot(2,2,2)
imshow(O)
title('Prewit    Gy');
Z=N+O;
subplot(2,2,3)
imshow(Z)
title('Prewit    Gx+Gy');
subplot(2,2,4)
imshow(b)
title('Original Image');
```

Sobel Operator

- Looks for edges in both horizontal and vertical directions, then combine the information into a single metric.
- The masks are as follows:

$$y=\begin{bmatrix}-1 & -2 & -1\\ 0 & 0 & 0\\ 1 & 2 & 1\end{bmatrix} \qquad x=\begin{bmatrix}-1 & 0 & 1\\ -2 & 0 & 2\\ -1 & 0 & 1\end{bmatrix}$$

Edge Magnitude = $\sqrt{x^2+y^2}$

Edge Direction= $\tan^{-1}\left[\frac{y}{x}\right]$

Implementation

```
%SOBEL
P(1:m,1:n)=0
for i=1:m-2;
   for j=1:m-2;
      P(i,j)=-1*b(i,j)-2*b(i,j+1)-
1*b(i,j+2)+0+0+0+1*b(i+2,j)+2*b(i+2,j+1)+1*b(i+2,
j+2);
   end;
end;


R(1:m,1:n)=0
for i=1:m-2;
   for j=1:m-2;
      R(i,j)=-1*b(i,j)+0+1*b(i,j+2)-
2*b(i+1,j)+0+2*b(i+1,j+2)-
1*b(i+2,j)+0+1*b(i+2,j+2);
   end;
end;

 figure;
subplot(2,2,1)
imshow(P)
title('Sobel   Gx');
subplot(2,2,2)
imshow(R)
title('Sobel   Gy');

Y=P+R;
subplot(2,2,3)
imshow(Y)
title('Soble  Gx+Gy');
subplot(2,2,4)
imshow(b)
 title('Original  Image');
```

[III] PROPOSED WORK

Canny edge detector have advanced algorithm derived from the previous work of Marr and Hildreth. It is an optimal edge detection technique as provide good detection, clear response and good localization. It is widely used in current image(picture) processing techniques with further improvements.

[IV]OBJECTIVE OF RESEARCH

Objective of research is to High light the benefit of canny edge detection over traditional edge detection schemes. On analyzing all these edge detection techniques , it is found that canny gives optimum edge detection .Following are the some points throwing light on the advantages of canny edge detector as compared to other detectors discussed in this research:

1. **Less Sensitive to noise:** As compared to classical operators like Prewitt, Robert and Sobel canny edge detector is less sensitive to noise. Its uses Gaussian filter which removes noise at a great extent as compared to above filters. LoG operator is also highly sensitive to noise as differentiate twice in comparison to canny operator.

2. Remove streaking problem: The classical operators' like Robert uses single thresholding technique but it results into streaking. Streaking means, if the edge gradient just above and just below the set threshold limit it removes the useful part of connected edge, and leave the disconnected final edge.

3. **Adaptive in nature:** Classical operators have fixed kernels so cannot be adapted to a given image(picture) while the performance of canny algorithm depends on variable or adjustable.

[V] PEAK NOICE RATIO

The psnr function implements the following equation to calculate the Peak Signal-to-Noise Ratio (PSNR):

$$PSNR=10\log_{10}(peakval^2/MSE)$$

where *peakval* is either specified by the user or taken from the range of the image(picture) datatype

```
function psnr= PSNR(X,Y)
%Calculates the Peak-to-peak Signal
to Noise Ratio of two images X and
Y
[M,N]=size(X);
m=double(0);
X=cast(X,'double');
Y=cast(Y,'double');
for i=1:M
    for j=1:N
        m=m+((X(i,j)-Y(i,j))^2);
    end
end
m=m/(M*N);
psnr=10*log10(255*255/m);
```

psnr

Robert

>>imgr=imread('Robert.jpg')

```
>> A=imnoise(imgr,'salt & pepper',0.02);
>> PSNR(A,imgr)

psnr =

   20.2791


ans =

   20.2791
```

Previt

>>imgr=imread('previt.jpg')

```
>> A=imnoise(imgp,'salt & pepper',0.02);
>> PSNR(A,imgp)

psnr =

   20.2887


ans =

   20.2887
```

Sobel

>>imgs=imread('sobel.jpg')

```
>> A2=imnoise(imgs,'salt & pepper',0.02);
>> PSNR(A2,imgs)

psnr =

   20.3643


ans =

   20.3643
```

Traditional canny (Single Threshold)

```
>> PSNR(A5,imgoc)

psnr =

   21.2878
```

Canny(Dual Threshold)

```
>> PSNR(A5,imgc)

psnr =

   21.3420


ans =

   21.3420
```

[VI]FUTURE SCOPE AND CONCLUSION

It finds practical application in Runway Detection and Tracking for Unmanned Aerial Vehicle, in brain MRI image, cable insulation layer measurement, Real-time facial expression recognition, edge detection of river regime, Automatic Multiple Faces Tracking and Detection. Canny edge detection technique is used in license plate reorganization system which is an important part of intelligent traffic system (ITS), finds practical application in traffic management, public safety and military department. It also finds application in medical field as in ultrasound, x –rays etc.

It is consider as optimal edge detection technique hence lot of work and improvement on this algorithm has been done and further improvements are possible in future as an improved canny algorithm can detect edges in color image(picture) without converting in gray image, improved canny algorithm for automatic extraction of moving object in the image(picture) guidance.

In this research we have studied and evaluate different edge detection techniques. We have seen

that canny edge detector gives better result as compared to others with some positive points.
It is less sensitive to noise, adaptive in nature, resolved the problem of streaking, provides good localization and detects sharper edges as compared to others.

References

1. The Technology of Night Vision by Harry P. Montoro, ITT Night Vision http://www.photonics.com/EDU/Handbook.aspx?AID=25144
2. **A. Marion** *An Introduction to image(picture) Processing*, Chapman and Hall, 1991
3. Azeema Sultana, Dr. M. Meenakshi, "Design and Development of FPGA based Adaptive Thresholder for image(picture) Processing Applications" ,on line access
4. Gerhard X. Ritter; Joseph N. Wilson, " Handbook of Computer Vision Algorithms in image(picture) Algebra" CRC Press, CRC Press LLC ISBN:0849326362 Pub Date: 05/01/96
5. N. Nacereddine, L. Hamami, M. Tridi, and N. Oucief , "Non-Parametric Histogram-Based Thresholding Methods for Weld Defect Detection in Radiography " ,online access.
6. Otsu,N., "A Threshold Selection Method from Gray-Level istograms,"IEEE Transactions on Systems, Man, and Cybernetics, Vol. 9, No. 1, 1979, pp. 62-66.
7. Elham Ashari , Richard Hornsey, " FPGA Implementation of Real-Time Adaptive image(picture) Thresholding" ,online access
8. http://en.wikipedia.org/wiki/Digital_image_processing
9. J. Canny, "A Computational Approach to Edge Detection," IEEE Trans. Pattern Analysis and Machine Intelligence, PAMI-8, 6, November 1986, 679–698.