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A STATE OF ART FOR EDGE DETECTION TO TRACK THE EDGES OF SHADOW OBJECTS USING DIFFERENT METHODS

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Abstract
Edge contains most of the useful information in an image and also edges are used to measure the size of the objects in an image; to isolate particular objects from their background; to recognize or classify objects. We shall look for some of the straightforward approaches in edge detection methods like Sobel, Perwitt, Roberts, Laplacian, Zero-cross, Canny. Here, we described all the methodology which used to track the shadow of an object in the image. The result and experimental sample of certain images are projected in this paper.

Keyword:- Sobel, Perwitt, Roberts, Laplacian, Zero-cross, Canny.

1. INTRODUCTION

This paper will illustrate about the detection of edges of shadow is difficult one to find out the variance and thick edge in the object. There are two goals for image processing: one is to obtain the image that more suitable for human observing and understanding, the other one is to recognize the image automatically by computer. The key step is to decompose a large and complex image into small image with independent feature. The edge is the basic characteristic of image. It is a collection of pixels whose surrounding pixels have a grayscale step-like changes or changes in the roof. The edge widely exists between objects and background, objects and primitives. It contains rich information, step property, shape etc, which is able to describe the target object. There are two types of edge detection: one is step change edge whose pixels grayscale of two sides have significantly difference; the other one is roof edge that is the turning point from increase to decrease of gray value. Edge is basically the symbol and reflection of discreteness of partial image [1]. It symbolizes the end of one area and the beginning of the other area. The detected edge may become wide or discrete with the existence of noisy and ambiguity. So what we have to do for edge obtaining is to detect the discreteness of partial image and then eliminate breaking points of edges. Complete edge is combined by these edge pixels

2. BACKGROUND

In this edge detection method each method has differ from parameters, scaling, filtering, noise, depth of edge variance and etc. Here, we are going to compare different approaches of method and how it works on different images to detect or track the objects in images. First, we are going to display the original images which used for our experimental purpose show in the Fig (1). The Original size of the image is 1200x1600x3 and uint8 which resized into [200 200] row and columns and converted into rgb2gray tone Fig (2).

Fig (1) Original Image

Fig (2) RGB2GRAY

The succeeding sections in this paper are organized as follows by applying the double to the I=image and the threshold value of double is t=170 . After known the output of double we proceed for the sobel method which used to find edges and approximation of edges strong are then the given value. In addition we implemented all the methods of edge detection like Perwitt, Roberts, Laplacian, Zero-cross, Canny.

Sobel operator

Sobel operator[5]is in the form of the filtering operator. It is used to extract the edge. Each point in the image are the two nuclear convolutions. One checks maximum response of the vertical edge, and the other one checks maximum response of the horizontal edge. The maximum valueof two convolutions will be referred as output value of the changing point. Sobel operator is easy to achieve in space, has a smoothing effect on the noise, is nearly affected by noise, can provide more accurate edge direction information but it will also detect many false edges with coarse edge width.

-1	-2	-1
0	0	0
1	2	1

-1	0	1
-2	0	2
-1	0	1

Prewitt operator

The Prewitt operator is one type of an edge model operator. Fig. 5 shows that two convolution kernels formed Prewitt operator. Model operator is made from the ideal edge sub-image composition. Detect the image using edge model one by one, and take the maximum value of the model operator that is most similar to the detected region as the output of the operator. Both Prewitt operator and Sobel operator use the same differential and filtering operations, the only difference is that the template does not use the same image.

Roberts operator

Roberts[4] operator is a first-order operator, which uses a partial differential operator to find the edge. It uses the approximation between the two adjacent pixels of the diagonal direction of the gradient amplitude to detect edge. In the field of 2x2 diagonal derivative, the two convolution kernels, respectively;

$$G(x,y)=\left\{\left[\sqrt{f(x,y)}-\sqrt{f(x+1,y+1)}\right]^2+\left[\sqrt{f(x+1,y)}-\sqrt{f(x,y+1)}\right]^2\right\}^{\frac{1}{2}}$$

Gradient size of Roberts operator represents the edge strength of the edge and direction of the gradient and the edge are vertical. The operator edge has higher positioning accuracy, but it is easy to lose a part of the edge. The operator with a steep low-noise image corresponds best.

Canny operator

Canny proposed three criteria of the evaluation the pros and cons of performance of edge detection: (1) standard of ratio of signal to noise, that is real edge detection probability is higher and non -edge points sentenced to be lower the probability of edge points, so that the output of ratio of signal to noise is maximum; (2) standard of positioning accuracy, that is there is great possibility that the detected edge points is actually in center of the edge; (3) The unilateral corresponding standard, that is the probability of multiple response in single edge is low, and false edge The response should be the maximum inhibition.Canny operator[6] is based on three criteria. The basic idea uses a Gaussian function to smooth image firstly. Then the maximum value of first derivative also corresponds to the minimum of the first derivative. In other words, both points with dramatic change of gray-scale (strong edge) and points with slight change of gray-scale (weak edges) correspond to the second derivative zero-crossing point. Thus these two thresholds are used to detect strong edges and weak edges. The fact that Canny algorithm is not susceptible to noise interference enables its ability to detect true weak edges. LOG (Laplacian of Gaussian) operator find the optimal filter of edge detection by ratio of the signal to noise of image. Firstly, a Gaussian function is used to low-pass smoothingly filter image; then high-pass filter the Laplacian operator, according to the second derivative of zero to detect the edges. Gaussian filter function [8] is:

$$G(x,y,\sigma)=\frac{1}{2\pi\sigma^2}\exp\left(-\frac{1}{2\sigma^2}(x^2+y^2)\right)$$

Where letter is the standard deviation of the Gaussian filter, which determines the degree of smoothing of the image. By The low-pass filtering the image f (x, y) we can get, $f(x,y)*G(x,y,\sigma)$ and. Where $\nabla^2 G$ is LOG operator.

$$g(x,y)=\nabla^2[f(x,y)*G(x,y,\sigma)]=f(x,y)*\nabla^2 G(x,y,\sigma)$$

Experimental Result:

ORIGINAL IMAGE					
	MEAN	STD	SKEW	ENERGY	ENTROPY
BAND 0	113.023	80.488	0.639	0.007	7.495
BAND 1	73.039	62.907	1.119	0.010	7.173
BAND 2	58.154	54.902	0.673	0.023	6.194

The result of Sobel operator

SOBEL					
	MEAN	STD	SKEW	ENERGY	ENTROPY
BAND 0	8.704	46.300	5.132	0.934	0.215
BAND 1	8.705	46.300	5.132	0.934	0.215
BAND 2	8.704	46.300	5.132	0.934	0.215

The result of canny operator

CANNY					
	MEAN	STD	SKEW	ENERGY	ENTROPY
BAND 0	8.680	46.239	5.139	0.934	0.214
BAND 1	8.680	46.239	5.139	0.934	0.214
BAND 2	8.680	46.239	5.139	0.934	0.214

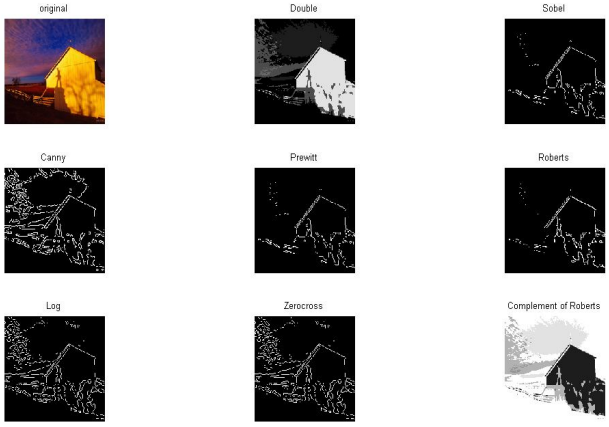
The result of perwitt operator:

PERWITT					
	MEAN	STD	SKEW	ENERGY	ENTROPY
BAND 0	7.034	41.764	5.769	0.946	0.182
BAND 1	7.034	41.764	5.769	0.946	0.182
BAND 2	7.034	41.764	5.769	0.946	0.182

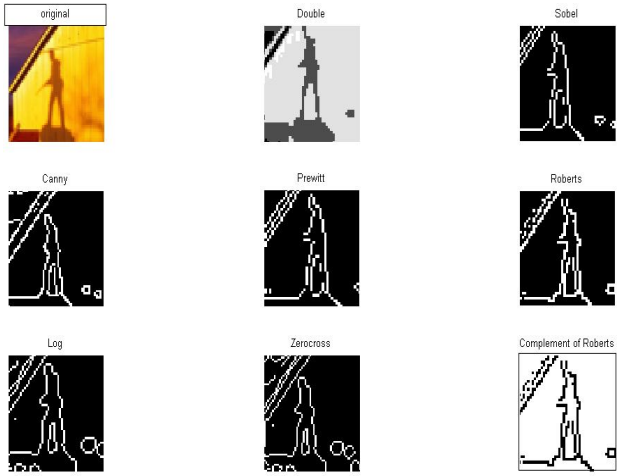
The result of Roberts

ROBERTS					
	MEAN	STD	SKEW	ENERGY	ENTROPY
BAND 0	7.035	41.769	5.770	0.947	0.188
BAND 1	7.035	41.769	5.770	0.947	0.188
BAND 2	7.035	41.769	5.770	0.947	0.188

In other words, both points with dramatic change of gray-scale (strong edge) and points with slight change of gray-scale correspond to the second derivative zero-crossing point.



Canny operator is based on three criteria. The basic idea uses a Gaussian function to smooth image firstly. Then the maximum value of first derivative also corresponds to the minimum of the first derivative.



2.CONCLUSION

One-dimensional operator Roberts, Sobel and Prewitt are able to handle treatment effect of images of more gray-scale gradient and noise. The Sobel operator is more sensitive to the diagonal edge is than to the horizontal and vertical edges. On the contrary, Prewitt operator is more sensitive to horizontal and vertical edges. LOG often produces the edge of double pixels wide; therefore, LOG operator is rarely directly used for edge detection. It is mainly used to determine pixels to determine if the pixels of image are in the dark areas or bright area of the known edge. Thus these two thresholds are used to detect strong edges and weak edges. The fact that Canny algorithm is not susceptible to noise interference enables its ability to detect true weak edges. Canny algorithm is not susceptible to noise interference enables its ability to detect true weak edges. It's optimal edge detection algorithm

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