HW3_MV_TaherVora.

1)Robert Cross Edge Detection:

It was one of the first algorithm for edge detection. It approximates the gradient of the image by calculating the sum of squares of diagonally adjacent pixels.

Algorithm:

Steps are as follows:

- Convert image to binary.
- Apply convolution kernels
    - X=[1,0 ; 0,-1]
    - Y=[0,1 ; -1,0]
- Filter both x and y and store them into G_x and G_y respectively.
- Calculate square root for both.
- Add them
- Display the Robert edge detected image.

Robert Edge Detection.

2) Canny Edge detection:

Canny edge detection is multi-staged widely used algorithm for edge detection.

There are 5 Steps as follows:

1]Noise Reduction: It blurs the images by applying Gaussian blur.

2]Gradient Calculation: The Gradient Calculation step detects the intensity and direction of the edge by calculating the gradient of the image. We ll get a thick and thin edge after this step.

3] Non-Maximum Suppression: This step reduces those thick and thin edges.

4]Double Thresholding: It identifies three types of pixels:

- Strong pixels: Pixels that have an intensity so high that we are sure they contribute to the final edge. High Thresholding is used to identify this kind of pixels.
- Weak pixels: Pixels that have an intensity value that is not too strong nor too weak. Weak Thresholding is used to identify this kind of pixels.
- Other pixels: Considered as non-relevant for the edge.

For all the pixels that lies between strong and weak pixels; Hysteresis mechanism will help to identify which one to consider and which one to reject.

5]Hysteresis: If atleast one of the pixel is strong pixel around the pixel which is being processed than it is considered as strong else it is rejected.

Figure 1: Canny Edge Detection

3)Difference of Gaussian:

DoG is basically the difference between two blurred version of an image by applying two Gaussian kernels of standard deviation on an image.

The logic is that by blurring we remove some high-frequency components that represent noise and by subtracting we remove some low-frequency components that correspond to the homogeneous areas in the image.

Application of DoG are:

- Blob detection.
- Automatic scale selection.

4)Laplacian of Gaussian (LoG) :

The LoG operator take the second derivative of image to find areas of rapid changing edges. . When the image is basically uniform, the register returns zero. Whenever there is a change, the log will give a positive answer on the darker side and a negative answer on the lighter side. At a sharp edge between two regions, the answer is

- Zero away from the edge .
- positive only on one side .
- negative only on the other side .
- zero somewhere in between on the edge same.

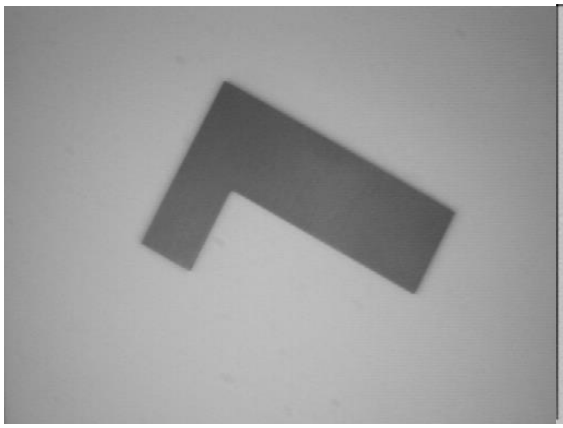

Figure 2:Original image

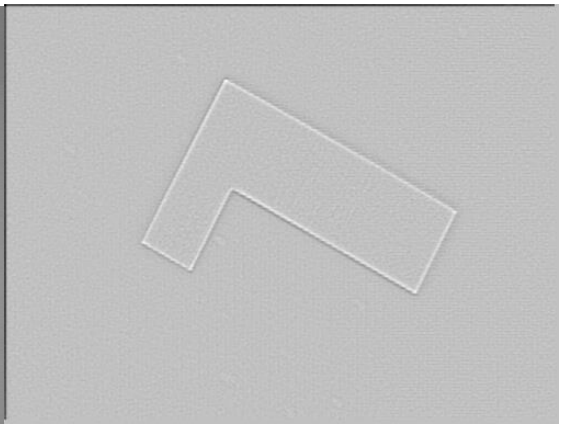

Figure 3: Applied LoG

If in the kernel the center peak is negative than it is called a negative Laplacian and vice versa.

References:

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