# PERFORMANCE ENHANCEMENT OF EDGE DETECTOR FOR HIGH DEFINITION AND BLURRED IMAGES

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**Abstract**

The Canny edge detector is widely used in computer vision to locate sharp intensity changes and to find object boundaries in an image. The construction of a pre-processing filtering tool for edge detection and segmentation tasks is still a challenging matter. In this paper the revision of the Canny edge detector is done to improve its detection accuracy. This paper proposes an edge sharpening filter to sharpen the edges of an image prior to detection and then apply the canny detector for the better results. The difference in the output can be observed by comparing the results of edge detection under normal and filtered conditions. This work is implemented using MATLAB 7.10.0.

**Keywords** Canny, Edge Sharpener, Edge detection

## I. INTRODUCTION

Edge detection is a very important area in the field of Image processing. Edges define the boundaries between regions in an image, which helps with segmentation and object recognition. Edges are significant local changes of intensity in an image. Edges typically occur on the boundary between two different regions in an image.

Among all the edge detection methods, the Canny edge detector is the most rigorously defined operator and is widely used. This method was proposed by John F. Canny in 1986. Even though this method is quite old but is still used because of its precision in edge detection. The main advantage of this method is elimination of multiple responses to a single edge. It also having good localization property means the detected edges are much closer to the real edges. The response of this detector is also good, as the original edge does not result in more than one detected edge. The gradient magnitude and direction is calculated by using first order finite differences.

Through this paper we will show how to revise the Canny edge detector to improve its detection accuracy.

### A Revised Canny edge detector

Although the optimization process described by Canny rests on solid grounds, A typical implementation of the Canny edge Detector follows the steps below.

1. Smooth the image with an appropriate Gaussian filter to reduce desired image details.
2. Determine gradient magnitude and gradient direction at each pixel.
3. If the gradient magnitude at a pixel is larger than those at its two neighbors in the gradient direction, mark the pixel as an edge. Otherwise, mark the pixel as the background.
4. Remove the weak edges by hysteresis thresholding.

The application of canny edge detector is as shown in the fig. 1:

Fig. 1. Image for analysis

Fig.. 2. Output of canny edge detector

The edge sharpener algorithm proposed for this paper, sharpens the image prior to the edge detection as in Fig. 2.. The algorithm follows the following steps.

1. $$h(x_2x_2) = \frac{h_x(x_1, x_2)}{\sum_{X1} \sum_{x_2}} h_x$$

2. For values of $h_v$ take linear matrix of $3 \times 3$.

| | | |
|---|---|---|
| 1/x | 1/x | 1/x |
| 1/x | 1/x | 1/x |
| 1/x | 1/x | 1/x |

$x = 1, 2, 3 \ldots\ldots$ etc

3. Now blur the image by Multiply the input image by $h_x$(next steps works for linear blurred image but not for randomly blsurred image.)

4. Now take a kernel (mask) with highest weight age at the centre

| | | |
|---|---|---|
| $-n$ | $-n$ | $-n$ |
| $-n$ | $+m$ | $-n$ |
| $-n$ | $-n$ | $-n$ |

Where m > n

These masks are designed to respond maximally to edges running vertically and horizontally relative to the pixel grid, one for each of the two perpendicular orientations.

5. Now apply the mask on the blurred image and add it with input taken image.

6. The previous step creates a sharpen image (by edge sharpener algorithm) and the sharpened image is then applied to canny edge detector for improved results as shown in fig. 3.

Fig.3. Result of improved canny edge detector

**Comparisons and Conclusions**

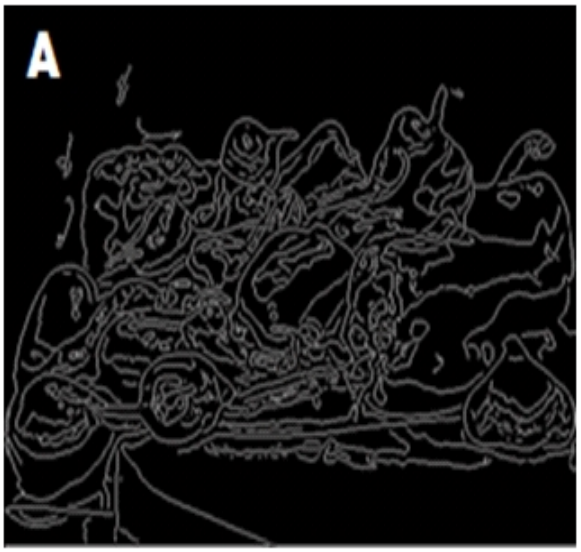


Fig.4. A shows canny's output

From fig.4 it is clear that edge sharpening prior to the edge detection improves results up to a great extant. The same thing can also be tested on a linearly blurred image, and output comes out as:


Fig.4. B shows revised canny's output


Fig. 5. A shows linearly blurred image


Fig. 5. B shows canny's output


Fig. 5. C shows revised canny's output

From fig.5 it is concluded that improved edge detector performs better under blurred conditions as compared to its original version and that's too because of sharpening the image prior to the edge detection through the use of image sharpening filter.

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