International Journal of Innovative Research in Computerand Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

||Volume 8, Issue 5, May 2020||

Canny Edge Detection Using Image Processing

Deepashri, Dr. Mohan Aradhya

PG Student, Dept. of Master of Computer Applications, RV College of Engineering, Bengaluru, India

Assistant Professor, Dept. of Master of Computer Applications, RV College of Engineering, Bengaluru, India

ABSTRACT: Edge detection method has been utilized to find the boundaries of things within the input images provided. Edge detection method introduces to the operation of discovering and finding the sharp disconnections or the disjointedness in the brightness. Edge detection process reduces the noises in the images. Canny algorithm is one of the excellent edge detection methods or the algorithms which is extensively used in the image processing field. As techniques like computer vision does the classification and recognition of objects in an input image, edge detection is an amazing tool which can be used for this purpose. The main focus in this paper is to learn edge detection process by comparing different types of edge detection operators also execute canny's edge detection operator or the technique. Edge detection is fundamentally an image segmentation method, divides structural domain, and then on which the image is identified, into valued regions or parts. Edges characterize borders and are therefore a problem of basic importance in image processing. The main focus is to learn edge detection process based on different operators and execute canny's edge detection method. Here we have compared all other other algorithms with the canny edge algorithm on the output efficiency.

KEYWORDS: Edge Detection, Canny Edge Detection (CED), Gaussian filter, Sobel's operator

I. INTRODUCTION

An edge is nothing but a bundle of connected pixels that creates a boundary between two different regions which are disjoint. And thus, the edges are obtained between these two regions of the input image. Those connected pixels in an image or a single pixel can be defined by edge strength and edge direction which are basically the two vital features of a pixel. Edge strength is the most important feature which is nothing but the magnitude of the gradient and edge direction is the angle of the gradient. So, all these discontinuities will be detected by using different types of edge detection operators. There are different applications of the edge detection method, especially in medical science application where an OCT image will be used to detect the edges. Different other applications like face recognition, utilised for the study of anatomical structure, recognition of finger prints etc. The edge detection method is done by convolving of an image using a 2-D Gaussian filter, and then using different operators on these images to detect the edges accordingly.

II. CANNY'S EDGE DETECTION ALGORITHM

Initially an input image is read. A 2-D Gaussian filter is applied on the input image to smoothen the image to get rid of all the noises in the image before detecting or locating any edges in the image. And the 2-D Gaussian filter can be used only in Canny Edge Detection method in particular.

- **Gaussian Filter**

Gaussian filter is used to remove noise from the image. It will remove all those noises so that we get a better result after using edge detection and also so that the edges will be detected more accurately.

$$h(min) = \left[\frac{1}{2\sqrt{\pi\sigma}} e^{\frac{m^2}{2\sigma^2}}\right]\left[\frac{1}{\sqrt{2\pi\sigma}} e^{\frac{m^2}{2\sigma^2}}\right]$$

The above expression shows that a Gaussian filter is separable. The Gaussian filter which is used for smoothing an image is an excellent filter used to remove the noise which has been drawn using a normal distribution.

Gaussian pyramid can be created by applying the Gaussian filter. And by using Pascal's triangle, the Gaussian filter can be created. Below is the Pascal's triangle that has been shown:

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

||Volume 8, Issue 5, May 2020||

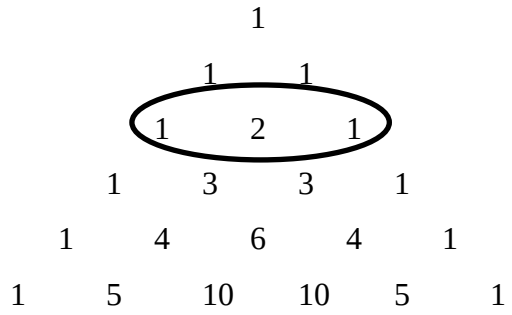

Fig 1: Generation of a 3*3 Gaussian Kernel from Pascal's Triangle

- **3 * 3 Gaussian Kernel**

The generation of a 3 * 3 Gaussian mark from Pascal's triangle is illustrated in the above triangle. The 3 * 3 Gaussian kernel can be generated from the third row of Pascal's triangle.

- Canny Algorithm

There are four filters used in Canny algorithm to detect vertical, horizontal and diagonal edges in the image that has been blurred. The angle of the edge direction. The edge direction angle is rounded to one of four angles which represent vertical, horizontal and the two diagonals (90°, 0°, 45°, and 135°).

canny_image = edge(original_image,'canny');

III. PROPOSED ALGORITHM – CANNY ALGORITHM

An input image is fed into the system which will be stored in JPEG format which will then be read. The image goes through the pre-processing so that the noise will be removed. Here, an OCT (Optical Coherence Tomography) image will be loaded as the implementation is done on the medical science application. Pre-processing of the image includes padding and de-noising of the input image using Gaussian filter. These de-noised and padded images obtained will then be used to detect the edges using various edge detection operators like sobel operator, prewitt operator, Log operator and here we use Canny edge detection method or Canny operator to generate edge detected images.

A. *Flow Chart of the Algorithm:*

- START: Input image is read
- SMOOTHING: Gaussian filter will be utilisedto remove or eliminate the noise
- COMPUTING GRADIENTS: Wherever the image gradients have large intensity, the edges need to be traced
- NON-MAXIMUM SUPPRESSION: Only the edges which are in local maxima need to be marked or traced as edges
- HYSTERESIS THRESHOLDING: If the edges are connected to any strong edge, those edges are suppressed and are taken as the final edges
- END: Edge extracted image resulted from an input image

B. *Different Types of Operators:*

- **Sobel:** It is done by determining the gradient of image intensity at every pixel within the input image. It perceives the direction of the highest increase from light to dark and also the rate of change in the direction which has been found

sobel_img = edge(original_img,'sobel');

- **Canny:** There are four filters used in Canny algorithm to detect vertical, horizontal and diagonal edges in the image that has been blurred. The angle of the edge direction. The edge direction angle is topped off to one of four angles which represent vertical, horizontal and the two diagonals (0°, 90°,45°, and 135°)

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

||Volume 8, Issue 5, May 2020||

canny_img = edge(original_img,'canny');

- **Prewitt:** Here the edges are calculated by using the difference between corelated pixel intensities of an input image. Derivative masks are the masks that are used here for edge detection

prewitt_img = edge(original_img,'prewitt');

- LOG: Log operator is the Laplacian of the Gaussian filter which results in zero crossing. It uses the area of an input image where the intensities will be constant. The zero crossing happens at the point where the 1st derivative is maximum

log_img = edge(original_img,'log');

IV. SIMULATION RESULTS

The simulation studies involve the Outputs obtained by using Edge detection operators.

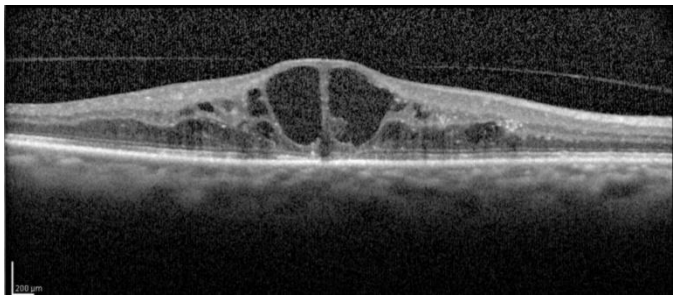

Fig 2: An OCT Image

This is an OCT (Optical Coherence Tomography) image generated by passing light waves to take a cross section pictures of the retina. The OCT image is then converted into a grey image which is shown here.

Fig 3: Image Obtained by Using Sobel Operator

This is an edge detected image generated by using sobel operator, which was then used to compare the result with the edge detected image using canny edge detection operator. This is obtained by using an OCT (Optical Coherence Tomography) image of a retina. Once the OCT image is converted to a grey image, gaussian filter is applied and then the sobel operator is used to get this edge detected image where we can also see that, all the edges weren't detected in a proper manner.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

||Volume 8, Issue 5, May 2020||

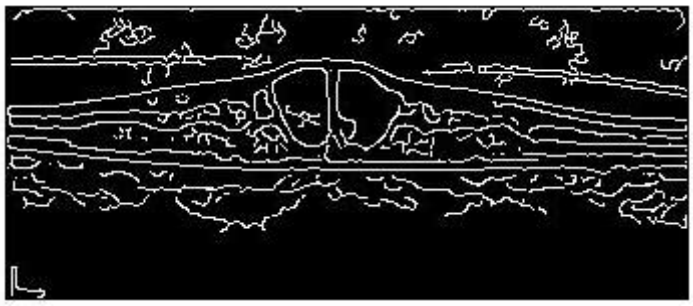

Fig 4:Image Obtained by Using Canny Operator

This is an edge detected image obtained by using canny edge detection operator. The input image is an OCT (Optical Coherence Tomography) image which is converted to a grey image and then the Gaussian filter is applied on the resulted image. Then the canny Edge detection operator will be used to get this edge detected image.

V. CONCLUSION AND FUTURE WORK

In this paper, various edge detection operators have been compared. Different edge detection techniques have been executed and have been evaluated. We have seen that the canny algorithm is an excellent edge detection algorithm used in the field of image processing. The ability to locate and mark real edges are good in comparison with other edge detection operators that is it is known for good detection. Canny edge detector also gives finer results as compared to other type of operators as it is rarely sensitive to noise and also it is flexible in nature. We have also observed that there is a minimal distance between the detected edge obtained and the normal(real) edge or the edge of the input image. We have also studied and analysed that it can be a used as a powerful tool to detect and map lineaments in the potential field maps.

REFERENCES

[1] Ireyuwa. E. Igbinosa “Comparison of Edge Detection Technique in Image Processing Techniques” International Journal of Information Technology and Electrical Engineering 2012-2013
[2] Mohd. Aquib Ansari, Diksha Kurchaniya and Manish Dixit “A Comprehensive Analysis of Image Edge Detection Techniques” International journal of Multimedia and ubiquitous Engineering 2017
[3] Sujeet Das “Comparison of Various Edge Detection Technique” International Journal of Signal Processing, Image Processing and Pattern Recognition, vol.9, no.2, (2016), pp.143-158 2016
[4] M.A. Massoud, Shaimaa Kamal “COMPARISON OF EDGE DETECTION TECHNIQUES FOR HUMAN FEATURE POINTS EXTRACTION” Journal of Advanced Engineering Trends (JAET), Vol. 38, No. 2. July 2019
[5] Saban Ozturk, Bayram Akdemir “Comparison of Edge Detection Algorithms for Texture Analysis on Glass Production” International Journal of Psychology in 2015
[6] Ghassan Issa, Shakir Hussain, Hussein Al Bahadili “DEVELOPMENT AND PERFORMANCE EVALUATION OF A LAN-BASED EDGE-DETECTION TOOL” International Journal on Soft Computing (IJSC) 2012
[7] Yara Khaluf and SyamGullipalli “An Efficient Ant Colony System for Edge Detection in Image Processing” University of Paderborn, Paderborn, 2014, Germany
[8] Muhamad AzharAbdilatef AL-Obaidy “ORIENTATION EFFECTIVENESS IN THE OBJECTS DETECTED AREAS USING DIFFERENT TYPES OF EDGES DETECTION TECHNIQUES” International Journal of Computer Science & Engineering Survey (IJCSES), 2017
[9] Pinaki PratimAcharjya, Ritaban Das, Dibyendu Ghoshal “A Study on Image Edge Detection Using the Gradients” International Journal of Scientific and Research Publications, Volume 2, Issue 12, December 2012
[10] Lai Zhiguo, etc, “Image processing and analysis based on MATLAB”, Beijing: Defense Industry Publication, 2007
[11] N. Senthilkumaran, R. Rajesh, "Edge Detection Techniques for Image Segmentation and A Survey of Soft Computing Approaches", International Journal of Recent Trends in Engineering, Vol. 1, No. 2, PP.250-254, May 2009
[12] Wang Xun and JIN. Jianqiu "An Edge Detection Algorithm Based on Improved CANNY Operator" Seventh International Conference on Intelligent Systems Design and Applications pp. 623-628 2007