

A Flexible Thresholding Based Image Edge Detection with High Resolution: A Review

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Abstract— Edge detection is one of the important parameter of image processing it basically help with preserving the image quality when image is either interpolating (enhance pixels) or decimating (compression/reduce pixels), if edges are clear and detected it can be preserve and if not the output image after image processing will not be a good quality image and image processing is in use almost in every area like Modern communication, Medical image processing, Mobile phones, graphics card etc. From the above discussion it is been clear that edge detection is one of the critical part of image processing but the question arise here is that the available methods are good or improvements required, answer is yes there are methods of edge detection which works good but not for all type of images, some methods like Canny, Roberts and Prewitt, works better for the images having high intensity and high frequencies in other hand Sobel works better for low intensity and low frequency images. Proposed work has better solution which provides edge detection for the high and low frequency/intensity images with modified Thresholding and combination of sobel and canny Edge detection. Feature extraction is a classic problem image processing. Edges are often detected using integer-order differential operators. Hence proposed edge detection method is working in frequency and time domain parallel.

Key words: CA: Canny Algorithm, AT: Adaptive threshold, LFM: linear fitting method, ED: Edge Detection

I. INTRODUCTION

Nowadays one of the most used algorithms for the image processing systems is the edge detection algorithm, starting from the identification systems in different domains to the complex systems direct from industry. Long range targets detection in thermal infrared image sequences is of interest in many applications such as military filed and surveillance system . However, a variety of noises are introduced into infrared image due to the electrical interference, the external working environment factors, as well as the working status of each component of the Infrared Imaging System. Noise reduced the quality of infrared image and seriously affects the subsequent analysis of the image.

Edge detection is one of the main steps in image processing, image recognition, computer vision techniques and also very important in the image analysis domain. This types of algorithms are composed by a set of mathematical methods that have the objective to identifying points in a proposed image at which the image brightness changes rapidly or has discontinuities behavior. The main objective of this algorithm is to reduce or simplify the amount of informations provided by image and step up to a further process depending on the intended purpose.

The Sobel’s and the Robert’s detections use some mathematical procededures that offer two different images, the

first one is for the vertical edges detection and the second for the horizontal detection. After this process, these two images are combined in one final image that offer the resulting edge detection image. The mathematical process can be described by this two algorithms use two different kernel’s for the Sobel algorithm 3x3 dimension, and for the Robert 2x2 dimension which are convolved with the input image for the calculus that offers derivatives, one for horizontal transformation and another for vertical changes. For example, if we define S for the starting image, and let’s say that G_x and G_y are the two resulted images for derivative approximations, for the Sobel algorithm, the two transformations can be such as:

$$G_x = \begin{bmatrix} -1 & 0 & +1 \\ -2 & 0 & +2 \\ -1 & 0 & +1 \end{bmatrix} * B$$

$$G_y = \begin{bmatrix} +1 & +2 & +1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix} * B$$

A. Image Equalizer:

Equalization is a procedure in image processing for contrast adjustment using image’s histogram; this procedure usually increases global contrast for many images, especially when usable data for image is represented by close contrast values, and enhance contrast is good for edge detection.

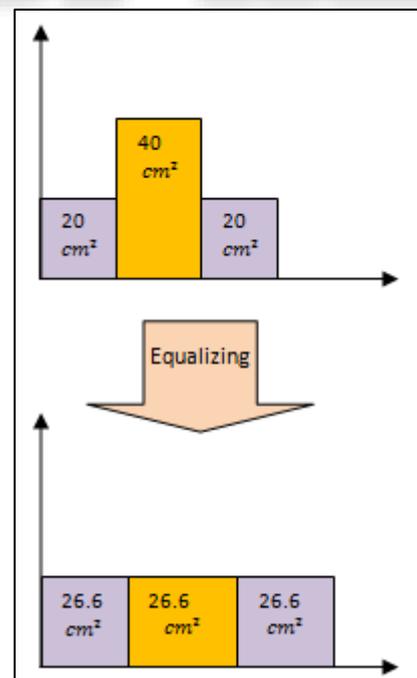


Fig. 1: image before and after Equalization

Form the figure 1 below it can be observe that before and after equalizing the area remains same as before it was 20+40+20=80 cm² after Image Equalizing it is

$26.6+26.6+26.6=80\text{cm}^2$ the image equalising does not lose any information it just distribute the color pixels in image equality it also make great helps in edge detection.

II. LITERATURE SURVEY

Meriem HACINI et al [6] discussed that a Feature extraction is a classic problem of machine vision and image processing. Edges are often detected using integer-order differential operators. In this paper, a one dimensional digital fractional-order Charef differentiator (1DFCD) is introduced and extended to 2D by a multi-directional operator. Anshal Joshi [5] they present a real-time hand gesture recognition system using a combination of image processing modalities. In the method to recognize individual characters, the hand gesture image is processed by combining image segmentation and edge detection to extract morphological information.

Bogdan Popa et al [4] they develop algorithm for the image processing systems is the edge detection algorithm, This study highlights that there are algorithms such as Robert or Sobel for edge detection and practical ways to improve traditional algorithms with new technology by the full utilization of the CPU on the full capacity. Tapan Sharma et al [3] In this paper they have implemented different edge detection algorithms such as Canny Edge, Sobel operator and Laplacian of Gaussian on Apache Spark. they have executed their implementations on remote sensing images residing on HDFS and then compared the statistical performance and scalability of all these algorithms for different set of images. In their experiments they have implemented the existing edge detection algorithms as per Spark architecture.

Li Xuan et al [2] They discussed that traditional Canny algorithm has been applied to image edge detection. However, this traditional algorithm can't adaptively determine the filtering threshold value and it can't separate targets from background, when filtering the lower contrast image. Therefore, in response to these problems, this paper proposed an improved method on Canny algorithm. Two adaptive thresholds were obtained by doing differential operation on amplitude gradient histogram. Then they connected edge points to get some generalized chains. After that, it needed to calculate their mean value to delete generalized chains, which are smaller than the mean value. Finally, the image edge detection results were got by linear fitting method. Abdelilah El Amraoui et al [1] In this paper, a new edge detection algorithm for medical images based on quantum computation concept is presented. Their proposed method is performed through two stages: the first one enhances the image according to the quantum states' superposition property, which determine the adequate quantum pixels' values. The second one extracts edges based on Shannon entropy. The algorithm is tested on synthetic and real medical images, and the obtained results are compared to others' classical edge detection methods. It can be seen that the approach is promising.

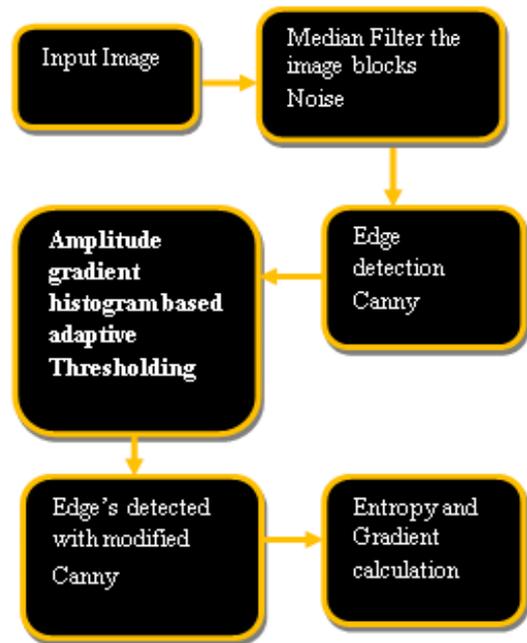


Fig. 2: Li Xuan work for image edge detection

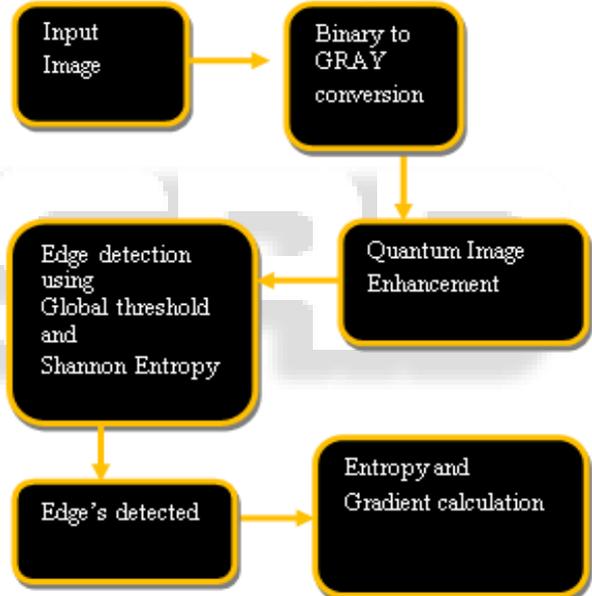


Fig. 3: Abdelilah El Amraoui work

Author / Journal/ Year	Approach	Result
Abdelilah El Amraoui/ IEEE/ 2016	shannon entropy based quantum edge detection of medical images	Entropy observe is 0:3662
Li Xuan/ IEEE/2017	They develop a Modified Canny Edge Detection Algorithm	Gradient observe is 3.15
Tapan Sharma/ IEEE/2016	They Compare Performance Of different Edge Detection Algorithms For Satellite Images Using Bigdata Platform Spark	Gradient observe is 3.84 and speedup ratio is 1.24

Bogdan Popa/IEEE/2017	They Study about the Edge Detection Algorithm and its Applications	execution times 1.2 minutes
Anshal Joshi/ IEEE/2017	American Sign Language Translation Using Edge Detection and Cross Correlation	NA
Meriem HACINI/IEEE/2017	A 2D- Fractional Derivative Mask for Image Feature Edge Detection	execution time 85.036 seconds

Table 1: Literature Review

III. PROBLEM STATEMENT

In 2010, the globalPb algorithm was proposed, its threshold is generated adaptively by system, so it can improve the anti noise ability of Canny algorithm. However, globalPb algorithm not only needs multi-scale and multi-information to compute the gradient, but also requires the additional spectral clustering to exclude the false edge. If these information cannot be provided, it will restrict the application in scene, which lacks texture information [1].

After that, an improved algorithm was proposed on it. This algorithm mainly wants to get the optimum solution of the maximal variance method by using adaptive particle swarm optimization [2]. In [3], it proposed an adaptive Canny algorithm for color image, which converts the RGB of color image into R-B chromatic aberration space graph, it needs to do integral arithmetic after Gaussian filtering. This method can connect the entire image edge. In [4], it puts forward an improved method based on Canny operator, it can achieve the positioning accuracy through the variance projection location algorithm. In order to improve the accuracy of edge detection, a morphological filtering algorithm is proposed to replace Gauss filtering, which can avoid manual intervention. This algorithm effectively resists salt and pepper noise[5-6]. In [7], it adopts the method of combining the global and local edge detection to extract the edges. In this way, it can obtain the complete image edges. There also has a Canny algorithm that is fused with the traditional motion objecting detection algorithm. This algorithm can effectively extract the foreground area of the image [8].

In this thesis, we use median filter to smooth the image, and adaptively get double thresholds. After that, we link edge points and get the generalized chains, and we put forward a criterion on the generalized chains. In this way, it can eliminate false edge points, which have the approximate gray value with real edge points. Finally, the results of image edge detection are given by linear fitting method, and it makes the detection of image more adaptive and accurate.

IV. CONCLUSION

Proposed work is the Literature review of Edge detection methods and also discuss improve edge detection methods and advantages of these methods as compare with conventional methods of edge detection, it can be concluded that [1] & [2] methods are good but still there are chances

for improvement because of image quality and image frequencies dependency of these works, proposed work near future will provide the solution of these problems.

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