# Review On: Analysis of Edge Detection with Color Control

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**Abstract- Edge detection is a very important problem in image processing. In this paper it has been shown that the most of the existing techniques has neglected the use of colors while detecting the edges but in many applications a region can be categorized based upon the color. This paper is a basic step in edge detection of a digital image; these kinds of ideas are useful in many fields for developing useful detecting systems. We proved that proposed edge detection is more functional and better edge detectors both theoretically and experimentally.**

**Keywords – Edge Detection, MSE, PSNR**

## I. INTRODUCTION

An edge [1] in an image is a significant local change in the image intensity, usually associated with a discontinuity in either the image intensity or the first derivative of the image intensity. Discontinuities in the image intensity can be either (1) step discontinuities, where the image intensity abruptly changes from one value on one side of the discontinuity to a different value on the opposite side, or (2) line discontinuities, where the image intensity abruptly changes value but then returns to the starting value within some short distance. However, step and line edges are rare in real images. Because of low-frequency components or the smoothing introduced by most sensing devices, sharp discontinuities rarely exist in real signals. Step edges become ramp edges and line edges become roof edges, where intensity changes are not instantaneous but occur over a finite distance. Illustrations of these edge profiles are shown in Figure 1.

It is also possible for an edge to have both step and line characteristics. For example, a surface that changes orientation from one flat surface to another will produce a step edge; but if the surface has a specular component of reflectance and if the surface corner is rounded, there can be a highlight due to the specular component as the surface orientation of the rounded corner passes the precise angle for specular reflection. The edge profile generated by such a situation looks like a step edge with a superimposed line edge.

There are also edges associated with changes in the first derivative of the image intensity. For example, mutual reflection from the sides of a concave corner generates roof edges. Edges are important image features since they may correspond to significant features of objects in the scene. For example, the boundary of an object usually produces step edges because the image intensity of the object is different from the image intensity of the background.

Edge detection refers to the process of identifying and locating sharp discontinuities in an image [2]. Edge detection technique is usually applied on gray–scale image. The discontinuities are abrupt changes in pixel intensity which characterize boundaries of objects in a scene. Classical methods of edge detection involve convolving the image with an operator (a 2-D filter), which is constructed to be sensitive to large gradients in the image while returning values of zero in uniform regions. There is an extremely large number of edge detection operators available, each designed to be sensitive to certain types of edges. Variables involved in the selection of an edge detection operator include:

- Edge orientation: The geometry of the operator determines a characteristic direction in which it is most sensitive to edges. Operators can be optimized to look for horizontal, vertical, or diagonal edges.
- Noise environment: Edge detection is difficult in noisy images, since both the noise and the edges contain high-frequency content. Attempts to reduce the noise result in blurred and distorted edges. This results in less accurate

localization of the detected edges. Operators used on noisy images are typically larger in scope, so they can average enough data to discount localized noisy pixels.

- Edge structure: Not all edges involve a step change in intensity. Effects such as refraction or poor focus can result in objects with boundaries defined by a gradual change in intensity. The operator needs to be chosen to be responsive to such a gradual change in those cases. Newer wavelet-based techniques actually characterize the nature of the transition for each edge in order to distinguish, for example, edges associated with hair from edges associated with a face. Edge detection makes use of differential operators to detect changes in the gradients of the grey levels.

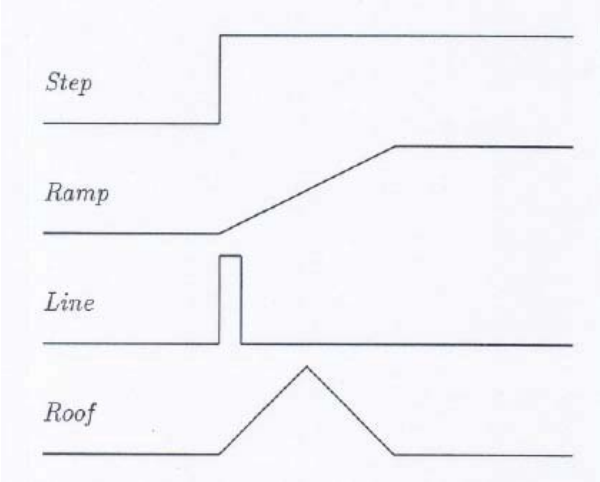


Figure 1. One-dimensional edge profiles

## II. LITERATURE REVIEW

Hao et al. [3] has studied that the premise of obtaining the clear object contour in traditional Canny operator is to set appropriate parameters, does not have the adaptive ability. An adaptive Canny edge-detection method is proposed which Based on Canny theory. Adopt the 3*3 neighborhood instead of canny algorithm in 2*2 neighborhood to calculate the calculation gradient. Then, the maximum between-class variance (Otsu) method is used to obtain the high and low thresholds.

Reema ajmera et al.[4] proposed a method to detect human faces in color images, that uses a combination of color spaces and edge detection for segmentation. Algorithm ingeniously combines different color space models, specifically; HSI and YCbCr along with Canny and Prewitt edge detection techniques. Experimental results indicate improved false acceptance rates. The overall performance of the face detection system is evaluated with a successful rate of 84%.

Abid et al. [5] has proposed a new method for image edge detection based on multilayer perception (MLP). The method is based on updating a MLP to learn a set of contours drawn on a 3×3 grid and then take advantage of the network generalization capacity to detect different edge details even for very noisy images. The method is applied first to Gray scale images and can be easily extended to color ones. The method works well even for very low contrast images for which other edge operators fail.

Raman Maini et al. [6] discussed that edges characterize boundaries and are therefore a problem of fundamental importance in image processing. Image Edge detection significantly reduces the amount of data and filters out useless information, while preserving the important structural properties in an image. Since edge detection is in the forefront of image processing for object detection, it is crucial to have a good understanding of edge detection algorithms. In this paper the comparative analysis of various Image Edge Detection techniques is presented. The software is developed using MATLAB 7.0. It has been shown that the Canny's edge detection algorithm performs better than all these operators under almost all scenarios. Evaluation of the images showed that under noisy conditions Canny, LoG( Laplacian of Gaussian), Robert, Prewitt, Sobel exhibit better performance, respectively. It has been observed that Canny's edge detection algorithm is computationally more expensive compared to LoG( Laplacian of Gaussian), Sobel, Prewitt and Robert's operator.

Pooja Kaushik et al. [7] discussed that assessment for image quality is a traditional need. The conventional method for measuring quality of image is MSE & PSNR. In this paper they compared the different image enhancement techniques by using their quality parameters (MSE & PSNR) & proposed a new erosion enhancement

technique. This technique gives better result than other techniques and their PSNR value is high & MSE is low. The experimental results show that the proposed enhancement method gives better results.

Tzu-Heng Henry Lee et al. [8] discussed that edges of an image are considered a type of crucial information that can be extracted by applying detectors with different methodology. This research paper presented a brief study of the fundamental concepts of the edge detection operation, theories behind different edge detectors, and some simple self-written Matlab edge detection functions with the simulation results. Previous works on edge detection models are reviewed and simulated. The Matlab results coincide with the first and second order derivative edge detection models.

Vinod Saini et al. [9] discussed that image enhancement is used for improving the visual quality of an image. In this paper two methods for image enhancement using image fusion have been described. The process of image fusion uses a source image and its histogram equalized image. The two algorithms discussed assigns weights to the source image and its histogram equalized image. First algorithm assigns weight manually whereas the second algorithm assigns them automatically. The two algorithms are compared using standard deviation and average gradient.

Simranjit Singh Walia et al.[10] presented a review on different color based edge detection techniques. Edge detection has found to be most important step in many critical vision applications. It actually results in the black and white (binary) image where each object is differentiating by lines (either black and white). Edges are basically the area in the image where sharp changes exist. It has been found that the most of the existing techniques has neglected the use of colors while detecting the edges but in many applications a region can be categorized based upon the color. This paper has shown that the most of the existing techniques fails in case of images with complex background.

Ajay Mittal et al.[11] presented an evaluative review of various edge detection techniques for color images that have been proposed in the last two decades. The statistics showed that color images contain 10% additional edge information as compared to their gray scale counterparts. This additional information is crucial for certain computer vision tasks. Although, several reviews of the work on gray scale edge detection are available, color edge detection has few. The latest review on color edge detection is presented by Koschan and Abidi in 2005. Much advancement in color edge detection has been made since then, and thus, a thorough review of state-of-art color edge techniques is much needed. The paper makes a review and evaluation of various color edge detection techniques to quantify their accuracy and robustness against noise. It is found that MVD edge detector has the best edge detection accuracy and RCMG-MM edge detector has highest robustness against the noise.

Shu-Yu Zhu et al. [12] examined the various approaches to edge detection for color images, including techniques extended from monochrome edge detection as well as vector space approaches. In particular, edge detection techniques based on vector order statistic operators and difference vector operators are studied in detail. Numerous edge detectors are obtained as special cases of these two classes of operators. The effect of distance measures on the performance of different color edge detectors is studied by employing distance measures other than the Euclidean norm. Variations are introduced to both the vector order statistic operators and the difference vector operators to improve noise performance. They both demonstrate the ability to attenuate noise with added algorithm complexity. Among them, the difference vector operator with adaptive filtering shows the most promising results. Other vector directional filtering techniques are also introduced and utilized for color edge detection. Both quantitative and subjective tests are performed in evaluating the performance of the edge detectors, and a detailed comparison is presented.

Jingxiu Zhao et al. [13] discussed that edge detection has been widely used in computer vision and image processing. Various edge detection methods of color image have been proposed which usually apply the components of a color image equally to obtain the ultimate result. In this paper they propose a novel method for edge detection in color image. First, the CLIP model of color image based on LIP model of gray image is developed, and then analyzed the existing problems of gradient algorithm with HSV color image characteristics and the separation by color hue, saturation and brightness information and proposes a color image edge detection method based on gradient extreme value of the local region and satisfying result is obtained.

Jingxiu Zhao et al.[14] presented a new method for quantifying color information so as to detect edges in color images. Their method uses the volume of a pixel in the HSI color space, allied with noise reduction, thresholding and edge thinning. They implement our algorithm using NVIDIA Compute Unified Device Architecture (CUDA) for direct execution on Graphics Processing Units (GPUs). Their experimental results show that: compared to traditional edge detection methods, their method can improve the accuracy of edge detection and withstand greater levels of noise in images; and their GPU implementation achieves speedups over related CUDA implementations.

## IV.CONCLUSION

Edge detection is a very important problem in image processing. We studied the problems faced by traditional edge detectors with noisy images. We proved that proposed edge detection is more functional and better edge detectors both theoretically and experimentally.

In this paper it has been shown that the most of the existing techniques has neglected the use of colors while detecting the edges but in many applications a region can be categorized based upon the color. This paper is a basic step in edge detection of a digital image; these kinds of ideas are useful in many fields for developing useful detecting systems.

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