RESEARCH ARTICLE OPEN ACCESS

Image Denoising based on Segmentation and Shape Analysis for Vegetables and Fruits Image

Mrs. Aparna Singh Kushwah , Aditya Bhalavi
Assistant Professor Electronics and Communications Department UIT-RGPV, Bhopal
Student Electronics and Communications Department UIT-RGPV, Bhopal
Corresponding auther:Mrs. Aparna Singh Kushwah

ABSTRACT: In this research work adopted the image de-noising scheme which is embedded using modified median filter, segmentation and edge detection method. The classical modified median filter replaces the central pixel in a window with the median of the pixels into this window. The modified median is the value of the pixel that occupies the central position when arrange the window pixels in ascending order. Image segmentation is the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. The simulation is done in MATLAB and simulation results of proposed method gives improved result than the existing method.

Index Terms: Image Segmentation, Image De-noising, Edge Detection, Modified Median Filter

---

Date of Submission: 18-06-2018 Date of acceptance: 03-07-2018

I. INTRODUCTION

The separation of the image into object and background is a critical step in image interpretation. When we imitate the human visual system by using computer algorithms, quite a lot of problems can be encountered. Segmentation subdivides an image into its constituent regions or objects. The level to which the subdivision is carried depends on the problem being solved. That is, segmentation should stop when the objects of interest in an application have been isolated [1][2]. Color image segmentation is usually the first task of any image analysis process. All subsequent tasks such as edge detection, feature extraction and object recognition rely heavily on the quality of the segmentation. Without a good segmentation algorithm, an object may never be recognizable. However, in many cases parts of contours can be correctly reconstructed either by performing edge grouping or as parts of boundaries of segmented regions. Therefore, recognition of objects based on their contour parts seems to be a promising as well as a necessary research direction. The latest survey on color image segmentation techniques discussed the advantages and disadvantages of classical segmentation techniques, such as histogram thresholding, clustering, edge detection and region based methods, vector based, fuzzy techniques as well as physics based methods [3]. Over segmenting an image will split an object into different regions while under segmenting it will group various objects into one region. In this way the segmentation step determines the eventual success or failure of the analysis. For this reason, considerable care is taken to improve the state of the art in color image segmentation. Extensive research has been done in creating many different approaches and algorithms for image segmentation, but it is still difficult to assess whether one algorithm produces more accurate segmentations than another, whether it be for a particular image or set of images, or more generally, for a whole class of images. Every year new edge detection algorithms are published. This paper analysis some recent approaches for detecting edges for segmentation.

II. TYPES OF NOISE

Noise is added inside the picture at the time of photograph acquisition or transmission. Different factors may be accountable for introduction of noise inside the photo. The wide variety of pixels corrupted in the picture will decide the quantification of the noise. The fundamental assets of noise within the virtual image are:

a) The imaging sensor may be stricken by environmental conditions at some stage in picture acquisition.

b) Inadequate mild degrees and sensor temperature may additionally introduce the noise in the picture.

c) Interference in the transmission channel may also corrupt the photo.

d) If dirt debris is gift at the scanner display screen, they also can introduce noise inside the photograph.

Noise is the undesirable results produced within the picture. For the duration of photo acquisition or

transmission, numerous elements are chargeable for introducing noise in the photo. Depending at the sort of disturbance, the noise can have an effect on the picture to special volume. Commonly our cognizance is to cast off sure kind of noise.

So we become aware of sure type of commotion and apply one of a kind calculation to get rid of the clamor. Picture commotion can be sorted as Impulse clamor (Salt-and-pepper clamor).

Gaussian distribution which is also known as normal distribution whose Probability Density Function is equal to statistical noise known as Gaussian Noise. This noise is removed from the digital images by smoothening of the image pixels which helps in reducing the intensity of the noise present in the image which is caused due to acquisition but the result maybe sometime undesirable and also which can result in blurring edges of the high-quality images [2].

Gaussian Noise: - Gaussian noising is a process that adds a noise signal to an image in order to deliberately corrupt the image, hence reducing its visual quality.

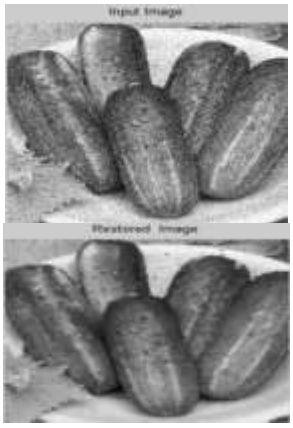

Figure 1: Gaussian Noise

Salt and Pepper Noise: - Salt and Pepper noise represents itself as randomly occurring white and black pixels in an image.

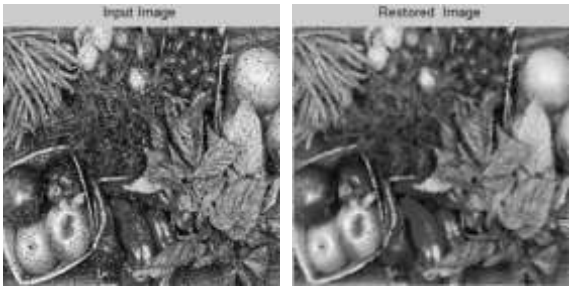

Figure 2: Salt and Pepper Noise

Speckle Noise Attack: - Speckle noise shares many common properties with other smoothing processes.

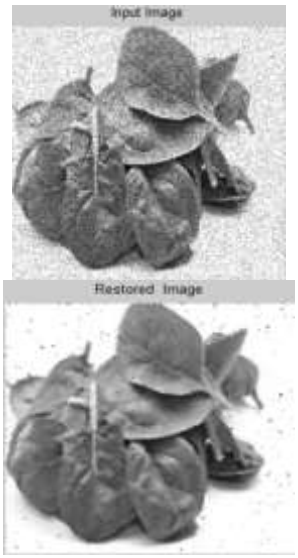

Figure 3: Speckle Noise

Poisson Noise Attack: - Shot noise and poison noise attack is associated with the particle nature of light. Shot noise in electronic devices results from unavoidable random statistical fluctuations of the electric current when the charge carriers (such as electrons) traverse a gap.

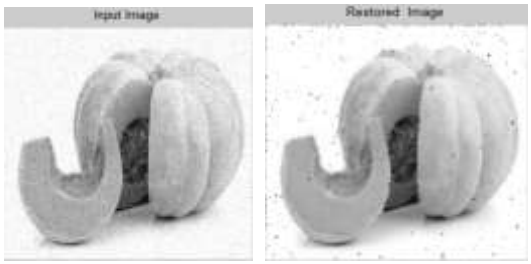

Figure 4: Poisson Noise

The current is a flow of discrete charges, and the fluctuation in the arrivals of those charges creates shot noise.

III. MEDIAN FILTER

In sign processing, it's far often proper that allows you to carry out some type of noise reduction on a photograph or sign. The middle sift through is a nonlinear advanced separating system, every now and again used to evacuate commotion. Such commotion refund is a typical pre-taking care of dare to upgrade the consequences of later getting ready (for example, side area on a photo). Center filtering could be for the most part used as a piece of automated photograph handling because of the reality, underneath specific circumstances, it jelly edges even as getting rid of commotion (anyway observe exchange under). The guideline idea of the middle get out is to gone through the sign section through get to, supplanting every passage with the middle of neighboring passages. The example of colleagues is known as the "window", which slides, access with the guide of access, over the

total flag. For 1D sign, the most extreme clear window is essentially the essential couple of past and taking after sections, while for 2d (or higher-dimensional) cautions including photos, more intricate window examples are reasonable (which incorporate "holder" or "go" designs). Know that if the window has an odd wide assortment of passages, then the middle is anything but difficult to characterize: it is essentially the inside esteem after every one of the sections inside the window is sorted numerically. For an even wide assortment of passages, there is several suitable middle, see middle for additional data.

See that, in the case above, in light of the fact that there is no get to past the principal esteem; the essential expense is rehashed, as with a definitive charge, to procure adequate passages to fill the window. This is one method for adapting to lacking window passages at the hindrances of the flag, yet there are diverse plans that have outstanding houses that may be fancied particularly examples:

- Avoid handling the limits, with or without trimming the flag or picture limit a while later,
- Fetching sections from different places in the flag. With pictures for instance, sections from the far flat or vertical limit may be chosen,
- Shrinking the window close to the limits, so that each window is full.

IV. PROPOSED METHODOLOGY

The Modified Median Filter calculation is the point at which a chose window contains just 0 and 255 esteem then the reestablished esteem is either 0 or 255(again uproarious), drives us to proposed. In this calculation we chose pixel esteem 0 and 255 values then the preparing pixel is supplanted by mean estimation of the chose window. The detail of the calculation is given underneath.

Algorithm:

Step 1: Select a 3 x 3 matrix size according to the 2-D window size. Assume that the processing pixel is P_{ij}, which lies at the center of window.

Step 2: If 0 < Pij< 255, then the processing pixel or Pij is uncorrupted and left unchanged.

Step 3: On the off chance that Pij = 0 or Pij = 255, then it is considered as tainted pixel and four cases are conceivable as given underneath.

Case 1: In the event that the chose window has all the pixel esteem as 0, then Pij is supplanted by the Salt clamor (i.e. 255).

Case 2: On the off chance that the chose window contains all the pixel esteem as255, then Pij is supplanted by the pepper commotion (i.e. 0).

Case 3: In the event that the chose window contains all the esteem as 0 and 255 both. At that point the handling pixel is supplanted by mean estimation of the window.

Case 4: On the off chance that the chose window contains not all the component 0 and 255. At that point dispose of 0 and 255 and locate the middle estimation of the rest of the component. Supplant Pij with middle esteem.

Step 4: Rehash step 1 to 3 for the whole picture until the procedure is finished.

Figure 5: Flow Chart of Proposed Method

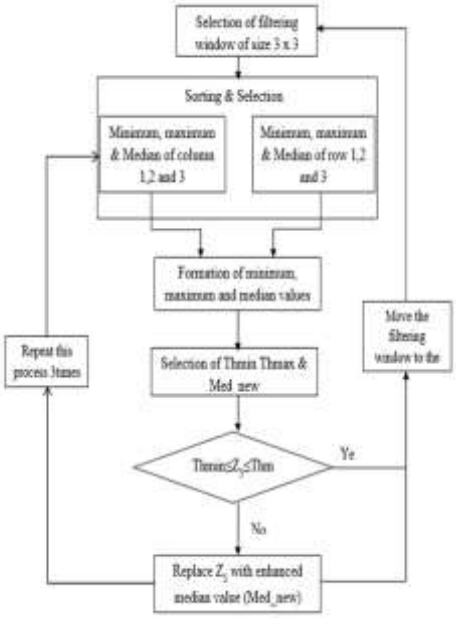

Figure 5: Flow Chart of Proposed Method

IMAGE SEGMENTATION METHOD

Image segmentation is probably the most important task in image understanding. It is the partitioning of an image into a set of non-overlapping regions whose union is the entire image. The purpose of image segmentation is to decompose the image into parts that are meaningful with respect to a particular application. Without good image segmentation, it is not possible to process the image appropriately and, therefore, to understand what it represents.

It is very difficult to define what constitutes a "meaningful" segmentation of an image within a computer algorithm. Haralick and Shapiro suggest that the following rules are usually obeyed.

Segmented regions should be uniform and homogeneous with respect to some characteristic such as gray level or texture.

Region interiors should be simple and without many small holes.

Adjacent segmented regions should have significantly different values with respect to the characteristic on which they are considered uniform

.

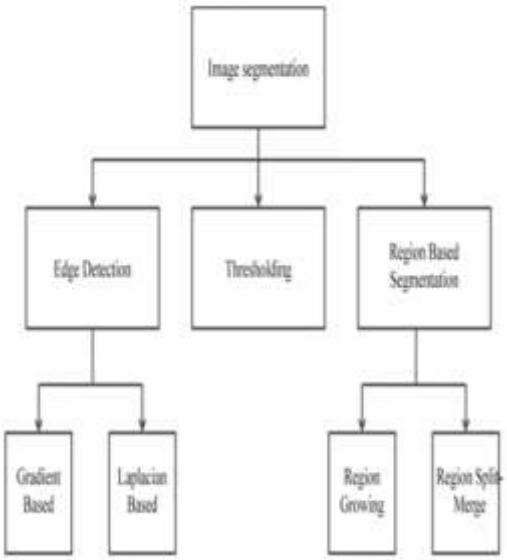

Figure 6: Image Segmentation Methods

EDGE-DETECTION

Gradient-based edge detection is the most common approach for detecting meaningful discontinuities in gray level. This leads to formalism in which "meaningful" transitions in gray levels can be measured. An ideal edge is a set of connected pixels, each of which is located at a step transition in gray level. The gradient of an image f(x, y) at location (x, y) is defined as vector. The gradient vector points in the direction of maximum rate of change of F at coordinates (x, y). An important quantity in the edge detection is magnitude of this vector.

$$G(x, y) = \frac{1}{2\pi\sigma^2}\exp\left(\frac{x^2 + y^2}{2\pi\sigma^2}\right)$$

(1)

The parameter σ of Gauss filter determines the degree of smoothing [5]. The lower σ has high edge detection precision, but smoothing and noise cancellation effect are ineffective. The larger σ has good effect in noise cancellation, but the edge of crack is vague and the position of crack is inexact. The theory of adaptive Gauss filter is that the present pixel is noise, σ should be larger and the present pixel is edge or smooth area, σ should be as small as possible. Boundaries of each segment should be simple, not ragged, and must be spatially accurate.

V. SIMULATION RESULT

The proposed calculations are tried utilizing 256x256 8bit/pixel image. The simulation parameter of proposed method by Mean square Error (MSE) and Peak Signal to Noise Ratio (PSNR) are:

Mean Square Error (MSE)

$$= \frac{1}{N_1 N_2}\sum_{j=1}^{N_2}\sum_{i=1}^{N_1}(f(i, j) - g(i, j))^2$$

(2)

Peak Signal to Noise Ratio (PSNR) in dB

$$= 10 \times \log_{10}\left(\frac{255^2}{MSE}\right)$$

(3)

Where MSE remains for Mean Square Error, PSNR remains for Peak Signal to Noise Ratio. From the reproduction result appeared in Table I to II, it is watched that the execution of proposed calculation is enhanced PSNR than the current calculations at medium and high clamor level.

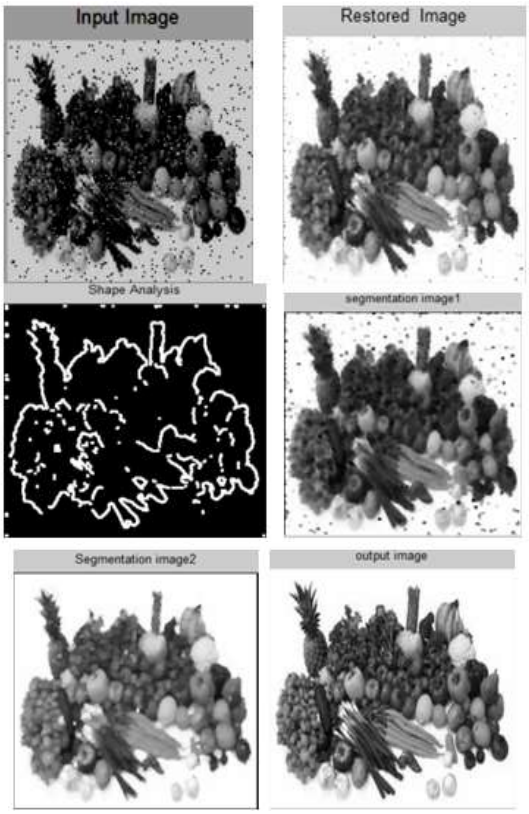

Figure 7: Simulation Result for Fruits Image

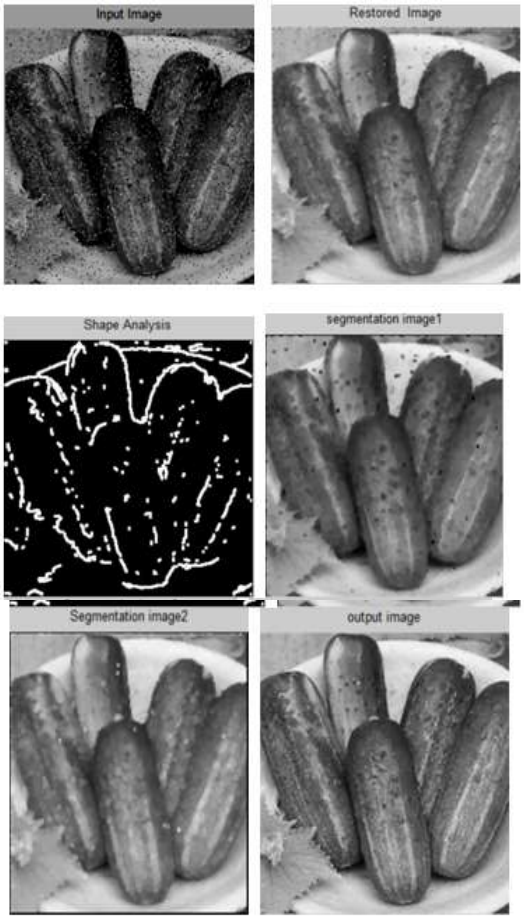

Figure 8: Simulation Result for Vegetable Image

Table 1: PSNR and MSE Value for Fruits and Vegetable Image

Image	Noise	MSE	PSNR (dB)
Fruits	Salt and Pepper Noise	16.7786	35.8832
	Gaussian Noise	17.943	34.895
	Speckle Noise	16.990	35.882
	Poisson Noise	12.894	37.932
Vegetable	Salt and Pepper Noise	8.3043	38.9378
	Gaussian Noise	8.0127	39.093
	Speckle Noise	10.893	37.904
	Poisson Noise	9.893	38.894

VI. CONCLUSION

In this paper image de-noising based on segmentation and edge detection method is proposed to overcome the drawback of previous method. Edge detection is used for image segmentation and data extraction in areas such as image processing, computer vision, and machine vision. Image segmentation is typically used to locate objects and boundaries in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label.

REFERENCE

[1]. Chi Cuong Tran, Dinh Tu Nguyen, Hoang Dang Le, Quoc Bao Truong, "Automatic dragon fruit counting using adaptive thresholds for image segmentation and shape analysis", 4th NAFOSTED Conference on Information and Computer Science, IEEE 2017.

[2]. C. Xia, L. Wang, B.-K. Chung, and J.-M. Lee, "In situ 3D segmentation of individual plant leaves using a RGB-D camera for agricultural automation," Sensors, vol. 15, pp. 20463-20479, 2015.

[3]. A. Payne, K. Walsh, P. Subedi, and D. Jarvis, "Estimating mango crop yield using image analysis using fruit at 'stone hardening' stage and night time imaging," Computers and Electronics in Agriculture, vol. 100, pp. 160-167, 2014.

[4]. Y. Song, C. Glasbey, G. Horgan, G. Polder, J. Dieleman, and G. Van der Heijden, "Automatic fruit recognition and counting from multiple images," Biosystems Engineering, vol. 118, pp. 203-215, 2014.

[5]. D. Chudasama, T. Patel, S. Joshi, G. Prajapati "Survey on Various Edge Detection Techniques on Noisy Images" , IJERT International Journal of Engineering Research & Technology ISSN: 2278-0181 Vol. 3 Issue 10, October- 2014.

[6]. Er. Komal Sharma, Er. Navneet Kaur, "Comparative Analysis of Various Edge Detection Techniques", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 12, December 2013.

[7]. S. Patel, P.Trivedi, V. Gandhi and G. Prajapati, "2D Basic Shape Detection Using Region Properties" IJERT International Journal of Engineering Research & Technology, Vol. 2 Issue 5, May-2013.

[8]. T. Gajpal, Mr. S. Meshram "Edge Detection Technique Using Hybrid Fuzzy logic Method", IJERT International Journal of Engineering Research & Technology, Vol. 2 Issue 2, Febuary-2013.

[9]. Mrs. A. Borkar, Mr. M.Atulkumar "Detection of Edges Using Fuzzy Inference System", International Journal of Innovative Research in Computer and Communication Engineering, Vol. 1, Issue 1, March 2013.
[10]. Ur Rehman Khan, K. Thakur "An Efficient Fuzzy Logic Based Edge Detection Algorithm for Gray Scale Image", International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459, Volume 2, Issue 8, August 2012).
[11]. Maini, Raman, and Himanshu Aggarwal, "Study and comparison of various image edge detection techniques", International Journal of Image Processing (IJIP), Issue 3, no. 1, Pp. 1-11, 2009.

Mrs. Aparna Singh Kushwah "Image Denoising based on Segmentation and Shape Analysis for Vegetables and Fruits Image "International Journal of Engineering Research and Applications (IJERA) , vol. 8, no.6, 2018, pp.50-55