Enrichment Of Color Image Using Random Transfer Functions

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Abstract-Image enrichment might be a way of improvising an image quality in terms of upper insight of the knowledge present within the image. Enrichment of color images is more burdensome compared to the enrichment of gray scale images. Several methods are preferred for enriching the color images. variety of these methods are furnished during this seminar. One method supported enrichment in HSV space is described intimately . The results and comparison of those methods are also proposed.

I.INTRODUCTION

The objective of enrichment is to utilize the image so on get exceptional details of the image so as that the developed image is more suitable and useful for a particular application. Enrichment of gray level images are often done using many methods. These enrichment methods are often mainly classified into two categories.

Type 1:Structural domain type

Type 2:Frequency domain type

In structural domain methods, the pixel values are adapted to understand the enrichment. In frequency domain type, the image is transformed to S domain(frequency domain).In the frequency domain method there will be a three stages. In the first stage as image is transferred into the form of S domain(frequency domain).After in the second stage the enhance operations are ad mistered to converted coefficients. The final third stage the selected image is transformed to Structured domain type method. The various methods are present in the literature to enrich the images like Histogram centralization ,variance stretching , gray level segment and intensity transformation. In intensity transformation, images are sub divided into various types like negative conversions method, logarithmic conversion method and steven law conversion method.

In these introduction part wewill discuss some of the methods used in the enriching of color image, followed by its advantages and disadvantages. In [11] authors proposed the Non Linear trusted function method using local approach for enrichment of color image. In this method the authors proposes the visibility of regions in digital images. The method having two steps, first one is luminous enrichment and second one is contrast enrichment. The random function is used to support the luminous enrichment for the QD contortion Gaussian function is used and multiple convolution methods is used to obtain the nearby pixels.

In [12] authors presents the method to enrich the color image using neighborhood dependent application using nonlinear enrichment. Similarly in[3] also researches extended the INDANE method with adaptive integrated neighborhood dependent approach for the same color image enriching.

In adapative INDANE methods , the enrichment with luminous and contrast are made compatible , flexible and control. The authors shown the results in the better way than previous methods with various parameters like z, p and c.

In[3] authors proposed the Multiscale Reactive method(MSRCR) , to achieve the stability and lightness simultaneously in enriching the image. The method has stable supply of color interpretation so that these method will give more accuracy.

II. ENRICHMENT OF COLOR IMAGES USING NTFBLA METHOD

Usually RGB color space is represented for all color images. Red , green and blue are the basic color of the space. Generally the color image is recognized by the amount of specified color present. Whenever the enrichment is applied the basic color will get deteriorated as the color and luminance details are not segregated. Hence Non linear transfer function converts the RGB image into Hue Saturation Value image. It is device independent color representation format which is very helpful to detect the basic color without any deterioration. In this color space the chrominance and luminance are separated so as to the enrichment operation is only applicable for intensity of the image.

Due to which the image remains constant . Therefore in Non linear transfer function method they basically use enrichment method for Hue saturation value space.

The equations for transformation of images to the required format are as follows:

$$H = \begin{cases} H1, & if\ B \le G \\ 360 - H1, & if\ B > G \end{cases} \quad (1)$$

$$H1 = \cos^{-1}\left\{\frac{0.5[(R-G)+(R-G)]}{\sqrt{[(R-G)^2+(R-B)(G-B)]}}\right\} \quad (2)$$

$$S = \frac{[\max(R,G,B) - \min(R,G,B)]}{\max(R,G,B)} \quad (3)$$

$$V = \frac{\max(R,G,B)}{255} \quad (4)$$

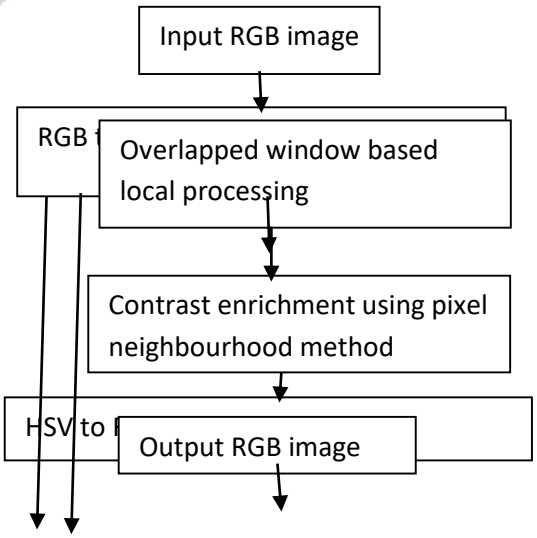

Fig. 1. Flowchart of NTFBLA method

the range of chrominance is 00 to 3600 and the S value is around 0 to 1 and V value is 0 to 1.The values should not be interrupted so as the H and S values are not changed. The enrichment operation is applied only on V values. The enrichment processing in done in two ways. A. The dynamic range compression is applicable if the pictures are mildly illuminated or non uniformly illuminated so that at the basic steps itself the administration is done., The equation 4 provides the luminance of the enriched image.

The enriched Luminance component is applicable in VLE.

$$V_{LE} = \frac{\left[(V^{0.75x+0.25}) + 0.4\left((1-x)(1-V)\right) + V(1-x)\right]}{2} \quad (5)$$

$$x = \begin{cases} 0 & for\ L \leq 50 \\ \dfrac{L-50}{100} & for\ 50 < L \leq 150 \\ 1 & for\ L > 150 \end{cases} \quad (6)$$

X parameter is analyzed as follows. The intensity L is 0.1 .If one part of the image is dark and other with better illumination then the enrichment will not be provided as shown in fig 2.The transfer function doesn't provide better results due to above said limitation. The enriched images provide grayed effect for all x parameters globally so it is better to determine the images locally.

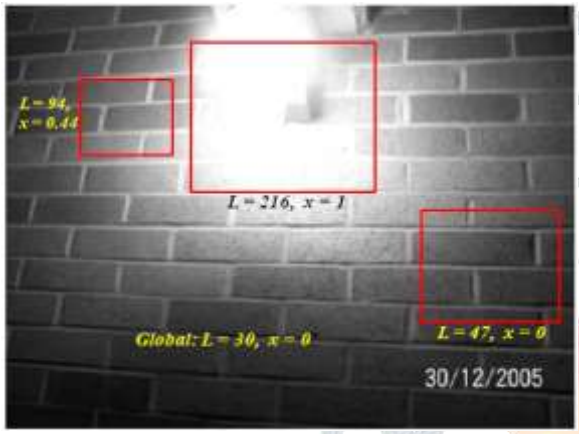

Fig. 2. Shows the value of parameter x for whole image and for different regions bounded by rectangle.

The x parameter is different in all regions so the transfer function also defers.The V values whatever determined split into overlapping blocks and the parameter x is calculated using the equation provided by histogram.

Fig. 3. Shows the luminance enrichment using global parameter x.

B. Contrast Enrichment:

The contrast enrichment method improves the luminance for brighter pixels but detoriates the luminance for darker pixels. Therefore, an area dependent contrast enrichment is required in behalf of contrast enrichment.

2-D convolution is administered using Gaussian function to accumulate the luminance information for the first V channel image of the source image. The convolution are often expressed as

$$V_c(x,y) = V_F(x,y) \otimes G(x,y) \quad (7)$$

The 8 bit V channel image is indicated by VF(x, y). The 2-D Gaussian function is denoted by G(x, y). Vc(x, y) is that the convolution output. Vc contains the luminance data of the nearby pixels. the quantity of contrast enrichment of the middle pixel value is evaluated by comparing the convolution output with center pixel value of the first VF image.

(a)

(b)

(c)

Fig. 5. (a) Source image (b)After luminance enrichment (c) After contrast enrichment.

III. RESULTS AND DISCUSSION

This section contains the output images of INDANE, AINDANE and MSRCR method and also the subjective approach of AINDANE, INDANE and MSRCR techniques and the critical analysis and of NTFBLA method

Fig. 6. Original Image

Fig. 7. Output of INDANE method

Fig. 6 shows an input image and Fig. 7 shows the performance of INDANE method.

A.Subjective Approach of NTFBLA method

Fig. 8(a). shows the examples of one input color images which are restraining both dark and bright regions. The NTFBLA method was proposed for those three images and the outputs are compared with the output of MSRCR method in Fig. 8(b), and with the output of AINDANE method in Fig. 8(c). Fig. 8(d) shows the output of color image enrichment using the random transformation function.

Fig 8(a)

Fig 8(b)

Fig 8(c)

Fig 8(d)

B. Objective Assessment

In the random transfer function, the pivot is on local processing of source image. Detail Variance (DV) and the Background Variance (BV) were applicable for the evaluation method wrt objective. Detail Variance gives the mean variance of the pixels included in the detail region. Background Variance gives the mean variance of all pixels included in the background region. By computing the variance of gray levels in the nearby pixels of each pixel in the image the values of DV and BV are obtained. Then the pixel is classified to the foreground if the variance is more than a threshold; otherwise the pixel is classified to the background. After the enrichment method is considered, the desired output is to see that DV is improved and no change in BV. Results are shown in Table I for five different input images. The threshold was chosen to be 5and the size of neighbourhood was 5*5. From Table I, the results indicate that MSRCR method provide the accurate result in terms of elevation in contrast, but there is deterioration of color after enrichment. The random transfer function produces excellent results in terms of DV and BV when analogized with the other methods.

Table I
BV and DV values for different enrichment methods

Image	Original		Hist. Eql.		MSRCR		AINDANE		Proposed Method	
	BV	DV	BV	DV	BV	DV	BV	DV	BV	DV
1	1.29	18.01	1.71	20.54	0.80	40.28	0.89	24.60	0.85	28.30
2	2.78	12.92	1.58	23.58	1.46	35.68	2.19	15.90	2.20	19.48
3	2.34	19.27	2.44	21.15	1.30	34.64	1.92	21.50	2.04	24.68
4	2.55	19.18	2.48	23.14	1.71	38.46	2.28	20.27	2.06	24.43
5	1.40	15.69	1.38	18.01	1.15	33.91	1.59	19.71	1.75	23.35
Average	2.07	17.01	1.99	21.28	1.28	36.59	1.77	20.34	1.78	24.05

IV. CONCLUSION

Based on the subjective evaluation the AINDANE manifested to surpass the INDANE and MSRCR methods for color image enrichment. Based on the subjective and objective assessments done, the random transfer function showed to be eminent and generates better images in collation to the methods AINDANE and MSRCR.

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