

PERFORMANCE EVALUATION OF IMPROVED CONTENT ADAPTIVE IMAGE DETAIL ENHANCEMENT BY USING GUIDED IMAGE FILTER

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Abstract: Existing details enhancement algorithms offer edge-preserving decomposition algorithms. A resource image is usually very first decomposed into a base layer that may be established via homogeneous regions together with sharp sides as well as a details level which consists of fine details or textures by way of the edge-preserving decomposition criteria, then a detail-enhanced image is definitely produced by amplifying this details level. However a brand new norm dependent detail improvement algorithm which often generates the particular detail-enhanced image directly possesses preserved the particular sharp edges greater than an recent norm dependent algorithms. Nevertheless it has definitely not considered the consequence of the particular noise, so to be able to remove this matter a brand new algorithm is actually proposed that may integrate the modern norm dependent detail enhancement algorithm using the well identified guided image filter. The well guided image filtering is chosen because can certainly remove noises efficiently as well as preserve edges in far more optimistic approach.

Keywords: Digital Image processing, Image enhancement, Image enhancement techniques, contrast enhancement

1. INTRODUCTION

Digital Image processing (DIP) involves the modify of electronic data intended for improving your image qualities because of the aid regarding computer process. The finalizing is great for maximizing quality, sharpness and information on features of interest towards information extraction and extra analysis. This way of remote knowing actually started in 1960s that has a limited quantity of researchers mastering airborne multispectral defense data as well as digitized aerial photos. On the other hand, it n as not prior to the launch associated with Landsat-1, along with 1972, that electronic digital image information became readily available for place remote knowing applications. Then not only the

principle and physical exercise of electronic digital image processing what food what food was in its years as a child but 's so the price tag on digital computer systems was incredibly high and his / her computational effectiveness was considerably below by just present demands. Today, entry to be able to low expenditure and useful computing equipment and computer software is commonplace plus the sources associated with digital impression data usually are many as well as varied. The electronic digital image sources range between commercial planet resources satellites, airborne security, airborne solid-state photographic camera, scanning micro-densitometer to assist high-resolution camcorder [1].

2. IMAGE ENHANCEMENT

Image enhancement techniques have been widely utilized in many software of picture processing where the subjective excellent of images is vital for people interpretation. Contrast is an important factor in almost any subjective evaluation of picture quality. Contrast is done by the difference inside luminance returned from two adjacent types of surface. In some other words, contrast would be the difference inside visual properties that makes an target distinguishable by other objects along with the background. Throughout visual belief, contrast is dependent upon the difference in the colour as well as brightness from the object with other things. Our image system is actually more vulnerable to compare than absolute luminance; as a result, we can certainly perceive the earth similarly regardless of considerable changes in illumination conditions. Many algorithms pertaining to accomplishing compare enhancement have been developed and used on problems inside image running [6].

Enhancement would be the modification of your image to enhance impact for the viewer seeing that shown in fig 1. Generally enlargement distorts the main digital prices; therefore enhancement is just not done before the restoration procedures are completed. In personal laptop or computer graphics, the strategy

of improving the grade of adigitally saved image through manipulating your image getting software.

It can be quite simple, for case in point, to make an image lighter or even darker, as well as to increase or even decrease compare. Advanced impression enhancement computer software also supports many filtrations for shifting images in numerous ways. Programs specific for impression enhancement are sometimes called impression editors.

3. CONTRAST ENHANCEMENT

There exists a strong effect of distinction ratio in resolving electric power and detection capacity for images. Techniques with regard to improving picture contrast are one of the most widely employed enhancement processes. The sensitivity variety of any out of the way realizing detector is designed to record a wide range of terrain perfection from black basalt plateaus so as to white seaside beds under a wide range of lighting ailments. Few particular scenes use a brightness range that utilizes the many sensitivity.variety of these alarms. To produce a perception with the particular optimum distinction ratio, you should utilize the complete brightness variety of the screen medium, which is generally video [8].

3.1 Linear Contrast Stretch:

The easiest contrast enhancement is referred to as a linear distinction stretch. A DN value inside low end of the original histogram is usually assigned in order to extreme black and a value at the high finish is designated to severe white. The much better contrast ratio of the image having linear distinction stretch will certainly enhance different features on the particular map. The vast majority of image processing software display a perception only following linear stretching automatically. For colour images, your specific bands were stretched previous to being combined in colour. The linear distinction stretch significantly improves the particular contrast of most of the original perfection values, but you will find there's loss connected with contrast at the extreme excessive and small end connected with DN ideals. In comparison towards the overall distinction improvement, these distinction losses at brightness two opposites are tolerable unless the first is critically considering these portions of the landscape. Because of the flexibility connected with digital approaches an private eye could, for example, cause all DNs fewer the 106 to become black (0) then linearly stretch the remainder high DNs higher than 105 by having a range via 1 by means of 255. This severe stretch

would improve the contrast differences inside the bright pixels at the expense of the remainder of the scene [9].

3.2 Nonlinear Contrast Stretch:

Nonlinear distinction enhancement manufactured in different ways. The unique histogram have been redistributed to make a uniform population density connected with pixels along the horizontal DN axis. This expand applies the highest contrast enhancement towards the most used range as wsell as brightness values inside original picture. The perfection values are preferentially stretched, which results in maximum distinction. The consistent distribution expand strongly saturates perfection values at the sparsely used light along with dark tails of the original histogram. The resulting decrease of contrast inside light along with dark ranges is comparable to that inside linear distinction stretch however, not as severe. A Gaussian stretch is often a nonlinear expand that boosts contrast inside the tails of the histogram. This expand fits an original histogram to a normal supply curve between the 0 along with 255 boundaries, which improves contrast inside light along with dark ranges of the image. This enlargement occurs at the expense connected with contrast in the middle grey variety [10].

Encountered operators associated with image processing systems bypass the histogram examination stage in addition to adjust your brightness in addition to contrast associated with images which are displayed using a screen. For many scenes a range of stretched images must display fully the initial data. It ought to be noted that will contrast enhancement must not be done until other processing is finished, because your stretching distorts the initial values on the pixels.

4. RESULTS AND DISCUSSION

For the experimental results proposed algorithm, design and implementation may be performed in MATLAB employing image digesting toolbox. Results show which our proposed strategy gives greater results as opposed to existing approaches.



(a) Input Image 1 (b) Enhanced Image 1 (c) Output Image 1



(a) Input Image 4 (b) Enhanced Image 4 (c) Output Image 4

Fig 1: Output Results

INPUT IMAGE: we have taken the input image for producing the result of proposed as well as existing algorithms. It helps us to produce the result of proposed approach that is the study of image detail enhancement techniques, which provide us better result than the available methods. The figure showing is the input image.

ENHANCED IMAGE: we took the input image for experimental analysis. By implementation process we got enhanced image without using the guided image filter. It is existing image whose result will we compared with the proposed results that are quite better than the existing results showing in the figure.

OUTPUT IMAGE: The figure showing is the output image i.e the resultant image of our experiment. This final output of coloured image is more clear as compared to existing image. We observed that the proposed results are quite better than the existing results.

5. PERFORMANCE EVALUATION

This particular section contains the cross affirmation considering present and proposed methods. Some well-known photograph performance examination parameters intended for digital images are already selected for you to prove the performance in the proposed algorithm is very better than the existing procedures.

1. RMSE – The values of Root Mean square error are shown below in the comparison Table 1. As RMSE should be minimized; so the primary goal would be to decrease the actual RMSE wherever possible.

Table1: Root mean square error comparison table

SERIAL NO.	INPUT IMAGES	EXISTING RESULTS	PROPOSED RESULTS
1	IMAGE1	0.3596	0.3152
2	IMAGE3	0.3122	0.2537
3	TULIP	0.2411	0.2129
4	ROSE	0.2449	0.2437
5	FLOWER	0.3357	0.3241
6	PUPPIES	0.3207	0.2848
7	NATURE	0.3085	0.3068
8	DUCK	0.3411	0.3138
9	DOGCAT	0.2820	0.2814
10	FRIENDSHIP	0.3985	0.3102

Table 1 has clearly shown that the RMSE is minimum regarding the proposed algorithm for that reason proposed algorithm offers better results than the available procedures. This table has shown the results of existing algorithm as well as proposed algorithm.

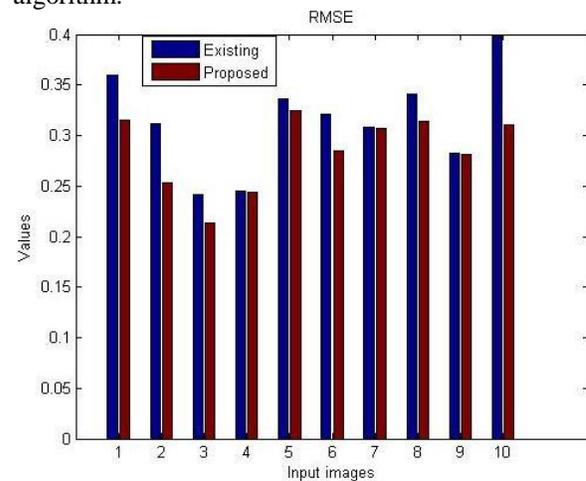


Fig 2: Root Mean square error graph

Figure 2 has shown the quantized analysis of the Root Mean Square Error of diverse images by means of Existing values in (Blue line) & proposed values in (Red lines). It is quite clear from the plot there's value involving RMSE is actually minimum in every case by using proposed method over different methods. This symbolizes improvement inside objective quality of the image. This RMSE chart proves the values involving proposed algorithm is low compared to the existing algorithm.

2. BER - The values of Bit error rate are shown below in the comparison Table 2. As bit error rate is have to be reduced hence the proposed criteria is

showing the greater results than the available approaches as bit error rate is less in each case. This table has shown the results of existing algorithm as well as proposed algorithm.

Table 2: Bit error rate comparison table

SERIAL NO.	INPUT IMAGES	EXISTING RESULTS	PROPOSED RESULTS
1	IMAGE1	0.0175	0.0172
2	IMAGE3	0.0172	0.0167
3	TULIP	0.0165	0.0162
4	ROSE	0.0166	0.0166
5	FLOWER	0.0174	0.0173
6	PUPPIES	0.0172	0.0169
7	NATURE	0.0171	0.0171
8	DUCK	0.0174	0.0172
9	DOGCAT	0.0169	0.0169
10	FRIENDSHIP	0.0178	0.0172

Figure 3 has shown the quantized analysis of the Bit Error Rate of different images by Existing value in (Blue line) & proposed values in (Red lines). It is rather clear through the plot the value regarding BER gets reduced in every case with the aid of proposed process over various other methods. This represents improvement inside the objective quality from the image. This BER chart proves the values regarding proposed protocol is low compared to existing protocol.

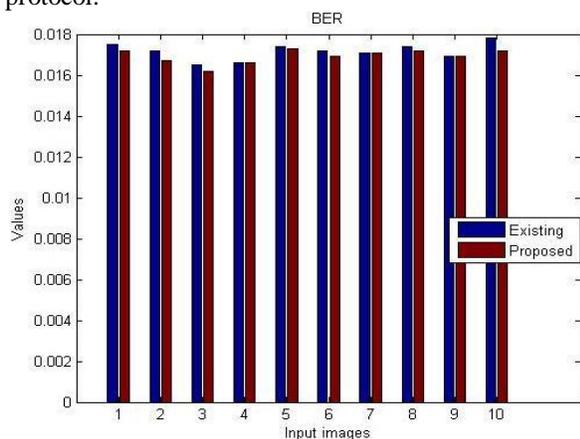


Fig 3: Bit error rate graph

Conclusion: The most recent approach are able to boost the particular contrast within digital images in useful manner by making use of the incorporated proposed enhancement algorithm. As edge preservation primarily based guided image filter has capacity to reduce the actual effectuation connected with noise as well as it maintains the edges in successful manner therefore provides superior results.

And also the proposed approach has offered quite effective results, thus can make it more realistic. The proposed technique is created and implemented within the MATLAB employing image processing toolbox. The several kind regarding images has additionally been considered for trial purpose. Also distinct quality metrics also thought to evaluate the potency of the proposed technique. The comparison between existing along with the proposed approach has definitely shown that this proposed method outperforms within the available approaches.

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