A Review on Bio-Medical Image Enhancement Using Counter Let Transformation and Bacterial Foraging Optimization

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Abstract— Image contrast enhancement is a feature for the enhancement of image. Images contrast is a feature which has been utilize for the proper visualization of image. In these feature intensity value available in the image, plays a vital role for the purpose of visualization. Bio-medical images like x-ray, ultrasound etc has drawback of low contrast constraints. Due to the low level of contrast, image feature cannot be proper visualized. Various approaches have been proposed for the enhancement of bio-medical images. Different type of f special type filters is available to enhance contrast of images but this approach does not provide better result in the context of contrast enhancement. The big issue in contrast enhancement is that these approaches utilize super resolution algorithm, which neglect some feature value available in the images and because of which proper feature cannot be visualized.

Key words: Image Contrast, Image Enhancement, BFO, Counter let Transformation

I. INTRODUCTION

A. *Image Enhancement*

The primary goal of picture upgrade is to process a given picture so that the outcome is more suitable than the first picture for a particular application. It complements or hones picture components, for example, edges, limits, or complexity to make a realistic show more supportive for showcase and examination. The improvement doesn't expand the inalienable data substance of the information, yet it builds the dynamic scope of the picked elements with the goal that they can be distinguished effortlessly.

Image enhancement includes three types of enhancement:

- Edge enhancement, an image-processing filter that increases the contrast of shape borders to improve its acutance
- Image enhancement, improvement to perceived image quality
- Shadow and highlight enhancement, an image processing technique to correct exposure

B. *Edge Enhancement*

Edge upgrade is a picture preparing channel that improves the edge difference of a picture or feature trying to enhance its acutance. The channel meets expectations by recognizing sharp edge limits in the picture, for example, the edge between a subject and a foundation of differentiating shading, and expanding the picture differentiate in the range quickly around the edge. This is the impact of making unpretentious splendid and dim highlights on either side of any edges in the picture, called overshoot and undershoots, driving the edge to look more characterized when seen from a normal survey separation.

1) *Properties of Image Enhancement*

- Amount: This controls the extent to which contrast in the edge detected area is enhanced.
- Radius or aperture: This influences the span of the edges to be recognized or improved, and the measure of the zone encompassing the edge that will be modified by the upgrade. A littler span will bring about upgrade being connected just to more honed, better edges, and the improvement being limited to a littler zone around the edge.
- Threshold: Where accessible, this alters the affectability of the edge location component. A lower edge brings about more unpretentious limits of shading being distinguished as edges. A limit that is too low may bring about some little parts of surface compositions, film grain or clamor being erroneously recognized just like an edge.

C. *Image editing*

Picture altering includes the procedures of modifying pictures, whether they are advanced photos, customary photochemical photos, or delineations. Customary simple picture altering is known as photograph correcting, utilizing apparatuses, for example, a digitally embellish to alter photos, or altering delineations with any conventional workmanship medium. Realistic programming projects, which can be extensively assembled into vector illustrations editors, raster design editors, and 3D modelers, are the essential apparatuses with which a client may control, improve, and change pictures. Numerous picture altering projects are additionally used to render or make PC workmanship starting with no outside help.

D. *Shadow and highlight enhancement*

Shadow and highlight upgrade alludes to a picture preparing strategy to right presentation. The utilization of this system is turning out to be more well known, advancing onto magazine covers, advanced media, and photographs. It is, notwithstanding, considered by some to be much the same as other damaging Photoshop channels, for example, the Watercolor channel, or the Mosaic channel.

1) *Recovering Shadows*

A conservative application of the shadow/highlight tool can be very useful in recovering shadows, though it tends to leave a telltale halo around the boundary between highlight and shadow if used incorrectly. A way to avoid this is to use the bracketing technique, although this usually requires a tripod.

2) *Recovering Highlights*

Recovering highlights with this tool, however, has mixed results, especially when using it on images with skin in them, and often makes people look like they have been "sprayed with fake tan".

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II. RELATED WORK

Imtiaz, M. S. [1] "New color image enhancement method for endoscopic images", this paper demonstrates a clear and successful shade picture change framework for endoscopic pictures. The proposed picture redesign framework satisfies desires by two interrelated steps: picture change at light dark level and shade era. Immediately, the got RGB endoscopic picture is changed over into 2 dimensional slag level apparition pictures using an astounding procedure called FICE (Fuji Intelligent Color Enhancement). In the accompanying stage the photo with most noteworthy entropy is picked as the base picture to be used for shade spread. Most noteworthy entropy quality demonstrates the most compelling enhanced picture. In shade duplication, the entire chrominance aide of a source picture is moved into the base picture by coordinating luminance and surface information between two photos. The detachment between luminance parts of target (base picture) and source pictures are found out using 2-standard Euclidean partition. The proposed shade picture update system is differentiated and standard thin band imaging on the size of picture quality, picture change, reenactment pace and capability of shading era and bowing. The proposed system can be joined on any RGB pictures assembled from any white light endoscopic contraptions. Is a highlight the tissue portrayal at first look bit of base endoscopic picture that enables better judgment.

Premkumar, S [2] "An efficient approach for color image enhancement using Discrete Shear let Transform" Picture upgrading is a key taking care of on a photo for broad mixture of employments. Differentiation overhauls improve the distinguishable nature of a photo by changing the pixels power of the data picture. In this study, a novel methodology for picture contrast change is proposed concentrated around Discrete Shear let Transform (DST) for shade pictures. With a particular deciding objective to get high separation change picture, the RGB picture is at first changed over into HSV (Hue, Saturation and Value) shading space. The changed over tint shade channel is simply taken into the record for DST crumbling. After that higher sub gatherings of shade section are wrecked and lower sub gatherings are considered for changing. Finally, high distinction picture is gotten by using reproduced Hue for HSV shading space and professor this shade space into RGB shading space. The execution of the proposed many-sided quality picture update framework is differentiated and existing histogram leveling based picture change. The perception based results exhibit that the proposed distinction picture change structure accomplishes alluring execution.

Janani, V. [3] "Infrared image enhancement techniques A review", From the most punctual beginning stage of the thought of picture changing, the investigators took the test of picture overhaul change as a key focus since redesigning a photo would realize change in the photo quality. Picture must be overhauled going before any predetermined taking care of. A perfect Enhancement methodology should redesign both astounding and low quality pictures, and should highlight even little purposes of interest concealed in the photo. Infrared picture overhaul refines the unobtrusive components immerged far away and give a racket free picture as yield. This paper was proposed to discuss and dismember about diverse picture change strategies and channels that are used to overhaul the way of the given information picture.

Bhattacharya, S [4] "Localized image enhancement", Picture change is a settled in field in picture taking care of. The guideline objective of picture change is to grow the perceptual information contained in a photo for better representation using some transitional strides, in the same route as, unpredictability redesign, de-obscuring, de-noising et cetera. Among them, separate change is especially vital as human eyes are more unstable to luminance than the chrominance portions of a photo. Most of the separation change computations proposed till now are overall schedules. The genuine drawback of this overall strategy is that in helpful circumstances, the unpredictability of a photo does not rot reliably and the yields of the overhaul strategies accomplish inundation at fitting distinction centers. That prompts information adversity. Really, to the best of our understanding, no non-reference perceptual measure of picture quality has yet been proposed to evaluate confined change. We propose a speedy figuring to extend the unpredictability of a photo chiefly using specific quality rot (SVD) approach and attempt to portray a couple of parameters which can give bits of data related to the headway of the change process.

Suprijan to [5] "Image contrast enhancement for film-based dental panoramic radiography", The dental encompassing radiography is one of dental imaging that used to picture the entire of the maxilla and mandible jaws on the one photo planes. Despite the way that the quick automated encompassing radiography has been available, however film-based encompassing radiography is still used on the by and large dental focus and lab in Indonesia. The way of film-based picture has essential obstacle in view of compound taking care of and picture redesign isn't conceivable if necessary. Along these lines, digitized film-based picture to mechanized picture was obliged to allow picture enhancements to improve the interpretability way of information in the photo. Digitized film-based picture is performed using a flatbed scanner on transmission and reflection mode. In this paper, the separation way of automated picture that checked using both modes is surveyed concentrated around estimation picture trademark. The outcomes showed that the way of digitized picture using transmission mode is better than using reflection mode. In any case, if prompt modernized imaging is used as a largest amount, picture update on digitized picture is still required. Four strategies, i.e. contrast broadening, HE, AHE, and CLAHE are used to try improve the quality digitized picture. Evaluation of the slant picture quality is performed concentrated around target establishment. The slant picture quality for digitized encompassing picture can be gotten by using picture change concentrated around CLAHE-Rayleigh framework, that showed by the minimum estimation of mean, standard deviation, RMSE, and ordinary qualification and the higher estimation of NAE and SAE.

III. APPROACHES USED

A. Counter let Transformation

The Contour let transform uses a double filter bank structure to get the smooth contours of images. In this double filter bank, the Laplacian pyramid (LP) is first used to capture the

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point discontinuities, and then a directional filter bank (DFB) is used to form those point discontinuities into linear structures. The Laplacian pyramid (LP) decomposition only produces one band-pass image in a multidimensional signal processing that can avoid frequency scrambling. And directional filter bank (DFB) is only fit for high frequency since it will leak the low frequency of signals in its directional sub-bands. This is the reason to combine DFB with LP, which is multi-scale decomposition and remove the low frequency. Therefore, image signals pass through LP sub-bands to get band-pass signals and pass those signals through DFB to capture the directional information of image. This double filter bank structure of combination of LP and DFB is also called as pyramid directional filter bank (PDFB), and this transform is approximate the original image by using basic contour, so it is also called discrete contour let transform. The Contour let transform is inspired by the human visual system and Curve let transform which can capture the smoothness of the contour of images with different elongated shapes and in variety of directions. However, it is difficult to sampling on a rectangular grid for Curve let transform since Curve let transform was developed in continuous domain and directions other than horizontal and vertical are very different on rectangular grid. Therefore, the Contour let transform was proposed initially as a directional multi-resolution transform in the discrete domain.

B. BFO (Bacterial Foraging Optimization):

Bacterial foraging optimization algorithm (BFOA) has been widely accepted as a global optimization algorithm of current interest for distributed optimization and control. BFOA is inspired by the social foraging behavior of Escherichia coli. BFOA has already drawn the attention of researchers because of its efficiency in solving real-world optimization problems arising in several application domains. The underlying biology behind the foraging strategy of E coli is emulated in an extraordinary manner and used as a simple optimization algorithm. This chapter starts with a lucid outline of the classical BFOA. It then analyses the dynamics of the simulated chemo taxis step in BFOA with the help of a simple mathematical model. Taking a cue from the analysis, it presents a new adaptive variant of BFOA, where the chemo tactic step size is adjusted on the run according to the current fitness of a virtual bacterium.

In this approach various parameters has been used are number of bacteria, search space dimension, chemo tactic steps, reproduction steps, reproduction probability and elimination-dispersal probability. All these parameters has been initialized and used for the elimination dispersal of the non-fit bacteria's and to reproduces the healthy bacteria on the space of eliminated one. Search space dimension is treated as minimum maximum range of feature values. Fitness values have been computed on the basis of the bacteria health, chemo tactic steps and reproduction probability. On the basis of that fitness value, the bacteria are treated as eliminated bacteria or reproductive one. The probability value considered in our work is 0.3. The reason behind considering this particular value is the after this value the precision and recall values starts declining. This optimization approach neglects the maximum values that can't illustrate proper features. That may reduce feature dimension size of the feature vector.

This algorithm is very effectual in giving quality explanations. It is enthused by the natural collection which tends to eradicate the animals with pitiable foraging strategies and support those having flourishing foraging strategies.

The working of algorithm is split-up into following steps:

- Step 1: Data Acquisition (Image).
- Step 2: Feature Extraction (Colour Feature).
- Step 3: Add to database.
- Step 4: Repeat Step 1 to 3 until all the data should not be finished.
- Step 5: Select query Image.
- Step 6: Extract Features and Apply Bacterial foraging Optimization to find out position best of query image.
- Step 7: Compare with database and find out best match.
- Step 8: Compare both the best image from database and query image and calculate results on the basis of approximate values [11]

IV. CONCLUSION

Approach Used	Advantages	Disadvantages
Counter let Transformation	Counter let Transformation produce smooth contours of images, It remove the low frequency	Counter Let Transformation use the double filter bank structure to get the smooth contours of images
BFO (Bacterial Foraging Optimization):	This is use to decrease the dimension of the matrix. It decreases the extra spaces in dimension.	This is very time consuming. *A.*

Table 1: Conclusion

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