Artificial Bee Colony Based Image Enhancement For Color Images In Discrete Wavelet Domain

Malika, Randhir Singh,

Department Of Electronics& Communication Engineering,
Sri Sai College of Engineering & Technology, Badhani,Pathankot
Associate Professor,Department of Electronics& Communication Engineering,
Sri Sai College of Engineering & Technology, Badhani,Pathankot

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Abstract - *Image enhancement takes on a large factor throughout vision primarily based applications. Not long ago tremendously deliver the results is done top electronic graphic enhancement. This report is adament a modification with time frame difference advancement strategies which might be in accordance with the synthetic stream community (ABC) to get protecting a suggest perfection of any supplied image. Although the ABC-based strategies enrich time frame difference graphics by way of climbing it's novel worth matrix, they may forget to generate satisfactory outcomes for several very low difference image. The actual aim with these studies jobs are to improve the image advancement approach further. The latest procedure could possibly have the ability to boost the precision rate with graphic advancement in which it will utilize artificial bee colony as well as the use of giuided image filter while enhancing the image to enhance the results further. In this we have used Artificial bee colony to enhance results as well as ABC search has ability to find optimistic adjustment factor. Therefore it will provide more optimistic results also to preserve edges further by using trilateral filter. It has been found that image enhancement using ABC search is better than ACO and ABC This paper finally winds up the several boundaries regarding earlier approaches.*

Key Words: **Image enhancement, Ant Colony Optimization, Guided image filter, Pso, Dwt-Svd.**

1. INTRODUCTION

Image Enhancement is basically a least complicated and beautiful element of electronic digital photograph processing. Graphic enlargement is process employed to improve the general efficiency from the damaged pictures can be obtained applying enlargement things .So which often a person's eye can certainly effortlessly observe crucial item top rated popular features of the images. It's really beneficial to eradicate the inappropriate artifacts from the photos similar to noises or maybe enhance the photo plus it to name primary capabilities then it appears enhanced. It is in reality an individual element of electronic digital photograph processing. In order to develop a graphic demonstrate far more accustomed to just imagine and assessment, them rejuvenates the picture capabilities similar to tips or maybe boundaries. It grows larger the vibrant selection of

composed characteristics. This doesn't improve the inherent content of information.

1.1 Need of Image Enhancement

The idea of impression enlargement is usually to raise the impression good quality hence the packaged impression exceeds the real key image to obtain a particular software or list of ambitions [1].Graphic editing encompasses this functions associated with transforming images, if they tend to be digital camera images, standard photochemical images, or designs. Standard analog impression editing is referred to as image editing designs having just about any standard artwork channel. Graphic software programs, which can be broadly arranged into vector visuals writers, raster visuals writers, and also 3D modelers, are classified as the major equipment having which often the end user may adjust, increase, and also modify pictures [22].

1.2 Discrete Wavelet Transformation-Singular value Decomposition (DWT-SVD)

The 2-D wavelet decomposition of a graphic is conducted by making use of 1 Debbie DWT across columns. In which tactic decomposes a lower distinction opinions image to the a number of registration elements that is LL, LH, HL, HH by means of DWT and also quotes this Solo importance matrix of your low-low registration band image. DWT-SVD tactic reconstructs the increased image during the Inverse DWT [18].

1.3 Optimization Techniques

The 2-D wavelet decomposition of a graphic is conducted by making use of 1 Debbie DWT across columns. In which tactic decomposes a lower distinction opinions image to the a number of registration elements that is LL, LH, HL, HH by means of DWT and also quotes this Solo importance matrix of your low-low registration band image. DWT-SVD tactic reconstructs the increased image during the Inverse DWT [18].

1.3.1 Ant Colony Optimization

ACO offers been made to be a population mainly structured Meta heuristic that is effectively placed on to a number of NP-hard combinatorial problems. The true ACO could be the most current procedures for expected search engine marketing methods. The principle theory will be its roundabout population conversation amongst individuals on the population involving fabricated ants. The central part of ant's activities is the contact between your ants through compound pheromone tracks, which allows those to find direct pathways amongst their nest and food resources. The function of pheromone is to steer the other ants right before the objective tips. This regarding legitimate insect colonies exploited. This ACO can be includes a few big development; initialization, pheromone bring up to date in addition to answer stage. Most of these stages generate an overall total search to your total optimum. Initially the primary technology, all bugs search with little thought to your best solution regarding confirmed dilemma in the potential answer place, in addition to old insect varieties can be generated with initialization period. Following that will, a higher level Pheromone depends on date. With the response levels, fresh insect nest can be generated predicated with the best possible answer through the old insect colony. After that, the best possible choices regarding 2 colonies will be compared. In the ending regarding the primary technology, doable answer place can be lower with a vector that will lessons your range regarding search place to get enough time on the ACO program. Optimum option would be next explored while in the lower search place throughout the protocol improvement. This ACO gets to the global ideal since bugs obtain channels while in the limited space [19].

1.3.2 Particle Swarm Optimization

Particle Swarm Optimization (PSO) is one of the recent heuristic algorithms that could be don not linear in addition to not ongoing promoting problems. That's a population-based stochastic search results promoting technique of ongoing nonlinear functions. PSO was made throughout 1995 as a result of Dr. Adam Kennedy, your interpersonal psychiatrist, and also Health-related expert. Russell Eberhart, an electricity engineer. PSO phrase highlights in order to a new family of algorithms which will be utilized to come across very best (or next to optimal) options for mathematical in addition to qualitative problems. That truly is readily carried out in a lot of computer programming dialects and possesses showed equally effective in addition to fast while on the different collection of selling problems. PSO was discovered while in trick of your made easier chook flocking model. Dr. Kennedy in addition to Dr. Eberhart defined throughout Particle swarm search results promoting possesses basic basic into two principal element methodologies. Most likely additional visible will be the idea ties in order to constructed living (A-life) generally, and then to bird flocking, fish training, in addition to swarming theory

specifically. The actual programmers of PSO talked about throughout Chemical swarm search engine optimization seeing that manufactured by Kennedy in addition to Eberhart comprise an easy strategy, in addition to paradigms could be placed positioned in a number of traces of computer code. It requires simply age-old mathematical vendors, which is likewise computationally inexpensive throughout disorders of equally storage space prerequisites in addition to quickness [19].

1.3.3 Artificial Bee Colony (Abc)

ABC criteria, the nest connected with artificial bees is made up of a few groups of bees: used bees, onlookers and also scouts. A new bee ready on the show up vicinity for producing conclusion for you to select a food source, is termed a great onlooker and a bee going to the food source visited independently before is termed a great used bee. A new bee carrying out unique look for is termed a scout. In the ABC criteria, initially 50 percent from the nest is made up of used artificial bees and also the partner indicates the onlookers. For every food source, there is just one used bee. In other words, the sheer numbers of used bees is equal to the sheer numbers of food options across the hive. The used bee in whose food source is usually fatigued from the used and also onlooker bees becomes a scout.

1.4 Guided Image Filter

The guided image filter operate functions edge-preserving removing upon an image, employing the information of the secondly image, referred to as a advice image, to help the filtering. The particular advice image can be the image itself, an alternative edition from the image, or even a totally different image. Taken image filtering is really a community functioning, for instance alternative filtering functions, yet accounts for the studies of a location in the corresponding spatial community inside advice image while establishing the value of the output pixel.

2. RELATED WORK

Atta et al. (2015) [1] offered a alteration of the low distinction improvement methods that will derive with the single worth decomposition (SVD) suitable for keeping the exact imply intensity of a picture While using the planned method, this measured sum of single matrices with the suggestions picture as well as world-wide histogram equalization (GHE) picture is worked out to discover the single worthy of matrix with the equalized image. **Bhandari et al. (2015) [2]** explained basic policy for an enhanced and effortless approach intended pertaining to enlargement regarding darkish plus low kind the comparison satellite TV for pc image based on knee operate in addition to gamma static a static correction utilizing underneath the radar wavelet adjust having single value decomposition (DWT–SVD) may be thought out meant for quality improvement

associated with credit. **Pathak (2015) et al. [3]** proposed image enhancement may be used to improve the digital quality of image. It really is employed to improve the compact quality of image that is too used to improve bad quality of picture into good picture or image. This part advises a combo of global and local way for contrast image improvement. Global comparison image enhancement improves low difference of image in a globally way. This sort of global improvement avoids noises and other calling artifacts of a stimulating image. In global variation image improvement when high evaluation occurs. **Ghosh et al. (2014) [4]** discussed the capacity for a new marketing criteria. The actual Cuckoo Find protocol all through tuning the actual impression development features pertaining to peak performance. The actual evaluate has long been carried out in relation to a pair of using the previous optimization protocol helped improvement, exclusively, Ancestral Algorithms plus Particle Swarm Marketing and sooner improvement methods Histogram Equalization plus Linear Big difference Grow methods. **Jiezhang Cheng et al. (2014) [5]** researched the pictures connected with outdoors displays received throughout haze, haze along with other local weather a short time usually have terrible distinction along with coloring reliability. Within this information, in order to efficiently enhance the degraded reflection throughout haze superior, decline the effect of the haze in order to outdoors targeted visitors online video media supervision methods, we considered the picture corrosion motive along with unclear process connected with photo throughout haze. **Agarwal et al. (2014) [6]** have researched in medical image handling; low assessment image research is a challenging problem. Low difference digital images decrease the capacity for audience in learning the image. Histogram founded techniques are being used to increase an evaluation of most kind of medical images. They'll are actually mainly requested those kind of medical images. These varieties of procedures are used to find exact locations of cancer tumor areas and with low-dose CT images, these methods are being used to increase small anatomies like blood vessels, bronchi nodules, inhaling and exhaling passages and pulmonary fissures. The very best method used for difference development is Histogram Equalization (HE). **Negi (2014) et al. [7]** summarized Image Enhancement is main steps in Image control. In this system, the original image is well prepared therefore the ensuing image is more attractive than the original for particular applications. Preprocessing a graphic include removal of noises, boundary or boundary enlargement, automated edge diagnosis, intelligent compare adjustment and segmentation. Image enhancement is a subjective control method simply. A graphic enhancement method used to process images might be fantastic for a specific nevertheless the same effect is typically not fine enough for another. Image improvement is a cheap process i.e. it doesn't attach any extra information to the original image. **Amira Bouaziz et al. (2014) [8]** proposed the grade of finger print images strongly influences any fingerprint biometric system. To enable you to care for poor fingerprint

images and overcome the limitations of conventional enhancement techniques, a cuckoo-search based formula for fingerprint image compare enhancement is proposed during this paper. The formula combines the by using cuckoo seek out both off white level mapping method of contrast augmentation, and the latest objective are being a fantastic metric for global fingerprint image augmentation. Therefore, the projected algorithm has proved to be extremely powerful for fingerprint image quality improvement for further control .
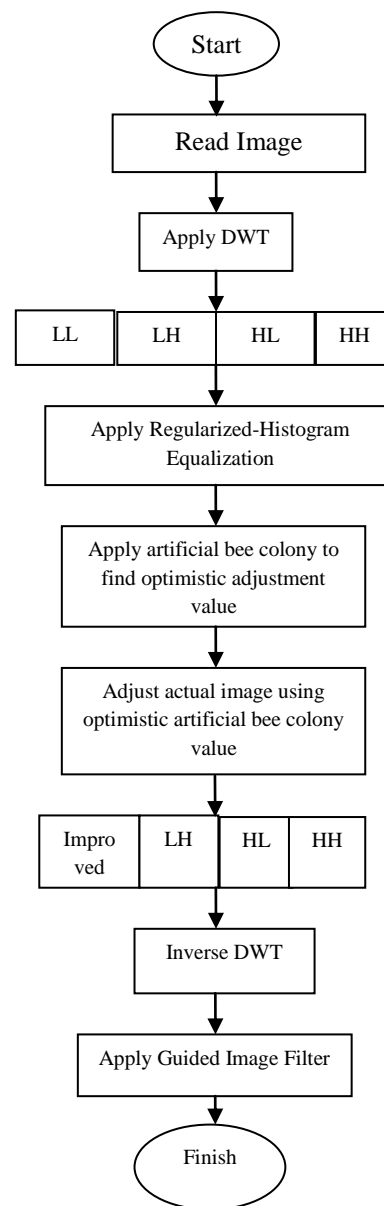
3. METHODOLOGY

Fig -1: Flowchart of the proposed technique
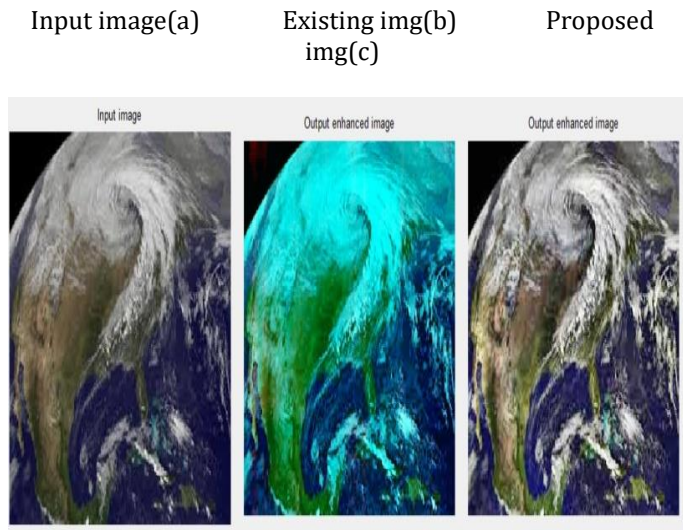
4. RESULTS

Input image(a)   Existing img(b)   Proposed
                        img(c)

Fig -2: Evaluation on Image Moundou

Input image(a)   Existing img(b)   Proposed
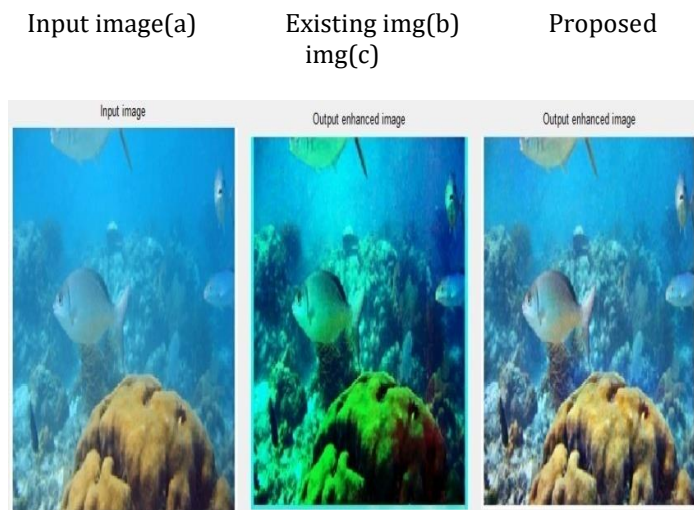   img(c)

Fig -3: **Evaluation on Image Great Barrier Reef**

As shown in above figure of Great Barrier Reef, the figure (a) is the original image. This is remote sensing image with low brightness. The (b) is the result image after using DWT. Figure (c) is output image after ABC search technique i.e. proposed technique which represent more enhanced image.

1. PSNR - Peak square noise ratio is the proportion between maximum possible value of the transmission and the power of the corrupting noise. It is measured in decibels (db). It could be explained as:

$$PSNR = 10.\log_{10}\left(\frac{MAX_I^2}{MSE}\right) \quad (2)$$

Here, MAX_I is the utmost possible pixel value of the image. When the pixels are represented using 8 bits per sample, this

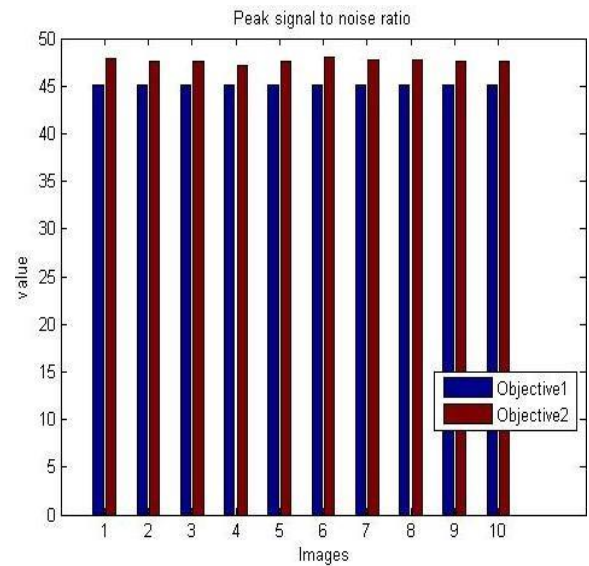is 255. Higher the PSNR value is, better the reconstructed image [24].

Fig -4: Comparison Graph for PSNR Value

Figure 2 from the plot there is increase in PSNR value of images with the use of ABC Search over other methods. This increase represents improvement in the objective quality of the image.

2. MSE – Mean square error is to compute an error signal by subtracting the test signal from the reference, and then computing the average energy of the error signal. It can be explained as:

$$MSE = \frac{1}{MN}\sum_{i=1}^{M}\sum_{j=1}^{N}(f(i,j) - f'(i,j))^2 \quad (3)$$

Where f (i, j) and f'(i, j) denotes intensity at location (i, j) in the input and processed image respectively [24].
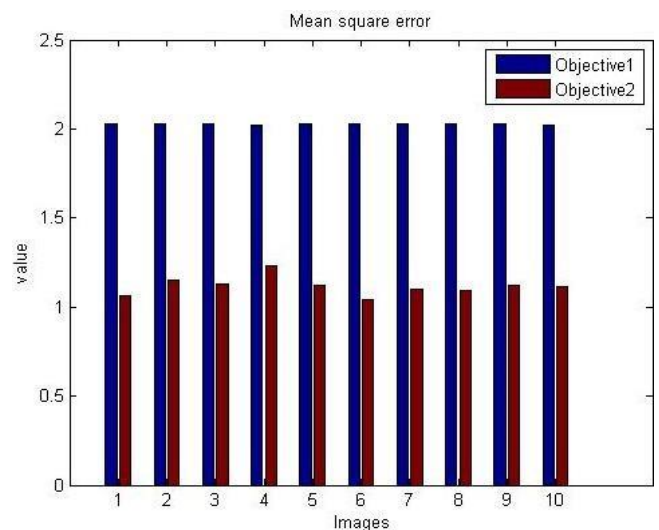

Fig 5: Comparison Graph for MSE Value

Figure 3 from the plot there is decrease in MSE value of images with the use of ABC search method over other methods. This decrease represents improvement in the objective quality of the image.

3. BER-It is called as the rate of which errors occur in a transmission system. This is directly translated into how many errors that occur in a sequence of a stated amount of bits. This is of bit error rate may be translated right into a simple formula:

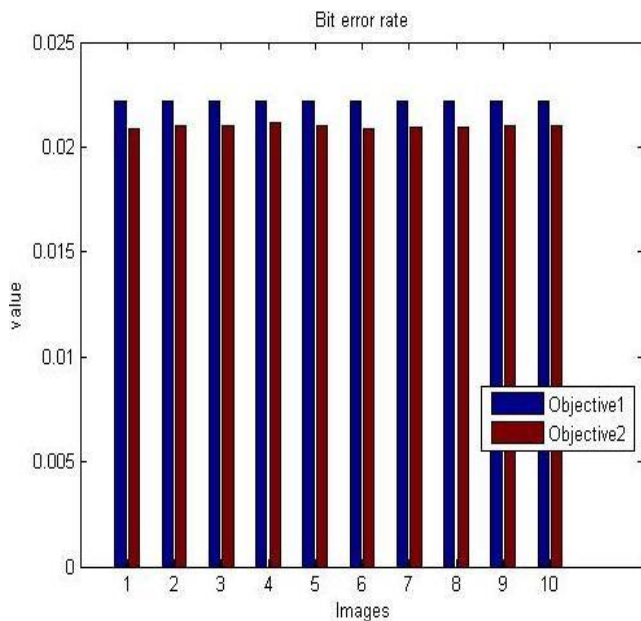$$BER = \frac{Number\ of\ errors}{Total\ number\ of\ bits\ sent}$$

Fig -6: Comparison Graph for BER Value

5. CONCLUSIONS AND FUTURE SCOPE

The work has presented an investigation on various image enhancement techniques. The review indicates the still many improvements are require in possible techniques to manage different images. The work indicates that the absolutely no technique will work for any type of images i.e. it can significantly preserve the natural appearance of an input image. In the existing method, The use of artificial bee colony while super-resolution and enhancing the image is also ignored by existing researchers. To get rid of this concern these studies features a revised approach. The objective of these studies tasks is to improve the style enhancement process further. The newest method could are able to improve the truth rate of image enhancement in joyful manner by utilizing artificial bee colony to find optimistic adjustment factor for DWT and SVD. The different of images been specifically taken for experimental purpose. Also different metrics has been considered to evaluate great and bad the proposed technique. The comparison between the earlier as well as the proposed method has clearly shown the proposed technique outperforms over the accessible

methods. In near future we will improve the proposed technique further in such a way that it can handle weather degraded images like foggy, hazy, dusty rainy and cloudy.

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