

# A Survey of Digital Image Visual Quality Enhancement using Histogram Equalization Technique

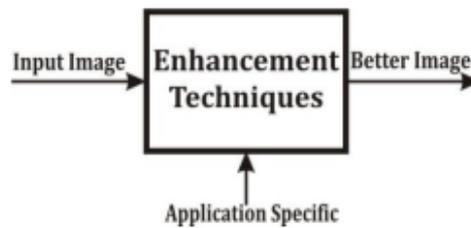
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**Abstract** - Image improvement is one among the difficult issues in low visual quality and low level image method. Image improvement completely different methods like histogram leveling, multipoint histogram equalizations and picture component dependent distinction protecting, but of this technique are not up to marks. Projected linear perception network methodology (PLPNM) for image improvement that features a additional strong result for distinction improvement with brightness preservation. Image element mutuality linear perceptron network supported curvelet transform and perceptron network. Curvelet transform image transform into multi-resolution mode. it's a realize element distinction of pixel for the dependency of characteristic and matrix work as a weight vector for perceptron network and so the perceptron network is in work to alter the load of input image or values. Image mutuality linear perceptron network for distinction improvement has applied on several pictures and compared the results of our projected methodology with various image improvement methods like histogram leveling. Absolute mean brightness error (AMBE) is used to measure the degree of brightness preservation. Smaller AMBE is best and Peak signal to noise quantitative relation (PSNR) is employed to measure the degree of distinction improvement, larger PSNR is best. By examination image secure coding improvement technique victimization histogram leveling with PLPNM supported the AMBE and PSNR. Image secure cryptography improvement have found that planned methodology (PLPNM) is best than existing methodology (HE).

**keywords** - Contrast enhancement, Histogram, Histogram equalization, brightness preserving, AMBE, PSNR

## 1. INTRODUCTION

Contrast improvement is one of the foremost important phenomena which can improve the visual quality of an image. Everyday individuals capture great deal of images, and these Photos might demand improvement due to the existence of noise, cloud, quality of the image capturing devices, etc. Digital image method may be a broad subject and generally involves procedures which can be mathematically advanced, but central set up behind digital image method is kind of simple. The ultimate word aim of image .Process is to use data contained at intervals the image to alter the system to understand, acknowledge and interpret the processed data out there from the image pattern [1]. Image improvement techniques improve the quality of an image as perceived by human. Usually image improvement techniques are accustomed get detail that is obscured, or to concentrate on sure choices of interest in image. In image improvement methodology one or extra attributes of image area unit modified. Image improvement is applied to altogether completely different areas of science and engineering. except for illumination conditions, quality of images is in addition affected by external noises and environmental disturbances like close pressure and temperature fluctuations. Thus, image improvement is very important. Approaches of distinction restricted image improvement via stretching the bar graphs over a reasonable dynamic vary and multi-scale adjective histogram equalizations is developed. Associate adjective rule is customized to the image intensity distribution either globally or regionally. By separating swish and detail areas of an image, the rule is applied to each of them to avoid excessive sweetening of noises. In most cases, quality of images is affected by atmosphere medium and water medium, so image improvement is required [2]. The aim of image improvement is to enhance the interpretability or perception of data in image for human viewers, or to supply `better' input for different automatic image process techniques. pictures will be processed by completely different suggests that, however image process mistreatment digital computers is that the most typical methodology as a result of digital strategies area unit quick, flexible, and precise. Image improvement improves the standard of pictures for seeing. In associate application specific image improvement technique the system is educated for the particular procedures to get a higher output image as shown by the diagram of Figure 1.1



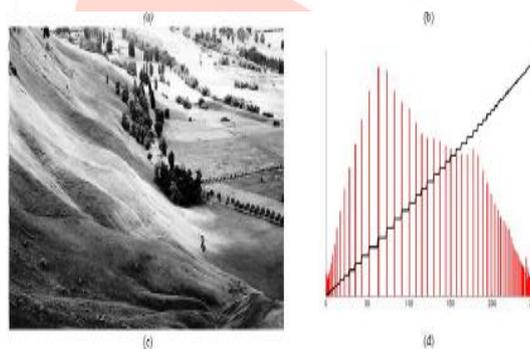
**Fig1** Application specific image enhancement

**II. DESCRIBE HISTOGRAM**

Histogram equalization (HE) may be a well-known methodology for image distinction improvement that uses bar graph of image in its process. he's a special domain technique that within which modification of pixels intensity values is completed directly which results in improvement of image. bar graph method is employed in image improvement the information inherent in histogram could utilize in several image method application like image segmentation and compression. A bar graph simply plots the frequency at that each grey-level happens from zero (black) to 255 (white). bar graph method got to be the initial step in preprocessing. to produce a so much higher image bar graph exploit and bar chart specification (matching) area unit 2 ways that wide used to modify the bar chart of an image. The bar chart may well be a separate perform that is shown in figure a combine of.1 bar chart represents the frequency of prevalence of all gray-level inside the image, which suggests it tell U.S. of America but the values of individual part during a image are distributed. Bar chart is given as-

$$h(r_k) = nk/N$$

Where an are unit strength and vary of pixels in image with intensity severally. Bar graph equalization (HE) is that the one amongst the celebrated technique for image distinction upgrade[3].



**Fig2** bar graph (Image Histogram)

**III.TYPES OF IMAGE ENHANCEMENT**

1. Bar graph Enhancement: The bar graph of a distinct gray-level image represents the frequency of occurrence of all gray-levels within the image. bar graph leveling (HE) may be a technique unremarkably used for image distinction improvement, since he's computationally quick and easy to implement. It works by flattening the bar graph and stretching the dynamic vary of the gray-levels by victimization the additive density performs of the image.

2. Local Enhancement: Previous ways of bar graph equalizations and bar graph matching area unit world. So, native improvement is employed. Outline sq. or rectangular neighborhood (mask) and move the middle from picture element to picture element. For every neighborhood, calculate bar graph of the points within the neighborhood. get bar graph equalization/specification perform. Map grey level of picture element targeted in neighborhood. It will use new picture element values and former bar graph to calculate next bar graph.bar graph leveling Technique: bar graph leveling may be a common technique for enhancing the appearance of pictures. Suppose we've got a picture that is preponderantly dark. Then its bar graph would be skew towards the lower finish of the gray scale and every one the image detail is compressed into the dark finish of the bar graph. If we may 'stretch out' the gray levels at the dark finish to supply a additional uniformly distributed bar graph then the image would become a lot of clearer. bar graph exploit stretches the bar graph across the complete spectrum of pixels (0 – 255). It will increase the distinction of pictures for the determinateness of human review and might be applied to normalize illumination variations in image understanding issues. bar graph exploit is one amongst the operations which will be applied to get new pictures supported bar graph specification or modification. Bar graph leveling is taken into account a world technique. This method is kind of easy and for every brightness j within the original image, the new pixel level worth (k) is calculated as given in equation wherever the add counts the quantity of pixels within the image with brightness capable or but j, and T is that the total variety of pixels .The main purpose of bar graph leveling is to search out grey level transformation perform T to remodel image f specified the bar graph of T(f) is 'equalized' .

Types of Image improvement Operations: Image improvement operations area unit removing blur and noise, increasing distinction and revealing details.

1. Improvement distinction: Image Contrast is that the distinction in look of 2 or additional elements of a picture seen at the same time. Distinction enhancement is employed to extend the seeing of distinction between completely different elements of a

picture. Variety of algorithms for distinction improvement area unit presently in use throughout the globe. The ways of brightness distinction and color distinction has been mentioned here. a picture should have sensible brightness distinction for correct vision. in a very low distinction image, we can't distinguish clearly between objects. Increasing the distinction makes the sunshine areas become lighter and dark areas become darker. 3 ways area unit won't to auto-correct the distinction of image. 1st technique uses linear stretching of bar graph over the complete vary. This system maps the intensities to new values specified the information is stretched to the entire vary.

2. Removing Noise: Digital pictures area unit susceptible to a range of varieties of noise. Noise is that the results of errors within the image acquisition method that end in picture element values that don't mirror actuality intensities of the important scene. Noise is introduced into digital pictures because of many reasons like a) If the image is scanned from a photograph, the film grain may be a supply of noise. It is a results of a broken film or because of the scanner itself. b) If the image is captured directly from a photographic camera it is because of mechanism of gathering the information. c) It can even be introduced because of less light-weight or high shutter speed of digital cameras Electronic transmission of image information can even introduce noise. Linear Filtering is best method to remove sure kind of noise. Averaging or Gaussian filter may be wont to accomplish this job. Averaging filter is beneficial to remove grain noise. Every picture element gets set to the common of its neighboring pixels. The problem with averaging filter is that edges of image get blurred. Median filter works during a similar method as averaging filter, the only distinction is that the output price of a picture element is set by the median of the neighboring picture element instead of mean. The principle advantage of median filtering over averaging is that it's a lot of less sensitive to extreme values. Therefore, median filtering is best ready to take away noise while not blurring the sides. adaptive filtering victimization Wiener filter usually turn out far better results than linear filtering. Accommodative filter preserves edges and different high frequency data of a picture thus it's additional selective than linear or median filters. This filter produces best output once noise is AWGN.

3. Blur Reduction: once we use a camera, we would like the recorded image to be a trustworthy illustration of the scene that we see however each image is additional or less indistinct. once a picture doesn't shows sharp details of its options it's known as blurred image. Thus, image deblurring is key in creating photos sharp and helpful. Some blurring continuously arises within the recording of a digital image; as a result of its inescapable that scene data "spills over" to neighboring pixels. In image declaring, we tend to request to recover the initial, sharp image by using a mathematical model of the blurring method. Sadly there's no hope that we are able to recover the initial image exactly! This can be because of numerous ineluctable errors within the recorded image. The foremost vital errors are fluctuations within the recording method and approximation errors once representing the image with a restricted number of digits.

#### IV. Previous Work Has Been Done

The previous work provides the information or data of hiding scheme that gives responsibility of information concealing in information science. a number of the theme is mention below. The section describe concerning previous connected work under image process.

Kim et al [9]. RSWHE proposed which is another improved version of HE. RSWHE consists of three modules such as bar graph segmentation, bar graph coefficient and bar graph equalization. In the bar graph segmentation modules, several sub-histograms of square measurement products support the mean and median image. Meanwhile, in the low coefficient graph modules, separate histograms are weighted by Stevens' normalized law. This module offers additional possibilities at rare gray levels. Finally, it was applied to each of the weighted bar charts. However, some applied mathematical data may be lost when the transformation of the low activity graph and the specified improvements are not obtained. Histogram equalization (HE) is widely used for improving contrast. However, it tends to vary the brightness of a photo and, therefore, is not suitable for consumer electronics, where maintaining the first brightness is important to avoid annoying problems. The bi-histogram equalization (BBHE) has proposed and analyzed mathematically that it can keep the first brightness of a particular range. However, there are still cases that are not treated well by BBHE, as they require the highest degree of preservation. This article proposes a generalization of BBHE which is called the Equivalent Repetitive Histogram Equation (RMSHE) to provide not only better but also scalable brightness conservation. BBHE separates the image entry histogram into two supported means before assimilating them independently. While the separation is done only once in BBHE, this article proposes to do the separation in another way; separate each new histogram to support their respective means. it is analyzed mathematically, which means that the brightness of the output image will converge towards the average light image input because the number of repetitions means of separation. In addition, the repetitive nature of RMSHE also makes it possible to preserve the evolving brightness, which is very useful in consumer electronics. The results of the simulation show that the cases which are not well treated by HE, BBHE and the dualist sub-image equalization histogram (DSIHE), are well reinforced by RMSH

Ch. Ganapathy Reddy et al. [10]. provided an algorithm in which he first executed the DWT to decompose the images into views of a group of band-limited parts, called HH, HL, LH and sub-band. Since the subband contains the lighting data, the logarithmic average brightness is calculated from the LL subband to calculate the dominant brightness of the input image. The LL sub-band is divided into 3 layers of low, medium and high concentration depending on the. intensity of the director. The adjusted operative intensity transfer is deliberately divided into 3 layers divided by the most important intensity, the operative transfer of the knee, and therefore the operative gamma shift. Then, the transfers adjust the operating concerns for a high speed differential protection improving the colors. The results increase the image obtained by the inverse DWT (IDWT). Improving contrast is very important for better perception and reproduction of colors. In this article, we explain the improvement techniques below: equogram equalization, bi-histogram equalization, contrast improvement using the discrete wavelet transform (DWT) and decomposition into singular value (SVD), the transformation into discrete cosine (DCT) and the decomposition into singular value (SVD). ) and therefore proposed contrast enhancement techniques to support the dominant brightness and adaptive transformation. The performance of each method is evaluated with parameters such as the mean square error (MSE), the improvement measure (EME), the peak signal-to-noise ratio (PSNR) and the mean absolute error (MAE) .

Li-Yu Chang Jiang et al. [11]. has developed a fuzzy approach to improve the distinction of distant image information in order to partition the value of the image element with the degree of artifact disappearing in order to reimburse the native light lost in dark and bright areas. The algorithm consists of 3 stages: mainly, the satellite image is distorted compared to the members of origin of gray level by groups of fuzzy average. Second, the appropriate stretching model for each group is performed to support the corresponding members. Third, the image is re-edited in the grayscale area by merging the gray stretch values in each cluster. Many conventional contract improvement techniques take a global approach to improving image brightness. However, it is generally difficult to apply all of the land cover classes that appear on satellite images, as information and details of the local contract may also be lost in dark and bright areas. during this study, an image enhancement method based on blurring is developed to partition the pixel values at different degrees of artefact in order to compensate for the local brightness lost in the dark and bright areas. The algorithm takes place in three stages: First, the satellite image is transformed from gray level space into member space by a fuzzy cMeans grouping. Second, they make stretching patterns appropriate to each group to support the corresponding member. Third, the image is transformed back into the grayscale space by merging the gray stretch values in all clusters. Finally, the performance of the proposed scheme is assessed visually and quantitatively. The results show that the proposed method can improve the image thanks to high quality visualization and high index image measurement.

S.C. Huang et al. [12] In addition to its image-based enhancement technique, another technique is already planned. AGCWD is intended for where gamma correction and light probability distribution panels are used. Although most AGCWD boxes improve the brightness of the input image, it may not offer satisfactory results if the input image lacks too bright pixels. following this case, the simplest potential enhancement node cuts the intensity of the first image input which can be simply understood. This article provides an effective method for changing histograms and improving the contrast of digital images. Improvement plays a major role in digital image processing, computer vision and pattern recognition. We present an automated transformation technique that improves the brightness of the immature image via gamma correction and the probability distribution of the luminance pixels. enhancing the video, the proposed image enhancement method uses time information about the difference between each image to reduce the magnitude of computational complications. Experimental results demonstrate that the proposed method produces an improved image quality comparable to or better than that produced using the previous modern state methods. Chen et al. [13] to reduce the problems encountered by BBHE, Wan et al. proposes another change, it is named DSIHE. Here, the bar graph is separated into 2 sub-images to support the median instead of the average and equalize an equivalent like BBHE. Even if DSIHE does not allow vital average changes, it fails to maintain average clarity in some cases. In addition, DSIHE may further produce artifacts or not apply to some extent. for example, the image intensity elements one, 2, 3, 200, 205, 208 and 210. Here, the median is two hundred; as a result, the first 3 pixels are often over-improved, which may not be desired.

In L.J. Huang et al. [14], discussed NIE (Nonlinear Image Enhancement). Simulation and identification processes are used along with the proposed NIE method. This process uses clipping and scaling parameters which are an appropriate combination of various images. This process enhances the quality of blurred image and a better quality is achieved, and PSNR (signal-to-noise ratio) performance is obtained than other nonlinear enhancement techniques.

In Ehsani et al. [15], proposed an adaptive and iterative histogram matching (AIHM) algorithm for chromosome contrast enhancement used in medical applications. To meet the different requirements and obtain the different results, some parameters in the presented model could be selected. The detailed simulations were accomplished using different sets of single chromosomes, indicating that the proposed method enhances the details adequately

Table 1. Explain related work

S.No.	Authors	Technique	Description
1	Kim et al.	Recursively separated and weighted histogram equalization for brightness preservation and contrast enhancement	Low embedding and low PSNR
2	Ch. Ganapathy Reddy et al.	contrast Enhancement for Remote Sensing Images with Discrete Wavelet Transform	ABMSE is more and low robustness or PSNR
3	Li-Yu Chang Jiang et al.	A Fuzzy-Based Method For Remote Sensing Image Contrast Enhancement	ABMSE is more and low robustness or PSNR
4	S.C. Huang et al.	Efficient contrast enhancement using adaptive gamma correction with weighting distribution	low robustness very low distortion and relatively large capacity
5	Chen et al.	Minimum mean brightness error bi-histogram equalization in contrast enhancement	blocks data embedding but low PSNR and more AMBE
6	L.J. Huang et al.	Non-linear image enhancement	good imperceptibility but more AMBE
7	In Ehsani et al.	chromosome image contrast enhancement using adaptive, iterative histogram matching	High IBE and low PSNR.

**V. PROBLEM DESCRIBED**

The main problem poor visual quality of digital image. This thesis is to propose an efficient a good and efficient technique for image improvement. In digital image process varied techniques have planned to reinforce the standard of image like bar graph leveling technique and component dependent distinction protective , however they doesn't give the higher result for distinction improvement and brightness preservation. Distinction improvement and image security main drawback overcome our planned a replacement technique for image improvement that's supported curvelet remodel and linear perceptorn network technique and it provides an improved result for distinction improvement with brightness preservation. Drawback of image could also be of

poor visual quality as a result of its distinction is low, or it's clattery, or it's blurred, etc. then low distinction within the pictures. Image distinction improvement may be a ancient drawback space in image process.

## VI.CONCLUSION

In image security improvement field varied techniques have planned to enhance the standard of image like bar graph leveling, multi-histogram leveling and component dependent image security protective a planned linear perception network technique (PLPNM) for image improvement that gives an improved result for distinction improvement with brightness preservation. PLPNM uses the curvelet and perceptron network for image improvement. The curvelet remodel is used to transform a picture into multi-resolution mode and perceptron network is used to regulate the load of input image or values. Our planned technique for image security improvement has applied on many pictures and compared the of our technique with different image security improvement ways. Their main disadvantages area unit a very increase within the contrast of large-sized objects and additionally a decrease within the contrast of small-sized objects within the image. Planned technique determine parameters particularly AMBE and PSNR, the planned technique is compared with the present ways particularly HE. However, identified techniques of bar chart leveling have variety of disadvantages that limit their use for image processing within the automatic mode. Mathematically established that the planned technique is healthier and high visual quality of digital image The higher than work is simulated victimization MATLAB simulation tool.

## VII.EXCEPTATION OUTCOME

Existing technique error additional however planned technique error less. Existing technique PSNR less however planned technique PSNR additional. Improve Peak Signal Noise ratio (PSNR) and therefore the Mean square Error (MSE) minimization, planned technique when put next to existing approaches. The goal of image improvement techniques is to enhance a top quality of an image specified increased image is best than the primary image. Several image improvement techniques are planned in every special and transform domains. Image improvement is one amongst the foremost very important issues in low-level image method. Its purpose is to enhance the quality of low distinction photos, i.e., to enlarge the intensity distinction among object. planned a replacement technique for image improvement supported image security. the most objective of image process is to extract or get the data from a picture.

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