Blind Image Quality Assessment For Highly Distorted Images Using Ciqe Algorithm

Anna Geomi. George[1],a Kethsy Prabavathy[2]
PG Scholar/Dept.of.CSE[1], Assistant Professor/Dept.of.CSE[2]

Abstract
No Reference-methods are used to predict the Quality of the images automatically by extracting and modelling prior Knowledge on specific distortions where the subjective quality assessment requires But many of the times the color accuracy is not noticed ie the structural distortions. The statistical features have been changed due to the presence of distortions and can be identified eventually without any reference. In this paper structural and non structural distortions can be distinguished and identified using the CIQE (Color Image Quality Estimating Algorithm).Compare it with PSNR and SSIM method.

Keywords: NR Method, Objective QA,.Spatial Dispersion, Natural scene statistics(NSS) method, Human Visual System (HVS)

1. INTRODUCTION

Image quality means the measurement of the perceived image degradation and the factors affecting the quality of an image is sharpness, distortions,color accuracy,noise,artifacts etc.The quality assessment is one problem and is classified mainly in two, subjective and objective quality assessment. In subjective method the quality is measured with the help of human opinion score but it is time consuming one. so the objective method is introduced and it predict the quality automaticaly.Depending upon the original image as reference the objective method is classified in two three, Full reference, Reduced reference and No reference method[1]. These methods want to be highly correlated with human perception. Distortions are occurred during the transmission, storing and sharing of information.

Many of the times only the distorted image is available and not have the original image as reference. In such cases the No reference method is used and it is difficult to create an algorithm to predict the visual quality without any reference. The Objective IQA measures are used in network visual communication applications for the purpose of QOS Monitoring. The concept of Human visual system is taken as it doesn't requires any reference to define the quality of an image. The statistical features also changes with distortions so by extracting the computational features from the image the distortions can be identified. The review and control of the quality of digital photographs is becoming quite challenging. By using the updating Algorithm the image quality can be evaluated and measured. In medical imaging application image distortions affect the diagnostic values so the quality want to be evaluate. These distortions can be identified by comparing the statistical features which are extracted from the input image with existing quality score. Then the type of distortion can be identified from it. The accurate and more efficient IQA measures will certainly enhance their applicability in real-world applications

2. PREVIOUS WORK

The No reference methods specify the distortions but it still lags the full reference method. The human eyes extract structural information from the viewing field, so the human visual system is highly adapted for this purpose. Therefore, the measurement of structural distortion should be a good approximation of perceived image distortion [2] from my survey.NR-IQA can be done based on DCT statistics. By this the BLIINDS algorithm is developed and predict the image quality based on the statistics of local discrete cosine transform coefficients[3]The degree of peakness and tail weight is then quantified.

$$k(x) = \frac{E(x-\mu)^4}{\sigma^4}$$

Where μ is the mean of x and σ is the standard deviation from this global image kurtosis value .Visually significant blocking artefact metric (VSBAM) is the other one used to measure the visibility of distortion as combination of blocking artefact and undistorted image.[4]But the LSB patterns are not satisfied in it. In BRISQUE method[5] the statistical features are extracted and the distortion orientation information is obtained by normalized luminance signals where in BLIINDS II the features are extracted in DCT domain and requires low dimensional features but it is time

consuming one because of the computational block statistics of DCT[6]

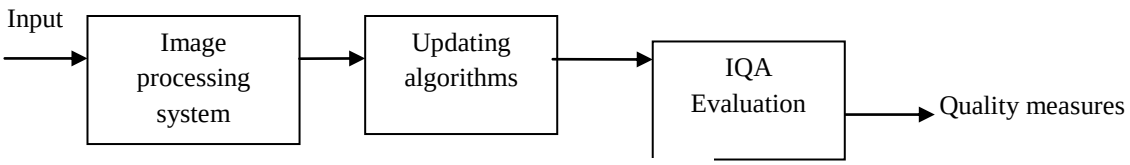


Fig.1. Diagram for IQA

In our method the quality is measured using the No Reference approach and the color accuracy is also considered.

In NR- IQA method signal from the transmitter is digitized and processed at the front end and at the receiver the perceptual signal is taken and map the vectors and d display .The diagram is shown in fig.2.

The psychophysical measurements to compute the visual quality and the image is decomposed to obtain the gain control model in the sub band decomposed domain[1] MSE (Mean Square Error) is used to evaluate the quality and is defined as

$$MSE=\frac{1}{M\times N}\sum_{i=1}^{N}\sum_{j=1}^{N}(x_{ij}-y_{ij})^2$$

Where x is the original image and y is the distorted image M✕N are the width and height of the image.

When MSE value increases as the compression ratio increases. If the MSE value decreases to zero then pixel by pixel matching of images become perfect.MSE is a simpler one. The other one is PSNR and is denoted by

$$PSNR=10\log_{10}\frac{L^2}{MSE}$$

The MSE and PSNR methods are easy to implement and have low computational complexities but they are not highly correlated with human perception and fail to capture image quality when they are used to measure across distortion types.

3.STRUCTURAL DISTORTIONS QUALITY ESTIMATION

A. Natural scene statistics based feature extraction.

The input image is decomposed in using scale space orientation decomposition and extract the statistical features using this the type of distortions can be identified. Range of pixel intensity values can be changed by normalization and the normalization can be done by the formula

$$I_N=(new_{max}-new_{min})\frac{1}{1+e^{-1-\frac{\beta}{\alpha}}}+new_{min}$$

Where α is the width and β is the intensity range. Divisive normalization affects the statistics of sub band coefficients.

Figure 2.1 . 1) Jpeg and 2) white noise affect

Figure 2.2. 1) Fast fading and 2) blur affect

The natural scene statistics model is used for the evaluation of quality. These natural images are considered as the signals with certain statistical properties. These features capture the dependencies

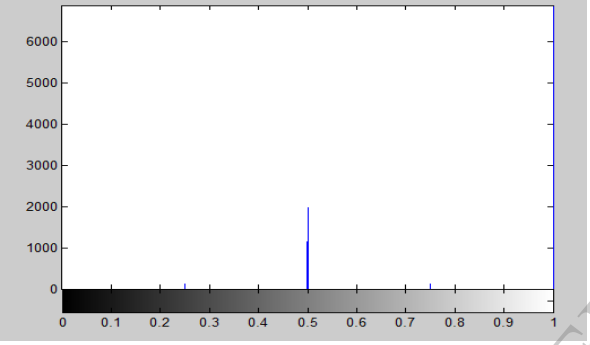
between the sub band coefficients over the scale and orientation statistics[7].

B.Quality assessment

Windowed structural correlation is used for comparing the band pass sub band and high pass residual band and is defined as[1]

$$\rho=\frac{2\sigma_{xy}+C_2}{\sigma_x^2+\sigma_y^2+C_2}$$

Where σ_{xy} is the cross variance between BP and Hp bands, C_2 is the constant and $\sigma_x^2\sigma_y^2$ are the windowed variances



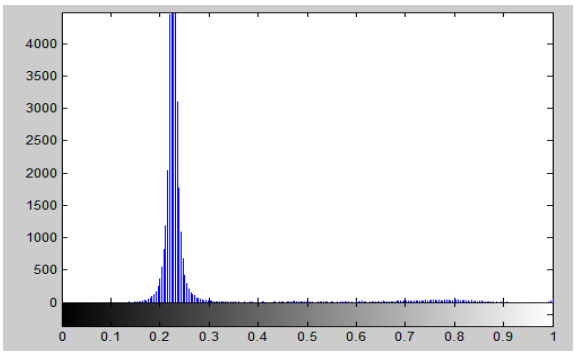
3.1 Histogram before normalization

The blurring affect is due to the attenuation of the high spatial frequency coefficient which occurs during the compression stage and is denoted as:

BM=
$$\frac{\sum_{i=1}^{M}\sum_{j=1}^{N} IM(i,j).A'_{Edge}(i,j).I_A^2(i,j)}{\sum_{i=1}^{M}\sum_{j=1}^{N} IM(i,j)A_{Edge(i,j)}.I_A^2(i,j)}.\frac{N(A'_{Edge})/M\times N}{N(A_{Edge})/M\times N}$$

Where $i_A(i,j)$ is the pixel (i,j) intensity of a component of size $M\times N$ pixels.A_{Edge} is the binary image resulting from the edge detection.A'_{Edge} is the A_{Edge} complementary.

Spatial information and pixel activity is also included in it [8]. Blocking artefacts have been observed in block-based DCT compressed images .Obtain the feature vector of it and by using the regression modules the quality is measured.SVM and SVR are mainly used for this.[9].SVM is used for the classification and contain the distortion identifier that predict the particular distortion and then estimate the quality score.[10].



3.2 Histogram after normalization

4.NON STRUCTURAL DISTORTION QUALITY ESTIMATION

Non structural features like brightness, contrast and color accuracy is not noticed many of the times but by using the CIQE method it assess the Quality of the color in the image The contrast affect of an image is defined as

$$C=\frac{L_u-L_l}{L_a}.$$

The distance between the mass values of upper and lower parts of the luminance is presented on bin axis[12]. L_u/L_l is the upper and lower mass values and L_a is the average mass of luminance channel and brightness is measured according to the value of L_a.[1]

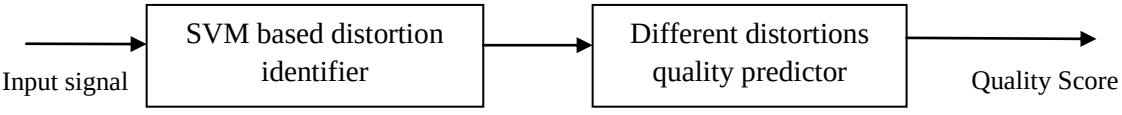


Fig .4 Distortion Predictor

The color accuracy can be estimated by using the HSV model and the chromatic diversity is also noted. Then the spatial dispersion is obtained and the number of pixels having the dominant color is selected and from the distance between the pixels the spatial dispersion factor is obtained[13]. If the whole image have the dominant color then it has no chromatic diversity.

5.PROPOSED METHOD.

By the combination of both structural and non stru.ctural distortion identification method is obtaine and measure the quality score.This method is called CIQE method Color image quality evaluation can be done by extracting the statistical features from the distorted images and then matches it with the existing value to obtain the quality score and the dispersion factor give the color accuracy.

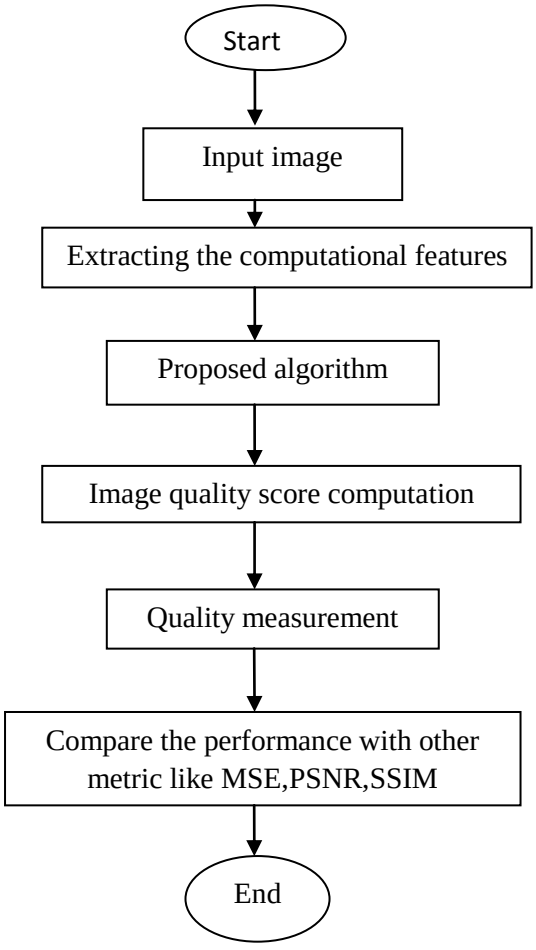


Fig.5. Flow chart for the Quality measurement algorithm.

ALGORITHM

Step1.Selecting the input image.

Step 2.Extracting the computational features.

Step 3.Spatial dispersion of color image is also extracted.

Step4.comparing it with the existing values

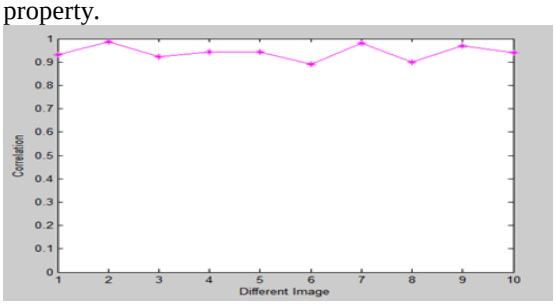
Step 5.insert the signal to the SVM based distortion identifier.

Step6.predict the type of distortion using quality predictor.

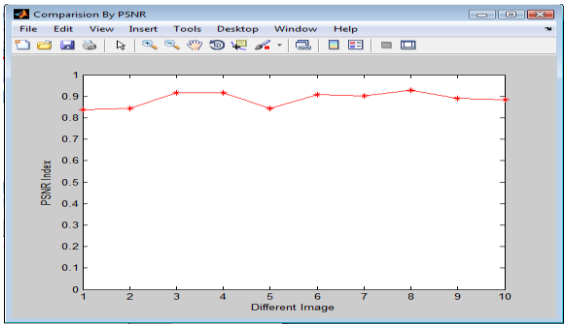
Step 7.if the type of distortion is predicted then obtain the Quality score.

6.OVERALL QUALITY

From these structural and non structural distortions the overall quality is estimated and it want to be highly correlated with human perception.SVM and SVR is used to predict and classify the distortions. Hence the distortions like fast fading, jpeg compession,White noise Blurring affect and color accuracy of the image is identified and estimate the quality by SVM witha radial-basis function (RBF). Compare it with full reference method like PSNR and SSIM.The SSIM[1] shows Symmetric property as well as the boundedness property.



6.1 Correlation affect of different images



6.2 Comparison by PSNR

The linear dependence measurement can be taken by the use of correlation coefficient in SSIM index .Overall correlation for the different images are then identified. The LIVE database is used to evaluate the performance of these no-reference metrics

7.CONCLUSION

In this paper the CIQE method is used to distinguish the structural as well as the non structural distortion. The computational features are extracted for this and by spatial dispersion method the color accuracy is also identified. We classified basis on the structural features and then estimate the Quality score. This method is highly correlated with Human Perception. .The evaluation shows that the proposed no-reference metrics are robust in measuring the corresponding distortions

8.REFERENCES

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