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Quality Evaluator for Completely Blind Images on Rpe Layer Changes Prediction using Svm Classifier

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Abstract—*In this paper the mathematical morphology (MM) is introduced to approach the contrast enhancement problem occurs in digital images. Two methodologies are proposed to compute the background image. Some normalizing operators also introduced to enhance the grey scale images. The contrast operators are similar to the basis of logarithm function which is similar to weber's law. The proposed project work is based on blind image quality evaluator. In real time image monitoring, dynamic wear debris images captured in a running machine are unconditionally blurred because the image particles are in lubricant motion. It is not very easy to get reliable images. Human opinion-aware methods are used by completely blind image quality evaluator, In opinion- unaware methods do not need human subjective scores. Wiener filter algorithm was adopted to perform image restoration to improve the image quality. It removes additive noise by compression operation and blurring simultaneously. It is an accurate way to restore an image.The above system will be implemented in MATLAB platform.*

Keywords*: Mathematical morphology (mm), digital image, logarithm function, weber's law, regionals minima.*

1. INTRODUCTION

The problem of digital images contrast has been approached by various methodologies. In the existing system logarithm functions or power functions technique is used to enhance the dark regions. It is one of the most common factors used in traditional digital images. Hemimorphic filter is another method that works on the frequency domain of digital images. Global and local histogram equalization is techniques based on the factor of data statistical analysis. In the histogram equalization process, uniform distributed histogram is obtained by the reordering of images with grey level intensities. The disadvantage of using histogram equalization is that the global properties of the digital image cannot be applied in local context results in the poor performance of frequency producing.

In the proposed system tow methodologies are used to solve the optimization problem that maximise the contrast level of image. It also computes the image background.

2. SYSTEM IMPLEMENTATION

The system consists of three modules. Loading an input image is the initial process. The loading image must be poor lighted blur image. The second process is to determine the background of loaded input image. The morphological operations are then performed to enhance the grey level images. The morphological operation involves dilation, erosion, opening and closing. The operations are followed by some transformations and reconstructions. If the input image is normal we get high illuminated image as output.

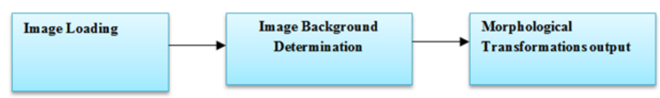

Fig. 1.1: modules involved in the project

Image Loading Module

Image loading is the initial stage of morphological transformations used to detect the background in images characterized by poor lighting. Once the user uploads the image it detects the background items to enhance the low illuminated image

Image Background Determination

In the second stage two methodologies are proposed to compute the image background. The contrast image enhancement has been carried out by the application of two operators based on the Weber's law notion. The first operator employs information from block analysis, while the second transformation utilizes the opening by reconstruction .The objective of contrast operators consists in normalizing the grey level of the input image with the purpose of avoiding abrupt changes in intensity among the different regions.

Morphological Transformations output Images uploaded with poor illumination are determined by the use of weber's law notion and image reconstruction. It avoids the changes in the intensity of digital images obtained from the different regions.

Weber's Law

In psycho-visual studies, the contrast C of an object with luminance Lmax against its surrounding luminance Lmin is defined as follows:

$$C = \frac{Lmax - Lmin}{Lmin}$$

If L=Lmin and ΔL=Lmax-Lmin can be rewritten as

$$C = \Delta L / L$$

A methodology to compute the background parameter was proposed. The methodology consists in calculating the average between the smallest and largest regional minima, as illustrated in Fig. 1.2

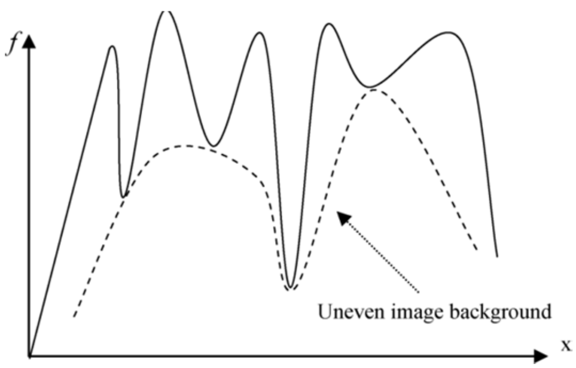

Fig. 1.2: Background detection from the smallest and largest minima of the image

However, the main disadvantage of this proposal is that the image background is not detected in a local way. As a result, the contrast is not correctly enhanced in images with poor lighting, since considerable changes occur in the image background due to abrupt changes in luminance as illustrated in Fig. 4.3.2. In the next section, a proposal to compute the image background by blocks is introduced.

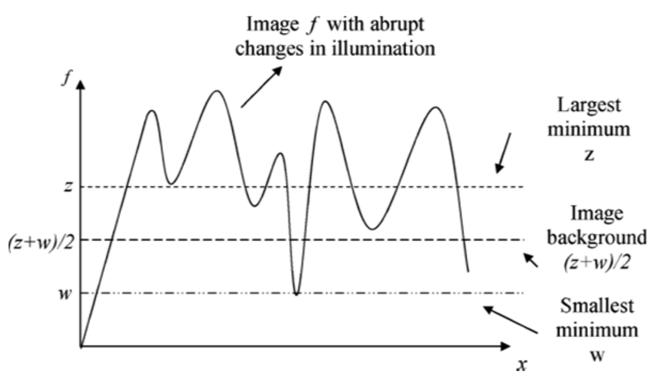

Fig. 1.3: Uneven background (dashed line) in images with poor lighting.

In our case, the opening by reconstruction is our choice because touches the regional minima and merges regional maxima. This characteristic allows the modification of the altitude of regional maxima when the size of the structuring element increases The multi background property allows the generation of family of image backgrounds when the size of the structuring element is increased.

3. REVIEW OF ALGORITHMS

Back Propagation Algorithm

Let X is the single real input of network and F is the function of network.

Let F'(x) is computed in two phases feed forward and back propagation.

Feed-forward: The x is the input into the network N. the primitive functions F and their derivatives are obtained at each node in the network.

Back propagation: the 1 is the constant consider as the output of the network which runs backward. The result is transmitted to the left of the unit. The result collected at the input unit is the derivative of the network function with respect to x.

Steps Of The Algorithm

The back propagation can be decomposed in the following four steps:

i) Feed-forward computation

ii) Back propagation to the output layer

iii) Back propagation to the hidden layer

iv) Weight updates

1)Input Layer:

The input vector, denoted as p, is presented as the black vertical bar. Its dimension is R × 1. In this paper, R = 3.

2) Radial Basis Layer:

In Radial Basis Layer, the vector distances between input vector p and the weight vector made of each row of weight matrix W are calculated. Here, the vector distance is defined as the dot product between two vectors [8]. The result is denoted as n = ||W- p||..p. Thetransfer function in PNN has built into a distance criterion with respect to a center. In this paper, it is defined as radbas(n) = 2 n e- (1) Each element of n is substituted into Eq. 1 and produces corresponding element of a, the output vector of Radial Basis Layer. The i-th element of a can be represented as ai = radbas(||Wi - p|| ..bi) (2) where Wi is the vector made of the i-th row of W and bi is the i-th element of bias vector b.

characteristics of Radial Basis Layer:

The i-th element of a equals to 1 if the input p is identical to the ith row of input weight matrix W.

A radial basis neuron with a weight vector close to the input vector p produces a value near 1 and then its output weights in the competitive layer will pass their values to the competitive function. It is also possible that several elements of a are close to 1 since the input pattern is close to several training patterns.
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3) Competitive Layer: There is no bias in Competitive Layer. In Competitive Layer, the vector a is firstly multiplied with layer weight matrix M, producing an output vector d. The competitive function, denoted as C .The index of 1 in c is the number of tumor that the system can classify. The dimension of output vector, K, is 5 in this paper.

4. MAIN MODULES

a).Statistics of normalized luminance & MSCN products

It is used to characterize the structural distortion and also capture the contrast distortion.Image quality information is captured by the distribution of the statistics of the MSCN products (mean subtracted and contrast normalization)So it is used to find the mismatch shape Gaussian model is indicative of istortion severityThen it is suggested to use zero mean generalized gaussian distribution to analyse the distortion level

$$\mu(i,j) = \sum_{k=-K}^{K} \sum_{l=-L}^{L} \omega_{k,l} I(i+k, j+l)$$

$$\sigma(i,j) = \sqrt{\sum_{k=-K}^{K} \sum_{l=-L}^{L} \omega_{k,l} [I(i+k, j+l) - \mu(i,j)]^2}$$

b).Gradient statistics

After finding the distortion in an image, the distribution of its gradient component and gradient magnitude are changed. To fit this parameter weibull distribution model used a and b are weibull parameters

$$p(x;a,b) = \begin{cases} \frac{a}{b^a} x^{a-1} \exp\left(-\left(\frac{x}{b}\right)^a\right), & x \geq 0 \\ 0, & x < 0 \end{cases}$$

c). Statistics of Log Gabor Filter response

Log gabor filter used for edge detection and pattern matching Detecting the discontinuties in the filter outputs and their Statistical properties helps in segmenting and classifying of a given image

It is used to generate the quality aware BIQA image features.

$$G_2(\omega, \theta) = e^{-\frac{\left(\log\left(\frac{\omega}{\omega_0}\right)\right)^2}{2\sigma_r^2}} \cdot e^{-\frac{(\theta-\theta_j)^2}{2\sigma_\theta^2}}$$

The parameters of log gabor filter

i) Central frequency

ii) Number of orientation

iii)Orientation angle

iv)Radial bandwidth

v)Angular bandwidth

d). Pristine MVG model learning

100 pristine images used here to create IQA(Image Quality Assessment) database IQA database used to evaluate the BIQA (Blind image quality Assessment).

MVG model expressed in

$$f(\mathbf{x}) = \frac{1}{(2\pi)^{m/2}|\boldsymbol{\Sigma}|^{1/2}} \exp\left(-\frac{1}{2}(\mathbf{x}-\mu)^T \boldsymbol{\Sigma}^{-1}(\mathbf{x}-\mu)\right)$$

e). Wiener filter

Wiener filter is an excellent filter when it comes to noise reduction or deploring of images. A user can test the performance of a wiener filter for different parameters to get the desired results. It can be considers both the degradation function and noise as part of analysis of an image**.**Consider a large set of images and calculate the power spectrum and mean, that could be used as the input for the wiener filter , it is used to get better result.The equation represents the mean square error .Then wiener filter can be represented by the equation

$$\begin{aligned} \hat{F}(u,v) &= \left[\frac{H^*(u,v)S_f(u,v)}{S_f(u,v)|H(u,v)|^2 + S_\eta(u,v)}\right]G(u,v) \\ &= \left[\frac{H^*(u,v)}{|H(u,v)|^2 + S_\eta(u,v)/S_f(u,v)}\right]G(u,v) \\ &= \left[\frac{1}{H(u,v)}\frac{|H(u,v)|^2}{|H(u,v)|^2 + S_\eta(u,v)/S_f(u,v)}\right]G(u,v) \end{aligned}$$

- When it is hard to estimate the power spectrum of either the un-degraded image or the noise
- In that case it assumes a constant K, then added to all terms of H(u, v)
- The new equation **,**

$$\hat{F}(u,v) = \left[\frac{1}{H(u,v)}\frac{|H(u,v)|^2}{|H(u,v)|^2 + K}\right]G(u,v)$$

5. EXPERIMENTAL RESULTS

A description of the derivation of the PNN classifier was given. PNNs had been used for classification problems. The

PNN classifier presented good accuracy, very small training time, robustness to weight changes, and negligible retraining time. There are 6 stages involved in the proposed model which are starting from the data input to output. The first stage is should be the image processing system. Basically in image processing system, image acquisition and image enhancement are the steps that have to do. In this paper, these two steps are skipped and all the images are collected from available resource. The proposed model requires converting the image into a format capable of being manipulated by the computer. The MR images are converted into matrices form by using MATLAB. Then, the PNN is used to classify the MR images. Lastly, performance based on the result will be analyzed at the end of the development phase.

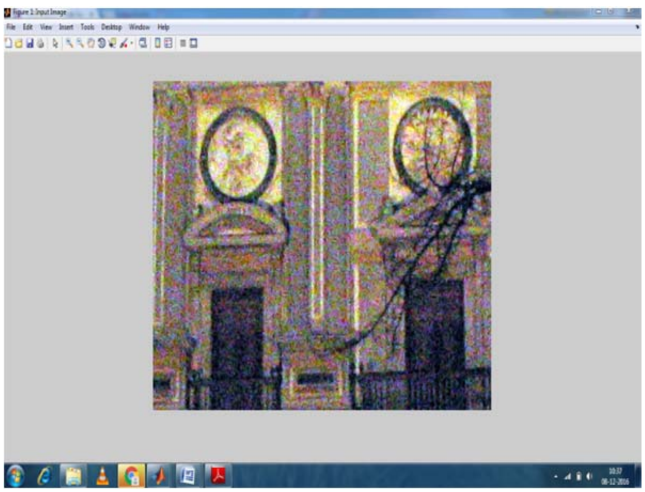

Fig. 1.4: Input image

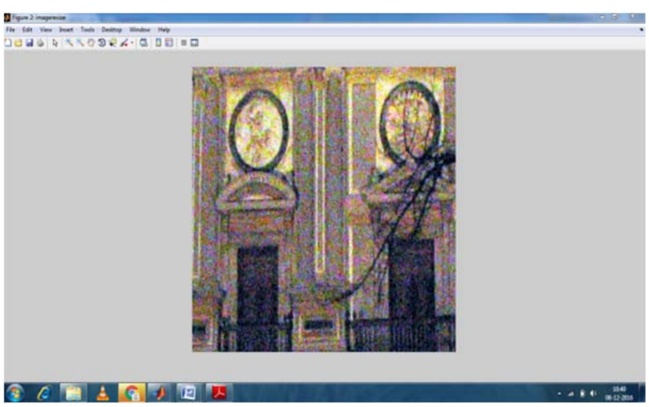

Fig. 1.5: Resized image

6. PERFORMANCE EVALUATION

The performance of classifier can be evaluated through following parameters,

Sensitivity: It measures the proportion of actual positives which are correctly identified

Sensitivity = Tp. / (Tp + Fn)

Where,

Tp = True Positive: Abnormal correctly classified as Abnormal

Fn = False negative: Abnormal incorrectly classified as normal

Specificity: It measures the proportion of negatives which are correctly identified.

Specificity = Tn./(Fp + Tn)

Where,

Fp = False Positive: Normal incorrectly classified as Abnormal

Tn = True negative: Normal correctly classified as normal

Total accuracy:

(Tp+Tn)./(Tp+Tn+Fp+Fn)

7. CONCLUSION

The paper implements the method to detect the background of image and to enhance the grey scale contrast of low illuminated images. The performance of the proposals is mentioned in different examples. Also, the operators performance employed in this paper were compared with others given in the literature. In this the contrast enhancement transformation can only be used satisfactorily in low illuminated images. By applying the proposed operators to images with correct lighting, over-illuminated images will be obtained. This effect is due to the logarithm function, which normalizes grey level intensities by dismissing changes in illumination. In a future work, the problem of over illumination will be normalized by using some standards.

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