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Analytical study of Voltage and Current level changes in Video Signal on Image Statistics Parameters Measurement

D.Muthukumar, Dr.T.Arumuga Maria Devi

Abstract— Objective methods for assessing perceptual image quality traditionally attempted to quantify the visibility of differences between a distorted image and a reference image using a variety of known properties of the human visual system. Under the assumption that human visual perception is highly adapted for extracting structural information from a scene, which is used to analyse the image statistical data for quality assessment based on the degradation of structural information. As the specific example of this concept, To develop an IDL procedure and demonstrate its promise through a set of intuitive examples, as well as comparison with standard deviation , mean and variance values of consecutive video images which is extracted from sequences of video clippings.

Index Terms— Image quality assessment, JPEG, Standard deviation value, Mean Value, Variance value, Image statistics information, Pixel similarity.

1 INTRODUCTION

WE are living in an age, where anything can be manipulated or altered with the help of modern technology. Today's digital technology had begun to erode the integrity of images. With the increasing applications of digital imaging [6], different types of software tools are introduced for image processing. They are used to combine no. of sample images to make it look real or objects. Digital images are subject to a wide variety of distortions during acquisition, processing, compression, storage, transmission and reproduction, any of which may result in a degradation of visual quality. For applications in which images are ultimately to be viewed by human beings, the only "correct" method of quantifying visual image quality is through subjective evaluation. In practice, however, subjective evaluation is usually too inconvenient, time-consuming and expensive. The goal of research in objective image quality assessment is to develop quantitative measures that can automatically predict perceived image quality. An objective image quality metric can play a variety of roles in image processing applications. First, it can be used to dynamically monitor and adjust image quality. Objective image quality metrics can be classified according to the availability of an original (distortion-free) image, with which the distorted image is to be compared.

2 JPEG IMAGE STATISTICS DATA ANALYSIS TO FIND THE VOLTAGE AND CURRENT LEVEL CHANGES

The term digital image processing generally refers to processing of a two-dimensional picture by a digital computer [6]. In a broader context, it implies digital processing of any two-dimensional data. A digital image is an array of real numbers represented by a finite number of bits. In this study we refer JPEG image data converted into two dimensional array for finding the value of Mean, Standard deviation and Variance value for classification of image similarity difference.

2.1 Mean value of Image data

The mean of a data set is simply the arithmetic average of the values in the set, obtained by summing the values and dividing by the number of values[1]. Recall that when we summarize a data set in a frequency distribution, we are approximating the data set by "rounding" each value in a given class to the class mark. With this in mind, it is natural to define the mean of a frequency distribution by

$$\mu = \frac{1}{n}\sum_{i=1}^{n} f_i x_i = \sum_{i=1}^{n} p_i x_i \quad \text{---------------} \quad (2.1)$$

The mean is a measure of the *center* of the distribution. As we can see from the algebraic formula, the mean is a *weighted average* of the class marks, with the relative frequencies as the weight factors. We can compare the distribution to a mass distribution, by thinking of the class marks as point masses on a wire (the *x*-axis) and the relative frequencies as the masses of these points. In this analogy, the mean is literally the center of mass--the balance point of the wire.

Recall also that we can think of the relative frequency distribution as the probability distribution of a random variable *X* that gives the mark of the class containing a randomly chosen value from the data set. With this interpretation, the mean of the frequency distribution is the same as the mean (or expected value) of *X*. 'Mean' value gives the contribution of individual pixel intensity for the entire image & variance is normally used to find how each pixel varies from the neighbouring pixel (or centre pixel) and is used in classify into different regions.

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2.2 Variance and Standard Deviation values of image data

The *variance* of a data set is the arithmetic average of the squared differences between the values and the mean. Again, when we summarize a data set in a frequency distribution, we are approximating the data set by "rounding" each value in a given class to the class mark. Thus, the variance of a frequency distribution is given by

$$\sigma^2 = \frac{1}{n}\sum_{i=1}^{n} f_i (x_i - \mu)^2 = \sum_{i=1}^{n} p_i (x_i - \mu)^2 \quad \text{----------} \quad (2.2)$$

The *standard deviation* is the square root of the variance:

$$\sigma = \sqrt{\sigma^2} \quad \text{---------} \quad (2.3)$$

The variance and the standard deviation are both measures of the *spread* of the distribution about the mean. The variance is the nicer of the two measures of spread from a *mathematical* point of view, but as we can see from the algebraic formula, the physical unit of the variance is the square of the physical unit of the data. For example, if our variable represents the weight of a person in pounds, the variance measures spread about the mean in squared pounds. On the other hand, standard deviation measures spread in the same physical unit as the original data, but because of the square root, is not as nice mathematically. Both measures of spread are useful.

Again we can think of the relative frequency distribution as the probability distribution of a random variable *X* that gives the mark of the class containing a randomly chosen value from the data set. With this interpretation, the variance and standard deviation of the frequency distribution are the same as the variance and standard deviation of *X*.

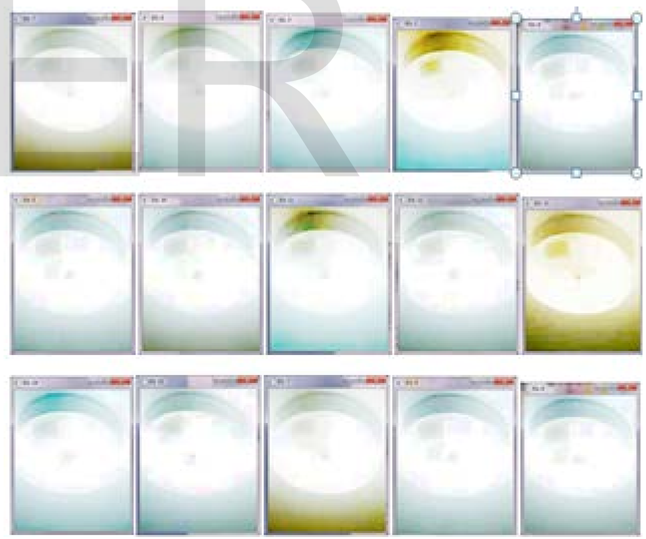
An RGB colour images is an M*N*3 array of colour pixels, where each colour pixel [4] is a triplet corresponding to the red, green, and blue components of an image at a spatial location. An RGB image can be viewed as the stack of three gray scale images that, when fed into the red, green, blue inputs of a colour monitor, produce the colour image on the screen. By convention the three images form an RGB images are called as red, green and blue components. The average values for the RGB components[4] are calculated for all images.

Red average= sum of all the Red Pixels in the image R (P) / No. Of pixels in the image P
Green average= sum of all the Green Pixels in the image G (P) / No. Of pixels in the image P
Blue average= sum of all the Blue Pixels in the image B (P) / No. Of pixels in the image P

3 Structural Similarity – Based Image Quality Assessment

The Extracted video image signals are highly structured: their pixels exhibit strong dependencies, especially when they are spatially proximate, and these dependencies carry important information about the structure of the objects in the visual scene. The motivation of our new approach is to find a more direct way to compare the structures of the reference and the distorted signals. Figure 1.a shows the sample voltage and current level image which is extracted from consequent video clipping in power quality problem [2].

(a)



(b)

Figure 2.1 Comparison of Voltage and Current level changes in Video Image with different time sequence scene.
(a) Original Video image (1280 x780 for visibility).
(b) Cropped image sequences(15 Samples) with Image Size 273 x 333.

4 Experimental Results

Many image quality assessment algorithms have been shown to behave consistently when applied to distorted images created from the same original image, using the same type of distortions. However, the effectiveness of these models degrades significantly when applied to a set

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of images originating from different reference images, and/or including a variety of different types of distortions. Table-1 shows different cropped image statistics data like image size, average pixel values of each image, mean, standard deviation and variance of Red, Green and Blue channel to find out the difference voltage and current level for applying magnification process[3][7]. In this study we have taken only 15 sample images for analysis.

Image_No	Image Size		AVG_Pixel_VAL	Mean_Value R	G	B	Std_Dev_Value R	G	B	Variance Value R	G	B
Image1	273	333	224	222	233	217	36	24	57	1346	587	3328
Image2	273	333	228	221	231	231	34	24	25	1220	577	675
Image3	273	333	186	222	213	123	40	46	99	1647	2141	9869
Image4	273	333	222	219	226	220	37	28	34	1430	816	1181
Image5	273	333	230	220	234	235	36	20	20	1335	422	439
Image6	273	333	230	225	233	231	28	19	24	834	383	608
Image7	273	333	217	222	223	205	34	35	68	1185	1273	4624
Image8	273	333	228	221	232	232	33	22	24	1101	517	596
Image9	273	333	229	222	233	233	32	21	23	1054	476	533
Image10	273	333	226	222	230	227	33	27	33	1123	731	1094
Image11	273	333	228	223	233	227	33	23	41	1133	541	1752
Image12	273	333	228	222	232	231	33	23	26	1142	562	715
Image13	273	333	203	219	216	175	41	42	79	1740	1782	6306
Image14	273	333	230	219	234	236	37	19	19	1429	385	372
Image15	273	333	228	220	231	232	37	24	25	1419	621	661

Table-4.1 shows 15 sample Voltage and Current level changes images statistical data (Image size, AVG pixel values, Mean, Standard Deviation and Variance of RGB Channels.

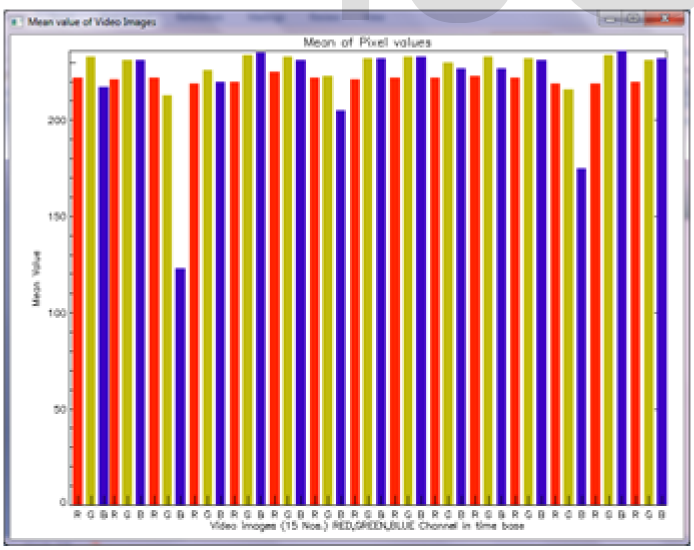

Figure -4.1 Mean of RGB channel pixel values for 15 sample images.

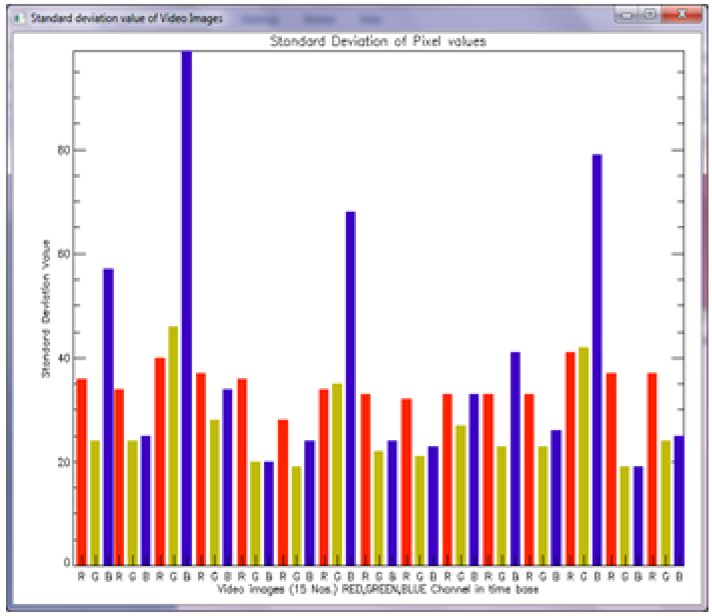

Figure - 4.2 Standard Deviation of RGB channel pixel values for 15 sample images.

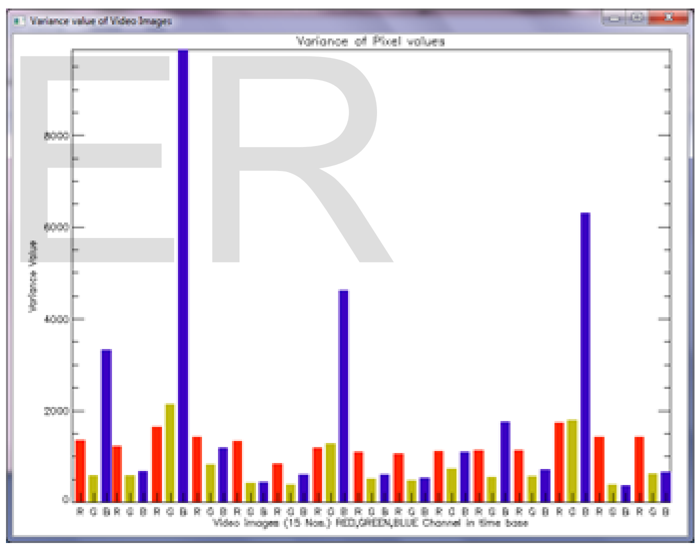

Figure -4.3 Variance of RGB channel pixel values for 15 sample images

In this analytical study Figure-4.1 shows a graph to depict Mean of RGB channel pixel values for 15 sample images. The *mean* of a data set is simply the arithmetic average of the values in the set, obtained by summing the values and dividing by the number of values. Figure-4.2 and Figure-4.3 shows a graph to depict Standard deviation and variance of RGB channel pixel values for 15 sample images. The variance and the standard deviation are both measures of the *spread* of the distribution about the mean. The variance is the nicer of the two measures of spread from a *mathematical* point of view, but as we can see from the algebraic formula, the physical unit of the variance is the square of the physical unit of the data.

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5 CONCLUSION

The present image analytical study had been shown that the statistical behaviour of an image we must get the 'Mean' and 'Variance' information [8]. Hence we can analysis the probability of maximum like-hood of a pixel or using this idea we can divide image pixel region. However apart from that the Mean and variance of a signal/image mayn't provide much information about the image. Two images with total different structural similarity may have same mean and variance. In this analytical study we analyse voltage and current level image video clipping data to find the difference among the sample images to applying magnification process in Resonant circuits.

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BIOGRAPHY

Dr. T. Arumuga Maria Devi Received B.E. Degree in Electronics & Communication Engineering from Manonmaniam Sundaranar University, Tirunelveli India in 2003, M.Tech degree in Computer & Information Technology from Manonmaniam Sundaranar University, Tirunelveli, India in 2005 and Worked as Lecturer in department of Electronics & Communication Engineering in Sardar Raja College of Engineering and also received Ph.D Degree in Information Technology – Computer Science and Engineering from Manonmaniam Sundaranar University, Tirunelveli , India in 2012 and also the Assistant Professor of Centre for Information Technology and Engineering of Manonmaniam Sundaranar University since November 2005 onwards. Her research interests include Signal and Image Processing, Multimedia and Remote Communication. Currently doing D.Sc in Periyar University.

D.Muthukumar received MSc Degree in Information Technology from Alagappa University, Karaikudi, India in May 2003, M.Tech degree in Computer and Informatin Technology from Manonmanium Sundaranar University, Tirunelveli, India in April 2009. Currently, he is doing Ph.D in Computer and Information Technology and also working as Assistant Professor in the Department of Software System in Kamaraj College of Engineering and Technology, Virudhunagar, Tamilnadu,India. His research interests include Hyberspectral Image Processing.

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