Image-Difference Database of Gamut-Mapped Images

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Abstract— **In this paper, we exploit a new data base of distorted test images for image difference prediction in the case of gamut mapping as well as conventional images. A comparative analysis of proposed data base and live data base is performed. The metrics are verified for the full images of proposed method and include distortions which are important in digital image processing. It is used for evaluation of full-reference visual quality assessment metrics is described.**

Keywords— Visual quality metrics, HVS, image denoising, test image databases.

I. INTRODUCTION

The images used in most gamut-mapping experiments exhibit similar distortions, e.g., reduced chroma and almost no change in hue.IDMs trained on such data may underestimate the importance of chroma changes because *all* images exhibit reduced chroma. For optimal results, a database with highly uncorrelated distortions is required. To test if further improvements are possible using only low-level image-difference features, both semantic and non semantic distortions should be included into this proposed database.

So many conditions are raised when we carry out experiments for developing the data base eg: methodology, number of participants, distortion types etc.

We have created a color image data base contain reference images and distortion images and also include gamut mapped images. Now so many methods are existed for predicting the difference between original image and distorted image. For this here create a large data base with gamut mapping distortions as well as conventional images. Existing quality metrics are mainly based on human visual system (HVS).But it is not an accurate way. Main reasons are first is, it is not understand very well, not clear how to model all possible distortion types and reference images, users use different types of data base, and the last one is appropriate peoples are required to conduct the experiments.

Proposed data base contain reference images and distortions which are useful in the field of image processing. It contain reference images from Kodak lossless true color image suite and 17 distortion types along with this gamut mapped images and there distorted images are included.

In the field of image processing, quality evaluation of images are very important [1, 2]. In the current connected world, many users share and deliver multimedia data. The overall communication process includes manipulation, processing, storing, and transmission over (noisy) channels. Although there have been great improvements in compression and transmission techniques, each stage of processing may introduce perceivable distortions [3, 4]. For example, blocking, ringing, and blurriness are only few of the artifacts that a lossy compression algorithm introduces in an image.

HVS is commonly used to check the visual quality metrics. But they are in sense heuristic. All these metrics are in some sense heuristic. However, currently there are no reliable mathematical models for the HVS resulting in the impossibility of defining an optimum metric perfectly matching the HVS. Therefore, a challenging task is the evaluation of the correspondence of visual quality metrics with HVS using some methods of quantitative analysis. Usually this is performed using databases of test images for which the mean opinion scores (MOS) of image quality have been experimentally collected [10]. The methodology for database creation and experimental tests carrying out directly influences accuracy and reliability of quantitative analysis [1].

For this a new data base is created and it contains reference images and distorted images which is helpful for the papers related to the image processing field.

II. QUALITY METRICS

Different types of quality metrics are used for predicting the quality of the images in the field of image processing. In the case of quality metrics checking, distorted image is compared with the original image and predict the difference and also find the quality of the distorted image. When we use quality metrics, methods in the digital image processing is divided into two methods. The first class involves methods of image and video lossy compression for which such metrics can be exploited to control compression quality (Fig. 1).For predicting the quality first we take two images, one is reference image and other one is distorted image. By using the quality metric method to both images, we can predict the quality of distorted image with respect to the original image. Distortions are compression, blur etc. First take an input image and apply quality metric. Then compression is performed to the input image and become compressed image. This is done for particular applications. Then decompress the image and quality metric method is applied and predicts the quality. Then we can identify how much distorted image is different from the reference image.

HVS is commonly used, but it has some disadvantages. So new techniques are used for predicting the difference between the reference image and distorted image and predict the quality of two images also.

Another class of digital image processing techniques involves a variety of methods such as image filtering, reconstruction, inpainting, etc. For this class, image visual quality metrics are used only in the process of a method design and evaluation of its efficiency.

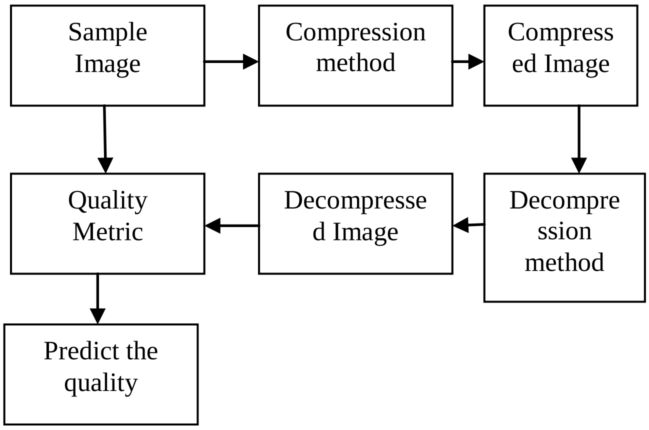

Fig 1: Lossy Compression Technique and Quality metric

As a first step, a test image (or a set of test images) presenting good quality is selected. Then, according to the chosen model of noise or distortion, a noisy version of the image (images) is obtained and processed by a designed filter. The obtained output image is"compared" to the corresponding original image using considered quality metric. A value of the same metric is calculated for the noisy (distorted) image as well. By comparing the scores of these metrics it is possible to address the effectiveness of the designed filtering technique [1].

Fig 2 represents the verification in the case of image filtering.

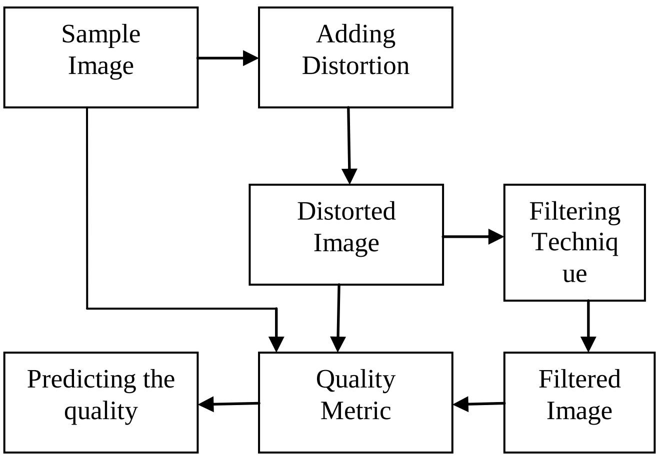

Fig 2: Method of image filtering

For high efficiency good quality metric is used. To understand the relation between the given metric and the HVS, the most reliable way is to exploit some specially created test image database.

Fig 3 shows the use of data base in the case of quality metric checking. Data base is very helpful for predicting the difference between the original image and distorted image. For better results data base is very urgent. Data base will contain all types of distortions. But in the case of HVS feature, data base contain only one distortion type.

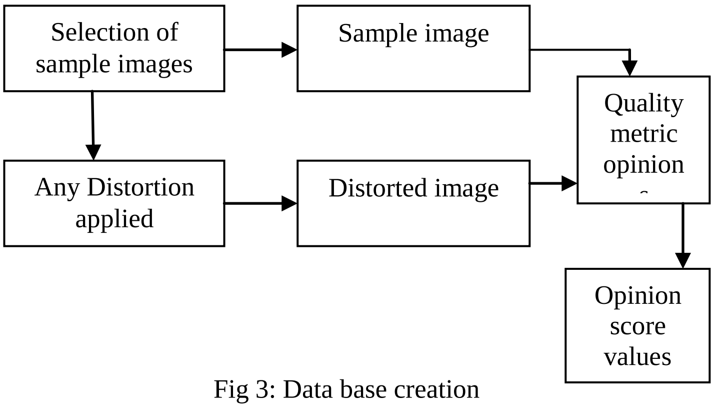

Fig 3: Data base creation

Mean opinion scores are experimentally collected [10].New proposed data base contain set of reference image, corresponding distorted images and mean opinion scores of each distorted images. When a metric is tested, its values are computed for each distorted image in a database and the obtained results are "compared" to the corresponding MOS values. But scaling problems are raised. It is solved by using rank correlations. Larger values of rank correlations indicate better correspondence of a given metric to image quality assessment by humans.

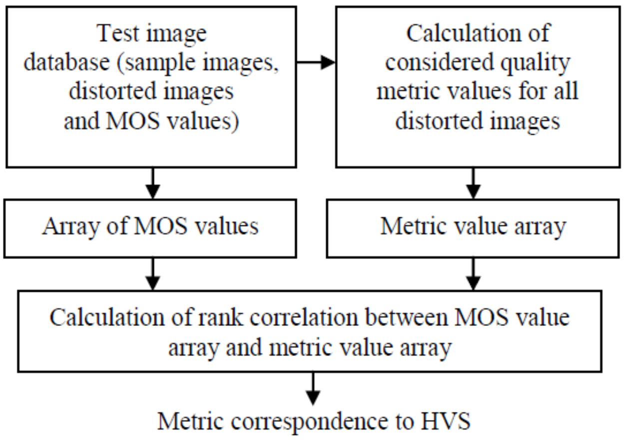

Fig 4: Verification of visual quality metrics

The image databases to be used for the chosen application should satisfy several requirements. The main constraint is that the test images should reflect the HVS peculiarities and contain non-trivial images for visual quality evaluation in order to effectively retrieve the advantages and the drawbacks of all tested quality metrics.

III. PROPOSED DATA BASE WITH GAMUT MAPPED IMAGES

quality of any image database strictly depends on the reference images that are used. The images in the database should present different textural characteristics, various percentages of homogeneous regions, edges, and details. Reference images are taken from the Kodak test set [14].And distortions are produced and added to the data base. Now data base contain original image and distorted images. So many distortions are added to the original image eg: noise, change the brightness, lightness, chroma change, hue variation etc. This data base is

Here we introduce a new data base with reference images and distorted images. This data base contains gamut mapped images as well as conventional images. The useful for predicting the difference between the original image and distorted image. Original image and distorted image is taken from this data base.

All images in our database are of size 512x384 pixels. All images of fixed size have been obtained by cropping selected fragments from the original images of the Kodak test set without any scaling and/or rotation operations. Kodak images are not in fixed size.

Fig 5: Examples of Reference images taken from the Kodak set

The above figures are the reference images that are collected from the Kodak test set and the below two figures are taken for showing to add the distortion to the reference image. Images with lossy compression are also included in this data base which is helpful in the field of transmission and receiving the images. In this data base simple methods are used for obtaining the distorted images. So the distortions are not more complicated, it is easily identified by the users. Thus we can say that here we have exploited particular and simple model of distortions. Data base contain 25 reference images and more than 15 distortions are applied to the original image.

Fig: 6 Reference image

Fig: 7 Change the contrast value (distorted image)

IV. RESULTS AND DISCUSSION

For developing the data base 25 reference images are taken from the Kodak test set and more than 17 distortions are applied to the each reference image and produce distorted images. There are different methodologies that can be used to evaluate the quality of an image [7, 10, and 27].Live data base contain only five types of distortions but the proposed data base contains more than 17 types of distortions.MOS values are more accurate here.

V. CONCLUSIONS

Here we proposed a data base contain reference images and distorted images in the case of gamut images as well as conventional images. This data base is helpful in the field of image processing. For predicting the difference between the original image and distorted image, the new data base is very helpful and produces a better result than existing data base. In this paper we include gamut images also to the data base.

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