

Blind Image Quality Assessment using NSS Approach in the DCT Domain

Sayali S. Deshmukh^{1,*}, H. K. Waghmare²

Abstract

We have develop an efficient model for improving image quality using IQA and NSS based on blind image Quality Assessment. This algorithm does computation for the parameters which user expect at output. The certain extracted features approach depends on a simple Bayesian inference model to depict image quality scores. The project features are based on statistic scenes of discrete cosine transform for images. The resultant parameters of the model are used to form features that are informed of perceptual quality. Before calculating the parameters as the bilateral filter is applied, so it gives the processing time of the bilateral filter which may vary depending upon the input provided by the user. So using this model we calculate PSNR, Mean, Standard Deviation and entropy for indication of errors if any while processing. There are many algorithms which are based on no reference picture to calculate image quality such as Visual Information Fidelity (VIF) algorithm, BRISQUE and NIQE. Consequently, if these algorithms are performed on image distortions, then these algorithms are expected to perform as per desired on the distortions they have raised during processing. It is highly required for many application to improve image quality with zero level of error. The algorithm does computation for the parameters which user expect at output. The certain extracted features to predict image quality scores approach depends on a simple Bayesian inference model

Keywords: Natural scene statistics, Discrete, Cosine, Transform,

INTRODUCTION

The modifications to the original image cause due to processes all introduce acquisition, digitization, compression, storage, transmission, and display. These modifications, also includes many distortions which may get involved in image processing but may not get identified by humans [1]. If that distortion is visible then also we are not able to find exact error. Process for improving the quality of service in applications is important. Our model relies on IQA algorithm for finding various perceptual levels of image quality assessment using Natural scene statistics against various distortion [1]. The learning model is then used to predict perceptual image quality scores.

NATURAL SCENE STATISTICS

Scene statistics is a field of perception. It is related with the statistical regularities of scenes. It is based on interpreting scenes that premise for system. Biologically this system has evolved many responsive properties of natural environments. So this NSS receives great attention in the field of improving image quality. NSS is useful for detecting and estimating many informative signals [2]. It is a most successful model for picture and video quality assessment. There are many algorithms which are based on no reference picture to calculate image quality such as Visual Information Fidelity (VIF) algorithm, BRISQUE and NIQE.

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NSS plays important role in quality assessment. As we know distortion not only changes the quality of image but also disturbs the parameter of Natural images. In this paper we have discussed various statistical distortion parameters that get evolved while image processing or Video streaming. It is highly required for many application to improve image quality with zero level of error.

SYSTEM ANALYSIS

We will refer to undistorted images captured by imaging devices that sense radiation from the visible spectrum as natural scenes, and statistical models built for undistorted natural scenes as NSS models. This algorithm does computation for the parameters which user expect at output. The certain extracted features to predict image quality scores approach depends on a simple Bayesian inference model. The project features are based on statistic scenes of Discrete cosine transform for images [3]. Before calculating the parameters as the bilateral filter is applied, so it gives the processing time of the bilateral filter which may vary depending upon the input provided by the user. So using this model we calculate PSNR, Mean, Standard Deviation and entropy for indication of errors if any while processing (Figure 1).

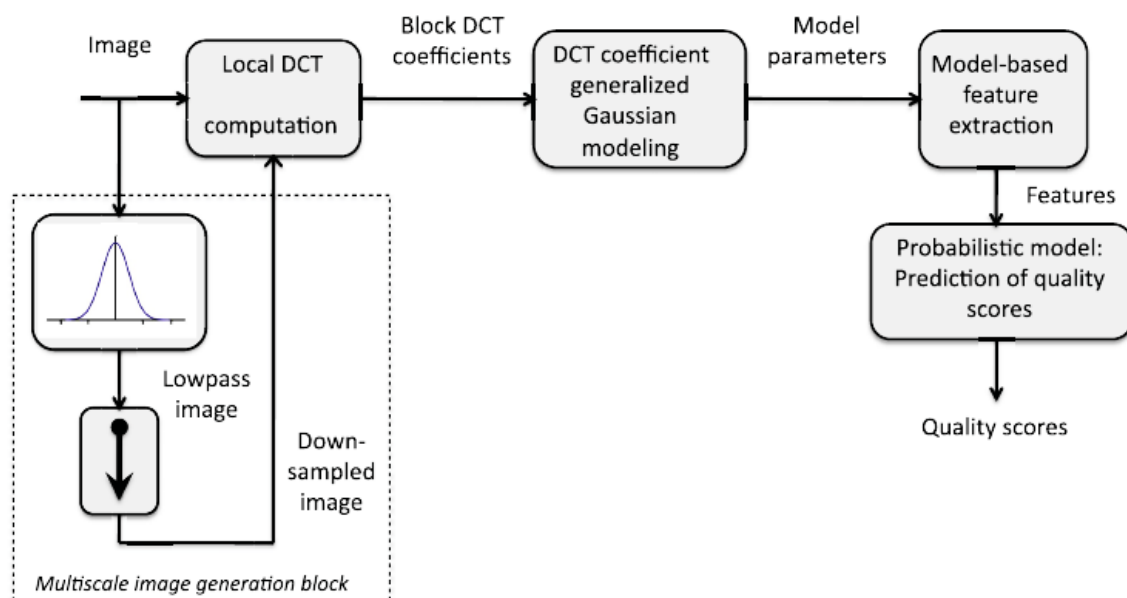


Figure 1 Block diagram Blind image quality assessment

RESULT ANALYSIS

A highly promising but relatively under-studied application in place of MSE achieved perceptual gains in applications of image restoration, wireless video streaming, video coding, and image synthesis. Figure 2 shows the input which we have given against the command to enter the input video, which is a completely undistorted video file. When this input undergoes the complete image processing the frames will gain some distortions and finally we will get the output figure which is an undistorted image.

The Figure 3 is an image frame which is given as distorted image whose parameters are calculated in the command window. Before calculating the parameters as the bilateral filter is applied, so it gives the processing time of the bilateral filter which may vary depending upon the input provided by the user. Here for the input shown in Figure 2 the processing time required for bilateral filter is 17.541982 seconds. After the processing of bilateral filter image undergoes the other steps of image processing and calculates the total processing time. In the example discussed above total processing time is 530.257556 seconds which is approximately 8 minutes for the color input.

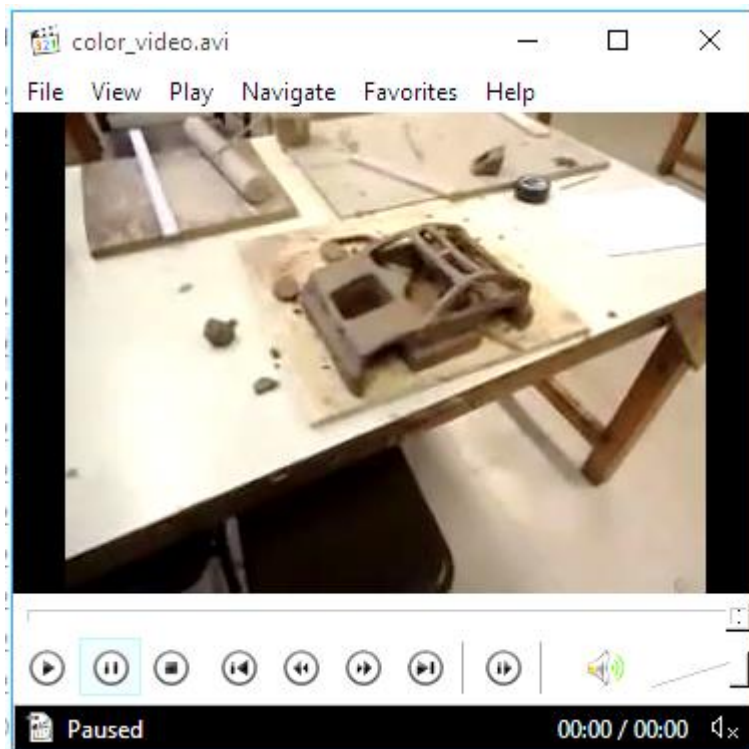


Figure 2. Color input

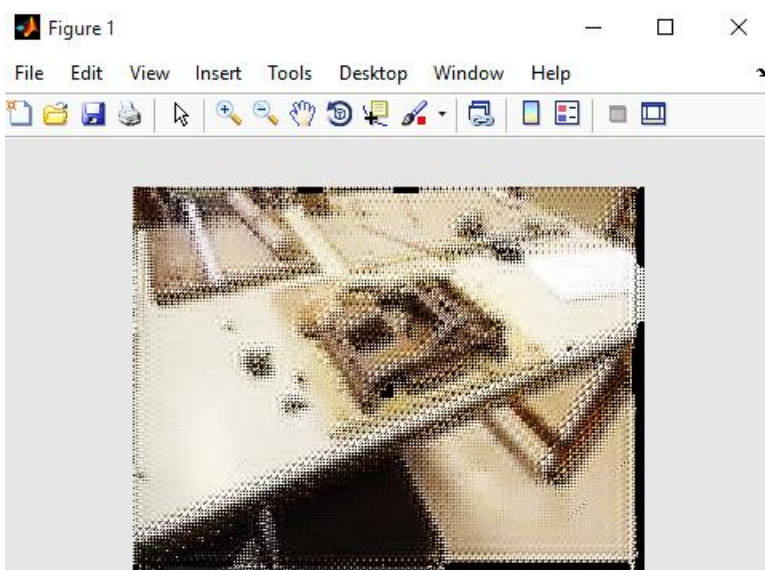


Figure 3. Output figure (distorted image) for color input.

Further PSNR is calculated as 31.92. PSNR stands for Peak Signal to Noise Ratio. This ratio is often used as a quality measurement between the original and a compressed image. Entropy is calculated as 7.57. The histogram of the image entropy determines or average information of an image can. The different grey level histogram shows the probabilities in the image. Mean is calculated as 148.51, a wide range of means have been developed for these purposes. The image processing filtering using mean is used for noise reduction. Variance is calculated as 1251098.83, measure of deviation of the signal from its mean value is given by Variance [4-10]. It computes the unbiased variance of each row or column of the input. Finally, the standard deviation is calculated as 76.68. The actual output obtained after processing is shown in the Figure 4

```
>> trial_sayali
Enter the type of video (press 1 for color video or press 2 for gray scale video):1
Processing time of Bilateral filter : 17.541928
Processing time : 530.257556
PSNR : 31.923325
Entropy : 7.570938
Mean : 148.518464
Variance : 1251098.832791
Standard deviation : 76.680926
```

Figure 4. Calculated parameters for color input.

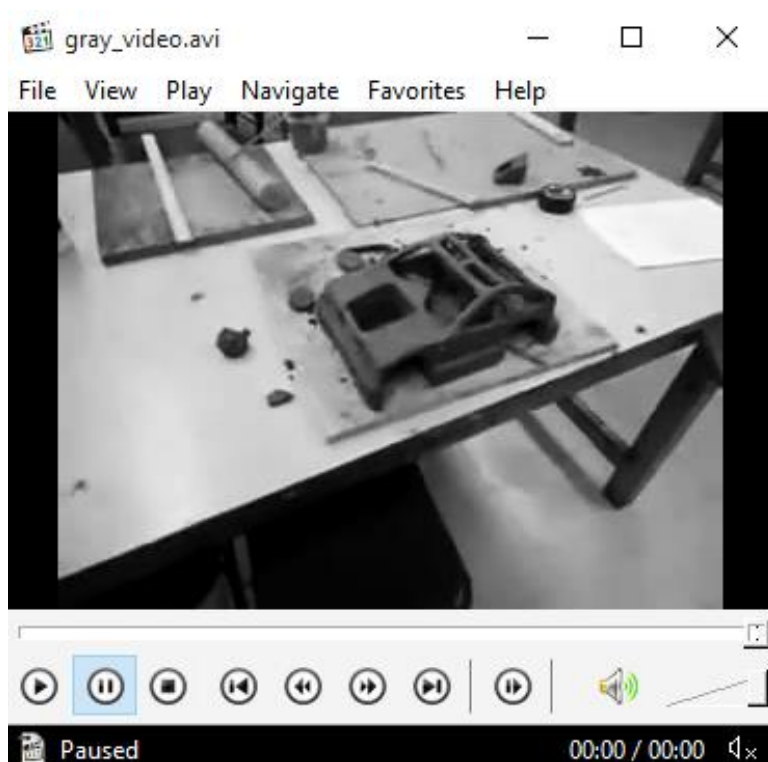


Figure 5. Grey input.

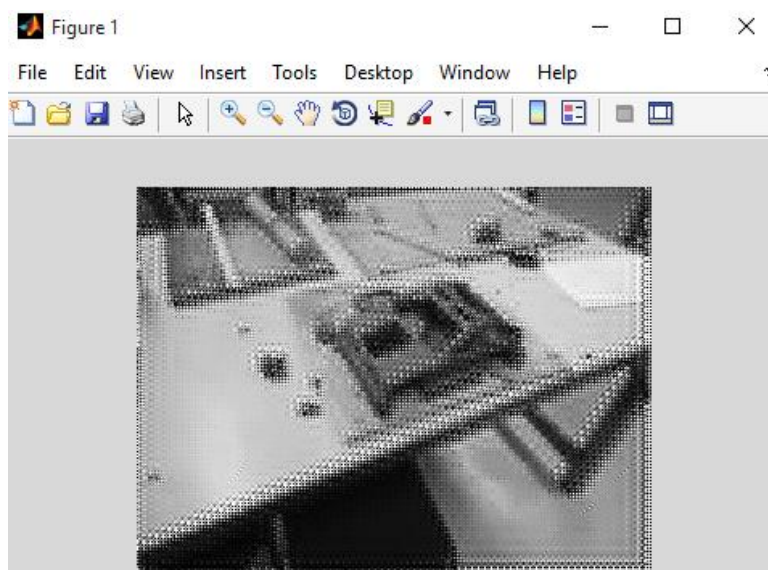
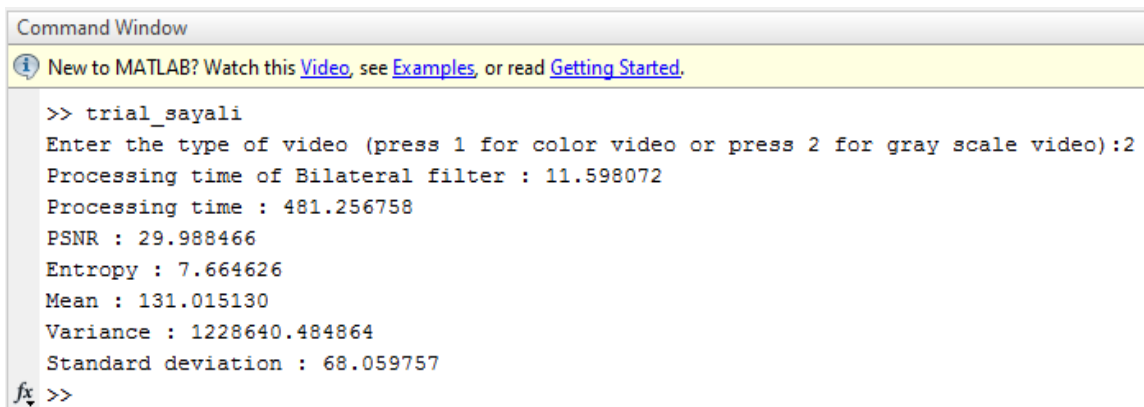


Figure 6. Output figure (distorted image) for grey input.

Figure 5 shows the grey input which we have given against the command to enter the input video, which is a completely undistorted video file. When this input undergoes the complete image processing the frames will gain some distortions and finally, we will get the output figure which is an distorted image.

The above figure is an image frame which is given as distorted image whose parameters are calculated in the command window. Before calculating the parameters as the bilateral filter is applied, so it gives the processing time of the bilateral filter which may vary depending upon the input provided by the user. Here for the input shown in Figure 6 the processing time required for bilateral filter is 11.5980 seconds. After the processing of bilateral filter image undergoes the other steps of image processing and calculates the total processing time. In the example discussed above total processing time is 481.25 seconds which is approximately 8 minutes for the grey input.

Further PSNR is calculated as 29.9884. PSNR stands for Peak Signal to Noise Ratio. This ratio is often used as a quality measurement between the original and a compressed image. Entropy is calculated as 7.6646. Mean is calculated as 131.0141, Mean is most basic of all statistical measure. Means are often used in geometry and analysis for reduction of noise. Variance is calculated as 1228640.4848. And finally the standard deviation is calculated as 68.059757. The actual output obtained after processing is shown in the Figure 7 given below



```
Command Window
New to MATLAB? Watch this Video, see Examples, or read Getting Started.

>> trial_sayali
Enter the type of video (press 1 for color video or press 2 for gray scale video):2
Processing time of Bilateral filter : 11.598072
Processing time : 481.256758
PSNR : 29.988466
Entropy : 7.664626
Mean : 131.015130
Variance : 1228640.484864
Standard deviation : 68.059757
fx >>
```

Figure 7. Calculated parameters for grey input.

CONCLUSIONS

We have described a natural scene statistic model-based approach to the no-reference/blind IQA problem. The new NR-IQA model uses a small number of computationally convenient DCT-domain features. The BLIINDS-II algorithm can be easily trained to achieve excellent predictive performance using a simple probabilistic prediction model. The method correlates highly with human visual judgments of quality. BLIINDS-II and the recent no-reference DIIVINE have similar prediction performance results. Consequently, if these algorithms are performed on image distortions, then these algorithms are expected to perform as per desired on the distortions they have raised during processing

BLIINDS-II is implemented with a much simpler representation. It uses a lower dimensional feature space and a simpler single-stage (Bayesian prediction based) framework operating in a more sparsely sampled DCT domain. There is only one QA engine in BLIINDS-II that does the multi-distortion QA.

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