Efficient Image Compression based on Region of Interest

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Abstract

Image Compression plays a very important role in image processing especially when we have to send the image on the Internet. Images are compressed so that the image can be sent on the Internet with available bandwidth of the network. But sometimes we need important region of the image rather than the whole image. So, we segregate the required region from the image. Spatial regions in images that are most important to the end user are called regions of interest (ROIs). The concept of an ROI is commonly used in medical imaging. For example, the boundaries of a tumor may be defined on an image or in a volume, for the purpose of measuring its size. In this paper we compress the ROI first with lossless compression techniques and then the image will be compressed by lossy compression techniques. After this at other end both the images will be decompressed and compared with one another and the results will be evaluated based on different parameters. ROI based compression is also termed as Intelligent Compression or Efficient Compression.

Keywords

ROI, PSNR, MSE, RMSE

I. Introduction

With the development in Internet and multimedia technologies, the amount of information that is handled by computers has grown very fast. This information requires large amount of storage space and transmission bandwidth. One of the possible solutions to this problem is to compress the information so that the storage space and transmission time can be reduced. Major part of this information that has to store and transmit includes images which have larger size. So image compression will solve these issues regarding storage and transmission. In medical imaging we need important region of the image rather than the whole image. So we separate the required part/region from the whole image. Spatial regions in images that are most important to the end user are called regions of interest (ROIs). The concept of an ROI is commonly used in medical imaging. We will compress the ROI first with lossless compression techniques and then the image will be compressed by lossy compression techniques. After decompression, both the images will be compared and the results will be evaluated by taking into consideration the different factors.

II. Concept of ROI

A Region of Interest, often abbreviated ROI, is a selected subset of samples within a dataset identified for a particular purpose. The concept of an ROI is commonly used in medical imaging. For example, the boundaries of a tumor may be defined on an image or in a volume, for the purpose of measuring its size. The endocardial border may be defined on an image, perhaps during different phases of the cardiac cycle, say end-systole and end-diastole, for the purpose of assessing cardiac function. So in case of ROI we separate the region of interest from the complete image in which the user is interested.

III. Comparison Parameters

The image that has been regenerated after being compressed or after any other attack can be compared using MSE, PSNR, and RMSE. Any value of PSNR above 40 will be considered as the good value. This is related to maximum gray level value of any pixel so higher the better. (Ton Kelker, 2002)

Typically PSNR values range between 20 and 40. They are usually reported to two decimal points (e.g. 12.12). The actual value is not meaningful, but the comparison between two values for different reconstructed images gives one measure of quality. (M. Rabbani and P.W. Jones)

IV. Algorithm

1. Select the gray scale image and then select the ROI from that image which is of our interest and if the image is not gray scale then first it will be converted to gray scale image.
2. Apply any lossy compression transform on the ROI image for compression and inverse transform to decompress the image.
3. Apply lossless compression transform and its inverse on ROI part of the image.
4. Decompressed Image is then compared with the original image for the above mentioned parameters.
5. Based on the values of the parameters conclude.

V. Results

Image Resolution	MSE	PSNR	RMSE
600x558	14.31	36.57	3.78
512x512	43.29	31.76	6.58
475x550	43.28	28.56	11.97
800x600*	47.59	31.35	6.89
800x450*	13.96	36.67	3.73

*Color Image Converted to Gray Scale

VI. Conclusion

Now in this the ROI is compressed with lossless and lossy techniques. Compression is used to compress the image so that it can be further transferred through the internet with in the low bandwidth. After the compression when both the images are compared with one another the root mean square error (RMSE) is very low which means the data lost during compression is negligible that can't be recognized with the human eyes. And also the PSNR is always between the ranges 20-40 which is considered as good.

VII. Future Scope

In the present discussion only attack that is taken into consideration is compression on the image, many other attacks such as gamma correction, blurring, sharpening etc can be considered. Also, more detailed parameters can be used for comparison purpose. Results can be more detailed so that conclusion can be made little more general. Diversified Image formats can be used to achieve the PSNR Value more than 40.

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