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RESEARCH ARTICLE

A Modified Method for Multiple Description Coding using Quincunx Subsampling

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Abstract— Multiple description coding, is a method of compressing a multimedia content into two or more descriptions. Each description has a controlled amount of redundancy, so that the content can be recovered even if one of the descriptions is lost. Also the descriptions can take different routes to the destination when they are transmitted from the source to the destination. Quincunx subsampling is a better method of subsampling than the normal subsampling. In this paper an image is quincunx subsampled to make two descriptions. The two descriptions are compressed by a method used to compress the green component of the CFA image separately. In this, side information about the other subsample is not needed because there are interpolation methods available to interpolate the quincunx subsampled image with greater PSNR. The decompression of each description is a lossless method so the quality of the image depends on the interpolation method. It is found that the decompressed image is infinity of greater than 30.

Keywords— Multiple Description Coding; CFA image; Quincunx Subsampling; Interpolation; lossy and lossless compression

I. INTRODUCTION

In these years of internet era, images are extensively transmitted through the non-prioritised network. During the transmission the packets may be lost. Due to the loss of the packet the reconstruction of the image may be impossible. As a remedy to this situation a method called multiple description coding is used. In this method the image is compressed into two or more description with a controlled amount of redundancy so that the image can be reconstructed even if one of the description is lost.

Many works have been done in this area of multiple description. In [1] correlating transform has been used to encode the descriptions. In [2] DCT and prediction compensation has been used to encode the descriptions. [3] shows a multiple description coding which is compatible to JPEG2000. In [4] the image is subsampled using quincunx subsampling and directional wavelet transform is used during encoding the two description. No side information is sent in each description. To interpolate each subsample in the decompression step Based-RKF interpolation method is used. This paper is taken as the base and image is subsampled using quincunx subsampling. Instead of using directional wavelet transform a prediction based method for compressing the green component of CFA image [5] is used for each description. Golomb rice code is then used for entropy coding. During the decompression if both the descriptions are received the image can be obtained without any loss. If any one of the description is lost interpolation should be used to reconstruct the image. Instead of Based-

RKF interpolation method an interpolation method from [6] is used to interpolate the image. This method has high PSNR and this has been proved in [6].

II. COMPRESSION

The block diagram of the proposed algorithm is shown in Fig. 4 and Fig. 5. This algorithm uses quincunx subsampling, a lossless prediction based compression method, golomb rice code for entropy coding and an interpolation method used for quincunx subsampled image. First the image is quincunx subsampled [4] to form two descriptions. The quincunx subsampled image is as shown in fig. 1. The pattern of the subsampled image is as the separated green pixels in the CFA image. [5] shows a prediction based compression method to lossless compression of CFA image. It uses a prediction based method to compress the CFA image. In this the method used to compress the green component of the CFA image is used to compress each description. First for each pixel in the description a predicted value of the pixel is computed with the neighbours by the method described in [5]. The difference between the original value and the predicted value is found out. This should be a very small value. This difference is the value which is encoded. The difference is then golomb rice coded for entropy coding. Thus the coded stream of bits are obtained for the two descriptions. Each description can be sent through different paths to the destination. If both the descriptions are received the image can be recovered in a lossless manner. If any one of the description is lost, after decompressing the description the interpolation method is used to interpolate the missing pixels.

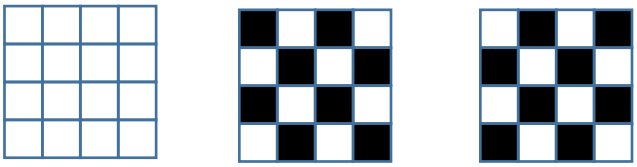

Fig. 1 Image matrix, quincunx subsampled image (shaded – present pixel, white – pixel not present)

III. DECOMPRESSION

The descriptions travel through different paths and reach the destination. They may reach at different times or one of the description may be lost at the time of transmission. The image can be recovered from one of the description even if one of the descriptions is lost. The streams of the descriptions travel through the transmission medium and reach the destination. There are two cases of receiving the descriptions. A) Both descriptions are received B) Any one of the description is received.

A. Both Descriptions are Received

When both descriptions are received the image can be decompressed in a lossless manner. First the Golomb rice coded streams are converted into the difference values. The difference values are placed in the correct positions and prediction based method used in [5] is again used to get the original values of the pixels. After decompressing the descriptions separately, they are combined together to form the original image. This reconstructs the image in a lossless manner.

B. Any One of the Descriptions is Received

Here the description which is received is decompressed as described in the previous section. Then the missing values in the description are interpolated by the method in [6]. This interpolation method is an efficient method and it produces an image with higher PSNR. Fig. 2 and Fig. 3 shows the original and decompressed image.

IV. EXPERIMENTAL RESULTS AND CONCLUSION

TABLE I
COMPARISON TABLE FOR PSNR IN DIFFERENT CASES

Images	PSNR (both descriptions received)	PSNR (Description-I alone Received)	PSNR (Description-II alone received)
Pepper	Inf	32.6278	31.4518
Lena	Inf	37.2942	33.0945
Baboon	Inf	34.6992	32.2301
Cameraman	Inf	36.0880	31.1419
Barbara	Inf	32.0398	26.7596

TABLE III

TABLE FOR AVERAGE COMPRESSION RATIO & AVERAGE BITS PER PIXEL

Images	Average CR per Channel	Average bpp per Channel
Pepper	2.5577	3.1278
Lena	2.5464	3.1417
Baboon	2.5070	3.1911
Cameraman	2.4796	3.2263
Barbara	2.3742	3.3695

Different images like pepper, lena, baboon, cameraman and Barbara have been used to test the algorithm. As the prediction based compression algorithm used is a lossless method, the PSNR for the case when both descriptions are received the PSNR is infinity. Also the interpolation method [6] used is very effective and almost the PSNR, when one description is received is above 30. This is evident from the table I. As the image compression method is lossless method the compression ratio is around 2.5 and the bits per pixel is around 3. As a comparison with [7] which is a lossy compression method the PSNR is higher and the compression ratio and the bits per pixel is smaller.

This algorithm is a method which uses a lossless method for compressing the different description is a good method along with the interpolation method than [7].

Fig. 2 Original Image

Fig. 3 Decompressed Image

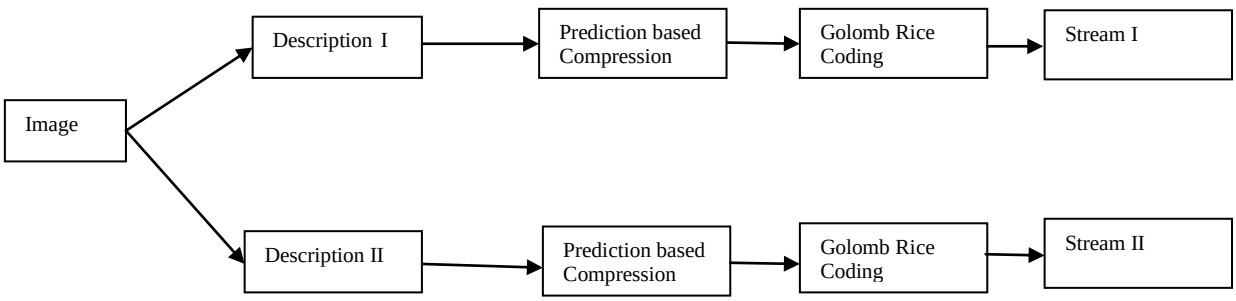

Fig. 4 Block Diagram of the Compression Algorithm

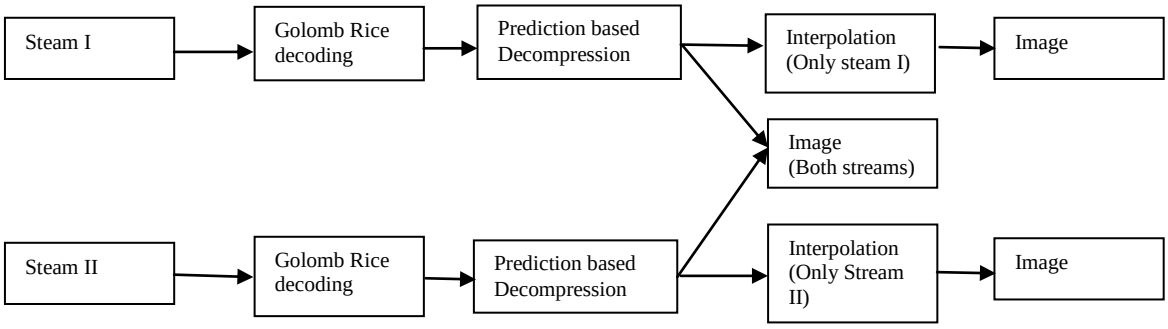

Fig. 5 Block Diagram of the Decompression Algorithm

REFERENCES

[1] Vivek K Goyal, and Jelena Kovacevic, "Generalized Multiple Description Coding With Correlating Transforms", *IEEE Transactions on Information Theory*, vol. 47, no. 6 Sep. 2001.

[2] Guoqian Sun, Upul Samarawickrama, Jie Liang, Chao Tian Chengjie Tu, and Trac D. Tran, "Multiple Description Coding With Prediction Compensation", *IEEE Transaction on Image Processing*, vol. 18, No. 5, May 2009.

[3] Tammam Tillo, and Gabriella Olmo, "A Novel Multiple Description Coding Scheme Compatible With the JPEG2000 Decoder", *IEEE Signal Processing Letters*, vol. 11, no. 11, Nov. 2004.

[4] Xin Li, Baocai Yin, Yunhui Shi and Dehui Kong, "Multiple Description Image Coding Using Directional Wavelet Transform in the Wavelet Domain and Based-RKF Interpolation", International Conference on *Computational Intelligence and Security, 2006* (Volume:2).

[5] Roopa Venna, and Narasimha Swamy B, "An efficient prediction-based lossless compression scheme for bayer CFA", International Journal of Innovations in Engineering and Technology, vol. 3 Issue 2 Dec. 2013.

[6] Yang Zhang, Yunhui Shi, Baocai Yin, and Xiaobo Liu, "An Improved Interpolation Scheme for Quincunx-Subsampled Images", 8th International Conference on *Signal Processing* 2006 (Volume:2).

[7] S. Radhakrishnan, G.Jameena, M. Mohamed Sathik, "Multiple Description Coding Based on Hadamard Transform", *IJCSMC*, Vol. 2, Issue. 11, November 2013, pg.247 – 251.

