Optimization using L1 Minimization Method in Image Processing

Tanu R[1] Dr. Jagadeesha S.N[2]
[1]PG Student [2]Professor & HOD
[1]Department of Network and Internet Engineering [2]Department of Computer Science and Engineering
[1,2]JNNCE, Shimoga, Karnataka

Abstract— In this proposal, the colorization-based coding problem is formulated into an optimization problem, i.e., an L1 minimization problem. In colorization-based coding, the encoder chooses a few representative pixels (RP) for which the chrominance values and the positions are sent to the decoder, whereas in the decoder, the chrominance values for all the pixels are reconstructed by colorization methods. The main issue in colorization-based coding is how to extract the RP well therefore the compression rate and the quality of the reconstructed color image becomes good. By formulating the colorization-based coding into an L1 minimization problem, it is guaranteed that, given the colorization matrix, the chosen set of RP becomes the optimal set in the sense that it minimizes the error between the original and the reconstructed color image. In other words, for a fixed error value and a given colorization matrix, the chosen set of RP is the smallest set possible.

Key words: Colorization, Compressive Sensing, Image Compression, Image Filtering, Reconstruction

I. Introduction

Colorization is a process of adding colors to a black and white image. The main task in colorization based compression is to automatically extract these few representative pixels in the encoder. In other words, the encoder selects the pixels required for the colorization process, which are called representative pixels (RP) and maintains the color information only for these RP. The position vectors and the chrominance values are sent to the decoder only for the RP set together with the luminance channel, which is compressed by conventional compression techniques. Then, the decoder restores the color information for the remaining pixels using colorization methods. We also propose a construction method of the colorization matrix, which combined with the proposed RP extraction method, produces a high quality reconstructed color image. It will be shown experimentally that the proposed scheme compresses the color image with higher compression rate than the conventional JPEG standard as well as other colorization based coding methods, and is comparable to the JPEG2000 standard even without using complex entropy coding for the proposed method.

II. Related work

Several techniques have been proposed in the various literatures to provide less storage and rapid transmission of images using this optimization technique in the colorization method. [1] "Novel inverse colorization for image compression," novel approach to color image compression based on colorization has been resented. The decoded chrominance components lose the local oscillation that the original images had. A large number of color assignations is required to restore these oscillations. It focus on the local correlation that exists between luminance and chrominance in separated texture components, and we present a new colorization-based coding method. [2] "Signal recovery from random measurements via orthogonal matching pursuit," orthogonal matching pursuit (OMP) can reliably recover a signal with m nonzero entries in dimension d given O(m ln d) random linear measurements of that signal. The new results for OMP are comparable with recent results for another approach called basis pursuit (BP). In some settings, the OMP algorithm is faster and easier to implement. [3] "Colorization using optimization," The image which is compressed, allowing reconstruction with accuracy comparable to that attainable with direct knowledge of the N most important coefficients. Moreover, a good approximation to those N important coefficients is extracted from the n measurements by solving a linear program-Basis Pursuit in signal processing. [4] "Fast image and video colorization using chrominance blending, Colorization, the task of coloring a grayscale image or video, involves assigning from the single dimension of intensity or luminance a quantity that varies in three dimensions, such as red, green, and blue channels. Such a relaxation reduces both the time and space complexity. [5] "Mean shift: A robust approach toward feature space analysis," It is observed that PSNR value is better in the case of discrete cosine transform technique. This technique is robust since the payload is embedded into the transform cover image indirectly. The robust data fusion algorithm was successfully applied to two computer vision problems: estimating the multiple affine transformations, and range image segmentation. Two computer vision applications ,multiple affine transforms estimation and range image segmentation, showed the effectiveness of this technique.

III. Proposed system

In order to provide high security while transmitting the image from encoder to decoder for the purpose of less storage and high transmission with low cost, we propose a Colorization-Based Compression Using optimization. The optimization technique plays a important role in selecting the few representative pixels to reconstruct the color image. The reconstructed color image is as same as original and the proposed method had shown that PSNR and SSIM values of the respective images. we formulate the RP selection problem into an L1 minimization problem. An essential prerequisite for this is that the colorization matrix has to be determined. we propose a method to determine the colorization matrix from the given luminance channel before the RP selection.

A. *Architectural Overview:*

Fig.1 and 2 illustrates proposed system Architecture and overall flow chart diagram of the proposed system respectively. In Colorization based compression using optimization, a few representative pixels are selected using an optimization technique called L1 minimization, where the reconstructed image is as same as original image for viewing purpose because image compression is a lossy compression but it hold the good value in both Peak Signal Noise Ratio (PSNR) and Structure Similarity Index Matrix (SSIM). System architecture shows how the original image is reconstructed and achieves a size that reduced and the quality of the reconstructed color image. Further it will generate PSNR and SSIM values between the different color images. This will further help in use of large memory remains and the quality of the reconstructed color image.

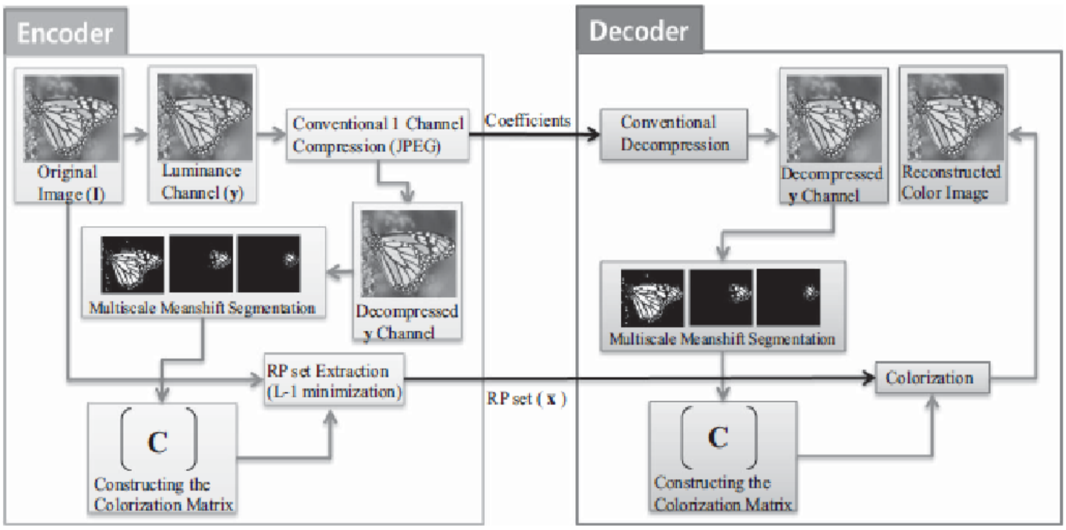

Fig. 1: Proposed System Architecture

Constructing the colorization matrix using the only luminance channel that is compressed. After construction the multi scale mean shift segmentation is performed to get the image smaller for the colorization purpose. After segmentation using the chrominance values we add the color components to the Y channel i,e luminance channel and the reconstructed is as same as the original image from the L1 minimization formulation using optimization.

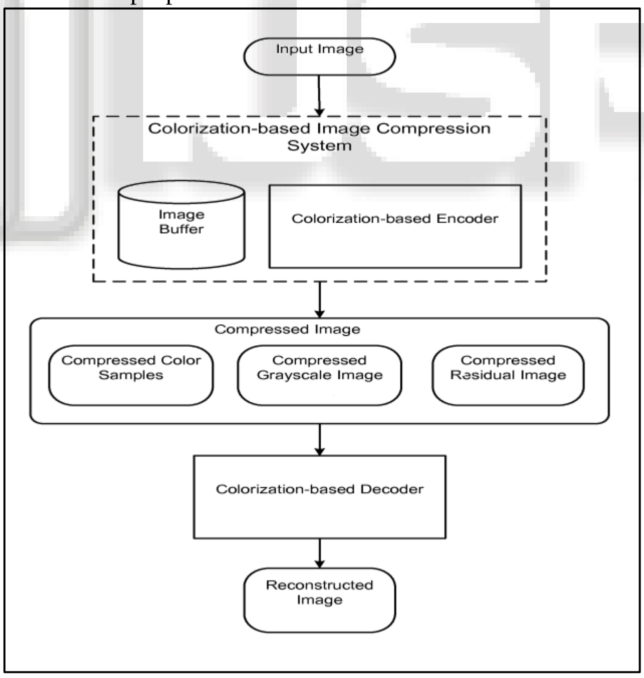

Fig. 2: Flowchart of Colorization-Based Compression Using Optimization

IV. Simulation and Results

The simulation is performed using Mat lab is used to implement and run the system. The performance metrics chosen for the image processing and for the size reduction, Fast Transmission.

Fig.3 shows the loading of color input image for compression

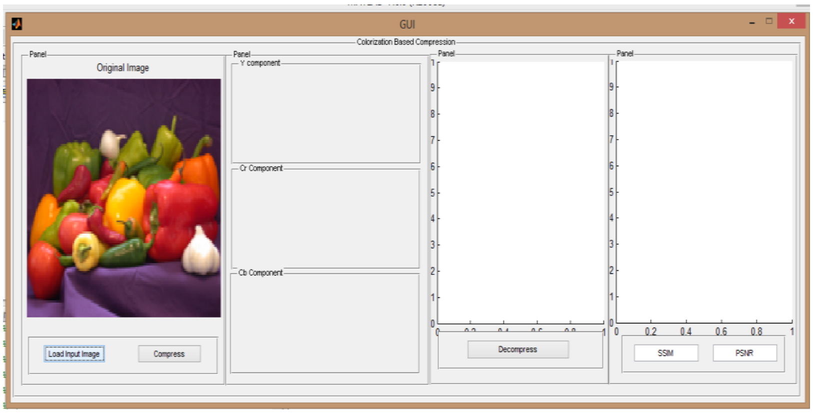

Fig. 3: Loading Input Image

Fig.4 shows the compression of original color image where it compressed in to luminance channel Y and the chrominance components Cb and Cr

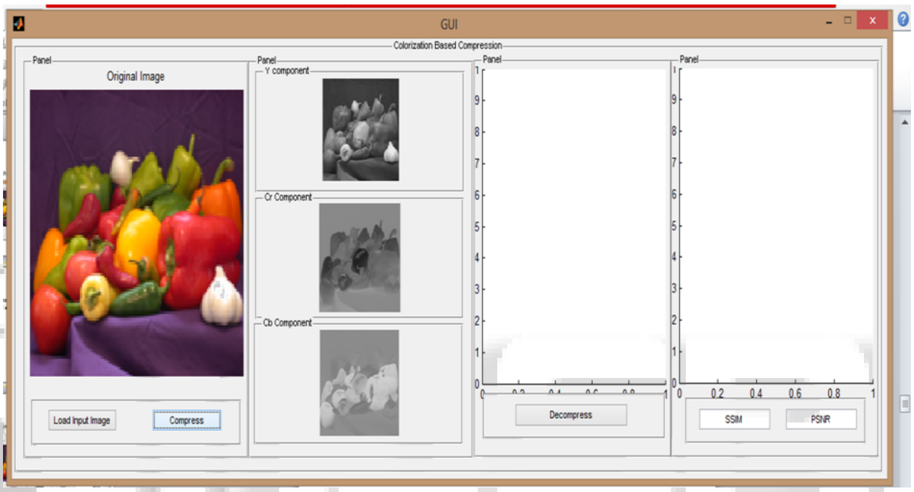

Fig. 4: Compressed Color Image

Fig.5 shows the decompression of luminance channel for the multi scale mean shift segmentation.

Fig. 5: Decompression of Luminance Channel

Fig.6 shows the reconstructed image from the decompressed luminance channel by adding the chrominance components Cb and Cr to it. It also shows the PSNR and SSIM value of the respective image.

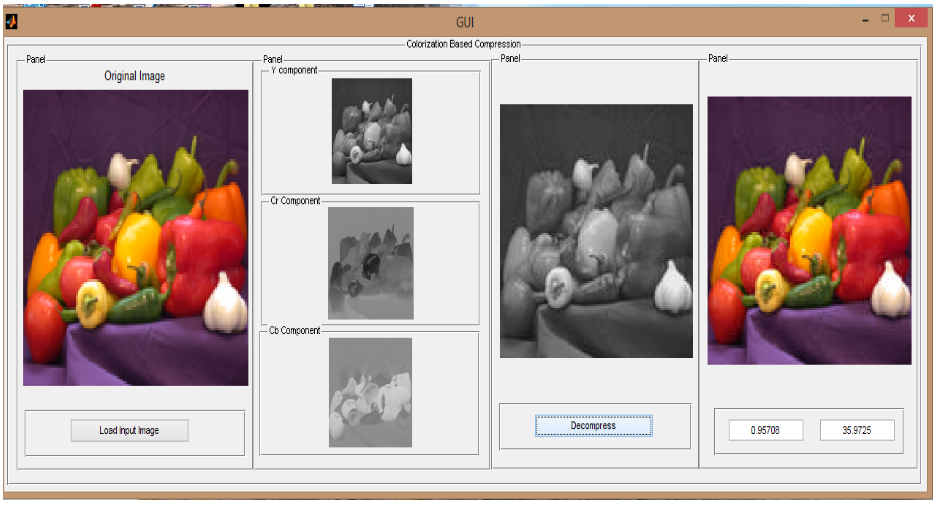

Fig. 6: Reconstructed Image

V. CONCLUSION

Colorization matrix which can colorize the image with a very small set of representative pixels(RP). The problem of computational cost and use of large memory remains and the compression rate as well as the quality of reconstructed color is good by using L1 minimization which is an optimization method. The reduction of size results in the fast transmission as well as lesser storage space.

REFERENCES

[1] T. Miyata, Y. Komiyama, Y. Inazumi, and Y. Sakai, “Novel inverse colorization for image compression,” in Proc. Picture Coding Symp.,2009, pp. 1–4.
[2] D. Donoho, “Compressed sensing,” IEEE Trans. Inf. Theory, vol. 52,no. 4, pp. 1289–1306, Apr. 2006.
[3] J. A. Tropp and A. C. Gilbert, “Signal recovery from random measurements via orthogonal matching pursuit,” IEEE Trans. Inf. Theory,vol. 53, no. 12, pp. 4655–4666, Dec. 2007.
[4] D. Comaniciu and P. Meer, “Mean shift: A robust approach toward feature space analysis,” IEEE Trans. Pattern Anal. Mach. Intell., vol. 24,no. 5, pp. 603–619, May 2002.
[5] Khalid Sayood “Introduction to Data Compression” fourth edition university of Nebraska 2012
[6] X. He, M. Ji, and H. Bao, “A unified active and semi-supervised learningframework for image compression,” in Proc. IEEE Comput. Vis. PatternRecognit., Jun. 2009, pp. 65–72.