Finaldata=(MatrixObtainedinStep4)^T × (Image-Mean)^T

2.2 Linear Discriminant Analysis (LDA)

Linear Discriminant Analysis [1] easily handles the case where the with-in class frequencies are unequal and their performance has been examined on randomly generated test data.

LDA is also closely related to Principal Component Analysis (PCA) and factor analysis in that they both look for linear combinations of variables which best explain the data. LDA explicitly attempts to model the difference between the classes of data. PCA on the other hand does not take into account any difference in class, and factor analysis builds the feature combinations based on differences rather than similarities. Discriminant analysis is also different from factor analysis in that it is not an interdependence technique: a distinction between independent variables and dependent variables (also called criterion variables) must be made. For PCDA approach we have to use the algorithm of LDA viz:

Step 1: Find the mean of the resultant Principal Component Matrix.

Step 2: Average of the Mean.

Step 3: Calculate the variance.

Step 4: Find eigen vector.

Step 5: After finding the eigen vector, we have to multiply it by the resultant of Principal Component Analysis Matrix.

3. Huffman Coding

Huffman Coding Technique [4] is a technique which works on both data and image for compression. It is a process which usually done in two passes. In first pass, a statistical model is going too built, and then in second pass the image data is encoded which is produced by that statistical model. The problem in Huffman Coding Technique is come during the first pass in which statistical model is built and applied on raw data through which the process become slow down and effect the efficiency and accuracy of the technique because all these depends on the statistical model so our main problem which we have to rectify in our project is these statistical model and do optimization in these Huffman encoding in terms of increasing the accuracy of this statistical model. Huffman Coding Technique is easy to implement and most popularly used lossless technique but there are certain other problem which arises due to the first pass i.e. this technique becomes relatively slow and other problems are like overhead due to Huffman tree. The algorithm for Huffman coding is:

Step 1: Read the image on to the workspace of the mat lab.
Step 2: Convert the given colour image into grey level image.
Step 3: Call a function which will find the symbols.
Step 4: Call a function which will calculate the probability of each symbol.

Step 5: Probability of symbols are arranged in decreasing order and lower probabilities are merged and this step is continued until only two probabilities are left and codes are assigned according to rule that; the highest probable symbol will have a shorter length code.

Step 6: Further Huffman encoding is performed i.e. mapping of the code words to the corresponding symbols will result in a compressed data.

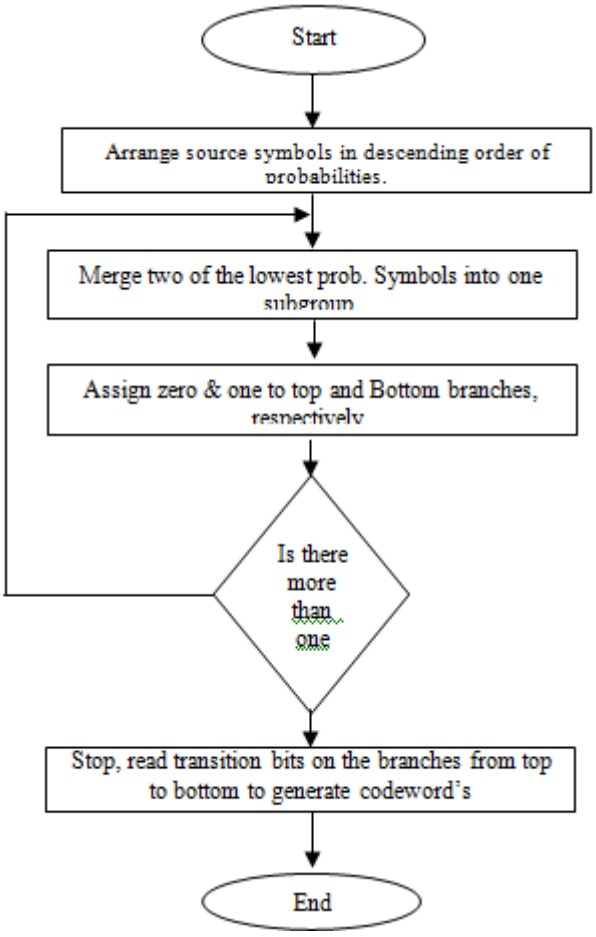

Figure 1: Flow Chart of Huffman Coding

4. Compression Ratio

Benchmark in image compression is the compression ratio. The compression ratio is used to measure the ability of data compression by the comparing the size of the image being compressed to the size of the original image. The greater the compression ratio means better quality compression we get.

5. Result

Here, we are using different square images and then apply PCA on it, On the resultant Data we apply LDA. And at last we apply Huffman coding on it, the images that we got are:

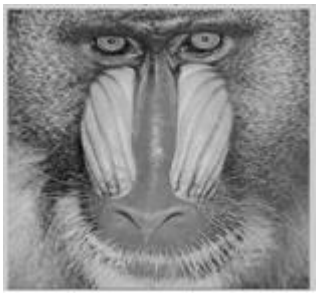

Figure 2: Original Image

Figure 3: After Applying PCA

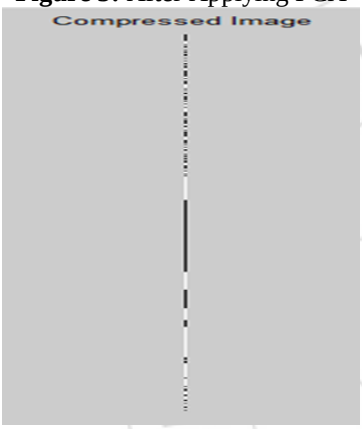

Figure 4: Compressed Image After Applying PCDA with Huffman Coding

The compression Ratio that we get on different images are,

Table 1: CR between When we apply Direct Huffman on the image and When we apply Huffman after applying PCDA

S.No.	Name of the Image	Compression Ratio	
		Huffman	PCDA+Huffman
1.	Lenna	1.58	2.46
2.	Baboon	0.577	2.46
3.	PeppersGray	1.83	2.41
4.	Cameraman	0.98	1.59
5.	Iris	1.2	1.59

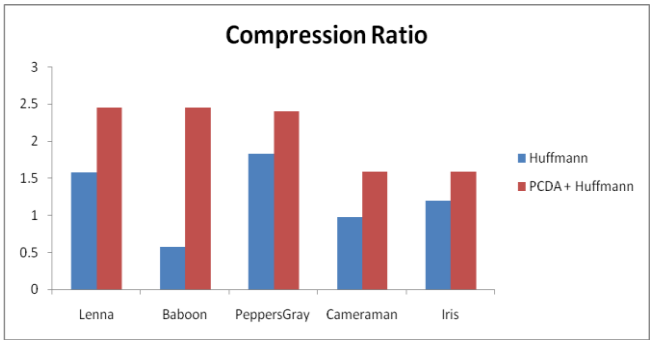

Figure 5: CR between When we apply Direct Huffman on the image and When we apply Huffman after applying PCDA

Table 2: Time Taken In Compression between When we apply Direct Huffman on the image and When we apply Huffman after applying PCDA

S.No.	Name of the Image	Time Taken for Compression in Seconds	
		Huffman	PCDA+Huffman
1.	Lenna	80.71	63.59
2.	Baboon	147.8	64.82
3.	PeppersGray	75.27	64.26
4.	Cameraman	49.01	13.38
5.	Iris	47.39	13.41

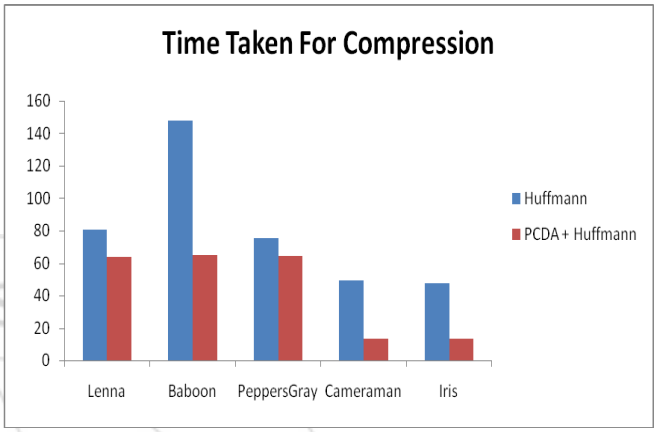

Figure 6: Time Taken for Compression between When we apply Direct Huffman on the image and When we apply Huffman after applying PCDA

6. Conclusion and Future Work

After implementing the proposed methodology We get the better results in terms of "Compression Ratio" as well as "Time taken For Compression" through which we conclude the above result of implementing PCDA in Huffman Coding makes Compression of an image much faster and gives Higher Compression Ratio. This work can be further extended for Decompression of an Image which may provide better results in terms of MSE (Mean Square Error) as well as higher PSNR (Peak Signal Noise Ratio). It can also be implemented in the Colour Images as well as its scope is also there with other Lossless and Lossy Compression Techniques.

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