CHAPTER 6

SUMMARY AND CONCLUSIONS

In this thesis, hybrid algorithms based on Discrete Wavelet transform (DWT) are proposed for image compression of continuous tone images. The wavelet coefficients in the approximation subband contain maximum information for reconstruction and more than eighty percent of the detailed subband coefficients are quantized to zero. Hence, all the image compression algorithms developed in this thesis use the approximation subband wavelet coefficients only, which are obtained from the one-level wavelet decomposition of the input image. The approximation subband coefficients are computed using Haar wavelets.

6.1 PROBLEMS CONSIDERED

The problems investigated in the thesis for the purpose of image compression are the following:

1. Combining DWT with simple and fast Absolute Moment Block Truncation Coding (DWT-AMBTC) and Adaptive Absolute Moment Block Truncation Coding (DWT-AAMBTC) algorithms.

2. Combining DWT with Vector Quantization techniques
3. Combining DWT, Singular Value Decomposition and data clustering techniques

4. Developing a template set for Daubechies wavelet filter ($db_2$) for use in Cellular Neural Networks

6.2 CONCLUSIONS

1. Two Image compression algorithms based on DWT and Absolute Moment Block Truncation Coding (AMBTC), namely DWT-AMBTC and DWT-AAMBTC, are proposed. It is shown that the subjective quality of the reconstructed images obtained using the proposed DWT-AAMBTC algorithm is almost the same as that obtained using AAMBTC. The advantage of the proposed algorithms is that these achieve high Compression Ratio. The proposed DWT-AMBTC algorithm offers a compression ratio of 16 as against 4 in the AMBTC algorithm.

2. Image compression algorithms based on DWT and Vector Quantization involving different data clustering approaches such as k-means, Fuzzy C-means, Genetic algorithm are proposed. It is found that the algorithm that uses Fuzzy C-means achieves good subjective quality images while simultaneously offering high compression ratio with a smaller compression time.

3. Image compression algorithms based on DWT-SVD-Clustering techniques. The optimum rank and cluster sizes determined for this approach are 4 and 8 respectively.
4. Forward and inverse template sets that mimic Daubechies ($db_2$) wavelet filters for use in Cellular Neural Networks in the forward and inverse DWT computation are obtained using Particle Swarm Optimization technique. The performance of the templates obtained is found to mimic the actual Daubechies wavelet filters ($db_2$).

6.3 FUTURE WORK

The proposed algorithms in this thesis use only the approximation subband wavelet coefficients since most images do not contain significant energy in the detailed coefficients. For future work, the proposed algorithms have to be modified to yield reconstructed images with high compression ratios and acceptable subjective quality even if the detailed subbands contain significant energy.