

Contents

Abstract (Chinese).....	i
Abstract (English).....	ii
Acknowledgement.....	iii
Contents.....	iv
List of Figures.....	vi
List of Tables.....	viii

CHAPTER 1: Introduction

1.1 Motivation.....	1
1.2 Previous Works.....	1
1.3 Organization of this Thesis.....	2



CHAPTER 2: Background

2.1 Basics of Discrete Wavelet Transform (DWT).....	3
2.2 Wavelets.....	6
2.3 Image Compression Schemes.....	11
2.4 Image Quality Evaluations.....	13

CHAPTER 3: Proposed Method

3.1 Image Compression.....	16
3.2 Parameters of Experiments.....	18
3.3 Image Contents.....	19

CHAPTER 4: Experimental Results

4.1 Test Images.....	22
4.2 Comparisons of the Compression Results.....	22

4.2.1 Different Image Contents.....	26
4.2.2 Different Number of Decompositions.....	29
4.2.3 Different Filter Orders.....	31
4.2.4 Different Wavelets.....	33
4.2.5 Different Compression Ratios.....	34
4.3 Selection of Proper Wavelets.....	35
4.4 Resolutions of Images.....	43
 CHAPTER 5: Conclusions and Future Works	
5.1 Conclusions.....	45
5.2 Future Works.....	46
 Appendix A.....	47
Appendix B.....	53
References.....	65



List of Figures

Fig. 2-1. (a) Structure of wavelet decomposition (3-level) (b) 2-D DWT.....	5
Fig. 2-2. Wavelet functions of each wavelet family.....	8
Fig. 2-3. The fundamental parts in a lossy image compression scheme.....	13
Fig. 3-1. Wavelet decompositions. (a) View mode: square (b) View mode: tree.....	17
Fig. 3-2. Some test images and their histograms.....	20
Fig. 3-3. The spatial features of each test image.....	21
Fig. 4-1. Reconstructed Lena image using some wavelet filters. (CR=30:1).....	25
Fig. 4-2. Reconstructed images using BW2.2 and $D = 5$. (CR = 50:1).....	26
Fig. 4-3. PSNR values of different images. (CR = 10:1).....	28
Fig. 4-4. Comparison of reconstructed Baboon image using BW2.2 with different number of decompositions. (CR = 50:1).....	29
Fig. 4-5. Different number of decompositions using BW2.2. (Baboon).....	30
Fig. 4-6. Comparisons of different filter orders. (CR = 50:1, Lena) (a) DW (b) CW..	31
Fig. 4-7. Comparisons of different filter orders. (CR = 30:1, Grass).....	32
Fig. 4-8. Comparison of reconstructed Lena image using CW with different filter orders. ($D = 4$, CR = 30:1).....	32
Fig. 4-9. Different wavelets applied on Peppers and Baboon images. (CR = 50:1)....	34
Fig. 4-10. PSNR values using appropriate wavelets. (a) CR = 10:1 (b) CR = 30:1 (c) CR = 50:1.....	36
Fig. 4-11. Reconstructed Lena images using appropriate wavelets. (CR = 50:1).....	37
Fig. 4-12. Reconstructed Fruits images using appropriate wavelets. (CR = 50:1)....	38

Fig. 4-13. PQS of each image using appropriate wavelets. (CR = 10:1).....	39
Fig. 4-14. Comparisons using BW2.2 and DW2 with different CRs (Baboon).....	40
Fig. 4-15. Comparisons using BW2.2 and DW2 with different CRs (Grass).....	41
Fig. 4-16. Comparisons of Text image. (CR = 10:1).....	42
Fig. 4-17. Comparisons using different wavelet families. (CR = 10:1, Resolution Chart).....	42
Fig. 4-18. Reconstructed Lena images. (BW2.2, $D = 5$, CR = 50:1).....	44



List of Tables

Table. 2-1. Properties of each wavelet family.....	9
Table. 2-2. Filter order and filter length of each wavelet family.....	10
Table. 2-3. Filter coefficients of some wavelets.....	11
Table. 2-4. The scales of the MOS.....	15
Table. 4-1. PSNR values of compression results (Lena).....	23

