ABSTRACT

Compression techniques have become the thrust area in the fields of computers with the growth of multimedia and Internet. Popularity of multimedia has led to the integration of various types of computer data. Multimedia combines many data types like text, graphics, still images, animation, audio and video. Image compression is a process of efficiently coding a digital image to reduce the number of bits required in representing the image. Its purpose is to reduce the storage space and transmission cost while maintaining good quality. Many different image compression techniques currently exist for the compression of different types of images.

In this thesis image compression using neural and wavelet techniques have been considered. Image compression systems using neural networks, wavelets and wavelet neural networks have been designed. Using these techniques the structure of image compression systems are presented. Segmentation is applied for compression of images using neural networks, back propagation training algorithm is used to train neural network systems. The neural network model has been trained and tested using different images.

The backgrounds of wavelet analysis, data compression using wavelets are explained. How wavelets can be used for image compression and problems involved with image compression were presented and the results of this investigation are discussed. It was discovered that thresholding had an extremely important influence to compression results.

The Wavelet Neural Network (WNN) combines the properties of wavelets and artificial neural networks. The purpose of this work is to use a combination of an artificial neural network and wavelets and to describe the wavelet neural network architecture for the image compression problem. Using different compression ratio, Peak Signal to Noise Ratio (PSNR) and Mean Square Error (MSE) results of above given image compression techniques for the reconstructed images are compared.

Key words: Neural Networks, Wavelet and Wavelet Networks Techniques.

ÖZET

Internet ve Multimedya büyümesi ile, sıkıştırma teknikleri bilgisayar alanlarında önemli bir alan haline gelmiştir. Multimedyanın çeşitliği, çeşitli biligisayar verilerinin entegrasyonuna yol açmıştır. Multimedya metin, hareketsiz grafik, görüntü, resim, animasyon, ses ve video gibi birçok veri türlerini birleştirir. Görüntü sıkıştırma verimli bir görüntüyü bit sayısının azaltılması ile sayısal görüntü kodlayan bir işlemdir. Amacı kaliteyi koruyacak bir şekilde depolama alanını ve iletim maliyetini azaltmaktır. Farklı resim çeşitlerini sıkıştırmak için birçok farklı resim sıkıştırma teknikleri vardır.

Bu tezde sinir ağı ve dalgacık teknikleri kulanarak resim sıkıştırma yöntemi kulanılmıştır. Resim sıkıştırma sistemi sinir ağı, dalgacık ve dalgacık sinir ağı kulanılarak dizayn edilmiştir. Bu teknolojileri kullanarak resim sıkıştırma sisteminin yapısı gösterilmiştir. Segementasyon sinir ağları kullanılarak resim sıkıştırma için uygulanmıştır. Geri yayılım eğitim algoritmasının sinir ağı sistemleri eğitmek için kullanılır. Sinir ağı modeli farklı görüntüler kullanılarak deneylenmış ve test edilmiştir.

Dalgacık analizinin özgeçmişi ve dalgacıklarla veri sıkıştırma yöntemi anlatılmıştır. Nasıl Dalgacıklar resim sıkıştırmak için kulanılır ve resim sıkıştırmada ortaya gelen problemler ile ilgili araştırmalar yapılıp incelenmiştir. Bu sonuçlar sıkıştırmaya son derece önemli bir etkiye sahip olduğu ortaya çıkmıştır.

Dalgacık Sinir Ağı (DSA), dalgacıklar ve yapay sinir ağları özeliklerini birleştiriyor. Amacımız bir yapay sinir ağı ile dalgacıktar birleştirmesi ve resim sıkıştırma sorunu için dalgacık ağı mimarisini tanımlamaktır. Farklı sıkıştırma oranı, PSNR ve MSE sonuçları yeniden duzenlenmiş görüntüler ve karşılaştırmak için kulanılmıştır.

Anahtar kelimeler: Yapay Sinir Ağları, Dalgacık ve Dalgacık Ağlar yöntemleri.

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**DECLARATION**

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**CONTENTS**

ABSTRACT i

ÖZET ii

ACKNOWLEDGEMENTS iii

DECLARATION iv

CONTENTS v

LIST OF TABLES vii

LIST OF FIGURES viii

LIST OFABBREVIATIONS ix

INTRODUCTION 1

CHAPTER 1, IMAGE COMPRESSION TECHNIQUES 4

1.1 Overview 4

1.2 Introduction to Image Compression 4

1.3 Huffman Coding 5

1.4 Characteristic to Judge Compression Algorithm 6

1.4.1 Compression Ratio 6

1.4.2 Compression Speed 7

1.4.3 Mean Square Error 7

1.4.4 Peak Signal to Noise Ratio 7

1.5 Lossless and Lossy Compression 8

1.5.1 Lossless Compression 8

1.5.1.1 Run Length Encoding 8

1.5.1.2 Arithmetic Coding 9

1.5.1.3 Lempel- Ziv- Welch (LZW) Encoding 9

1.5.1.4 Chain Codes 10

1.5.2 Lossy Compression 10

1.5.2.1Quantization 10

1.5.2.2 Predictive Coding 11

1.5.2.3 Fractal Compression 11

1.5.2.4 Wavelet Transform 11

1.6 The Use of Neural and Wavelet Techniques for Image Compression 12

1.7 Summary 15

CHAPTER 2, NEURAL NETWORK STRUCTURE FOR IMAGE COMPRESSION.16

2.1 Overview 16

2.2 Introduction to Neural Networks 16

2.3 Neural Networks versus Conventional Computers 17

2.4 Neural Network Architecture. 17

2.4.1 Multiple Layers of Neurons 19

2.5 Training an Artificial Neural Network 20

2.5.1 Supervised Learning 20

2.5.2 Unsupervised Learning 21

2.6 Back-propagation Training Algorithm 22

2.6.1 Feed Forward Phase 23

2.6.2 Back-propagation Phase 23

2.7 Summary 24

CHAPTER 3, WAVELET TRANSFORM FOR IMAGE COMPRESSION 25

3.1 Overview 25

3.2 Wavelet Transform 25

3.3 Discrete Wavelet Transform 27

3.4 Multiresolution Analysis 28

3.5 DWT subsignal encoding and decoding 28

3.6 Example of Haar Wavelet Transform 29

3.6.1 Image Representation 30

3.7 Summary 33

CHAPTER 4, WAVELET NEURAL NETWORK FOR IMAGE COMPRESSION 34

4.1 Overview 34

4.2 Wavelet Neural Network 34

4.3 Initialization of the Network Parameters 36

4.4 Stopping Conditions for Training 37

4.5 Training of WNN 37

4.6 Summary 39

CHAPTER 5, DESIGN OF IMAGE COMPRESSION SYSTEMS USING WAVELET AND NEURAL TECHNOLOGIES 40

5.1 Overview 40

5.2 Image Compression Using Neural Network 40

5.2.1 Pre-Processing 40

5.2.2 Training Algorithm 41

5.2.3 Post-Processing 41

5.3 Image Compression Using Haar Wavelet Transform 41

5.3.1 Procedure 41

5.3.2 Algorithm 41

5.4 Image Compression Using Wavelet Neural Network 44

5.4.1 Procedure 44

5.4.2 Method Principle 44

5.4.3 Training Algorithm 45

5.4.4 Algorithm 45

5.5 The Simulation Results 46

5.6 Implementation and Results 57

5.6.1 Comparison Using PSNR Values 60

5.6.2 Comparison of Computational Time of Used Techniques 61

5.7 Summary 62

CHAPTER 6, CONCLUSIONS 63

REFERENCES 64

Appendix 1.1 Neural Networks 68

Appendix 1.2 Haar Wavelet Transform 68

Appendix 1.3 Wavelet Networks 70

**LIST OF TABLES**

**Table 1.1** Multimedia data types and uncompressed storage space, transmission time required 5

**Table 5.1** The results for Lena images using Neural Networks. 58

**Table 5.2** The results for Lena images using Haar Wavelet Transform 58

**Table 5.3** The results for Lena images using Mexican Hat Wavelet Networks 58

**Table 5.4** The results for Peppers images using Neural Networks. 58

**Table 5.5** The results for Peppers images using Haar Wavelet Transform 59

**Table 5.6** The results for Peppers images using Mexican Hat Wavelet Networks 59

**Table 5.7** The results for Baby images using Neural Networks. 59

**Table 5.8** The results for Baby images using Haar Wavelet Transform 59

**Table 5.9** The results for Baby images using Mexican Hat Wavelet Networks 60

**Table 5.10** The values of MSE, PSNR and Compression rate for Lena images 60

**Table 5.11** The values of MSE, PSNR and Compression rate for Peppers images 60

**Table 5.12** The values of MSE, PSNR and Compression rate for Baby images 61

**Table 5.13** The computational time and compression rate for Lena, Peppers and Baby images…………………………………………………………………………………...62

**LIST OF FIGURES**

**Figure 2.1** Layers of *S* Neurons 18

**Figure 2.2** Layers of S Neurons, Abbreviated Notation 18

**Figure 2.3** Multilayer Neural Network 19

**Figure 2.4** Three-Layer Network 20

**Figure 2.5** Multilayer feed-forward network 23

**Figure 3.1** Mother wavelet 26

**Figure 3.2** Three – level multiresolution wavelet decomposition and reconstruction of signals using filter structure 29

**Figure 3.3** Represents the image of matrix (A) 8x8 31

**Figure 3.4** Represents the original and decompressed image of matrix (A) 33

**Figure 4.1** The Mexican Hat 35

**Figure 4.2** Architecture of WNN 36

**Figure 5.1** Two Dimensional DWT 42

**Figure 5.2** Original Baby Image 42

**Figure 5.3** Baby image after wavelet decomposition one level 43

**Figure 5.4** Baby image after wavelet decomposition two levels 43

**Figure 5.5** Representation of training 45

**Figure 5.6** Lena images with Compression Ratio 25 % 46

**Figure 5.7** Lena images with Compression Ratio 50 % 47

**Figure 5.8** Lena images with Compression Ratio 75 % 48

**Figure 5.9** Lena images with Compression Ratio 87.75 % 49

**Figure 5.10** Peppers images with Compression Ratio 25 % 50

**Figure 5.11** Peppers images with Compression Ratio 50 % 51

**Figure 5.12** Peppers images with Compression Ratio 75 % 52

**Figure 5.13** Peppers images with Compression Ratio 87.75 % 53

**Figure 5.14** Baby images with Compression Ratio 25 % 54

**Figure 5.15** Baby images with Compression Ratio 50 % 55

**Figure 5.16** Baby images with CompSression Ratio 75 % 56

**Figure 5.17** Baby images with Compression Ratio 87.75 % 57

**LIST OF ABBREVIATIONS**

ANN Artificial Neural Network

B/P Bits per Pixel

CR Compression Ratio

CWT Continuous Wavelet Transform

DB Decibel

DCT Discrete Cosine Transform

DPCM Differential Pulse Code Modulation

DWT Discrete Wavelet Transform

GIF Graphics Interchange Format

HWT Haar Wavelet Transform

JPEG Joint Photographic Expert Group

MLP Multilayer Neural Perceptron

MPEG Moving Picture Expert Group

MSE Mean Square Error

NN Neural Network

PNG Portable Network Graphics

PSNR Peak Signal to Noise Ratio

VQ Vector Quantization

WT Wavelet Transforms

WNN Wavelet Neural Network