**AUTOMATIC IMAGE/VIDEO CAPTIONING USING DEEP LEARNING**

***A Main Project submitted to Jawaharlal Nehru Technological* *University, Kakinada in partial fulfilment of requirements for the award of the degree* of**

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**CERTIFICATE**

This is to certify that the project work entitled **“AUTOMATIC IMAGE/VIDEO CATIONING USING DEEP LEARNING”** is a bonafide work carried out by **“Ms. P. SAI AMULYA (Roll No:19KT1A05A9), Mr. M. NITHIN (Roll No:19KT1A05A2), Mr. R. RAJKUMAR (Roll No:19KT1A05B5), Mr. G. JAYA SAI SIVA KUMAR (Roll No:19KT1A0585)”** in partial fulfilment for the award of the degree of **Bachelor of Technology in Computer Science & Engineering of Jawaharlal Nehru Technological University-Kakinada** during the year 2015-2019. It is certified by all correction/ suggestions indicated for internal assessment have been incorporated in the report. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the above degree.

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**DECLARATION**

# This is to declare that the project entitled **“AUTOMATIC IMAGE/VIDEO CAPTIONING USING DEEP LEARNING”** submitted by us in the partial fulfilment of requirements for the award of the degree of **Bachelor of Technology in COMPUTER SCIENCE & ENGINEERING** at **Potti Sriramulu Chalavadi Mallikarjuna Rao College of Engineering & Technology**, is bonafide of record of project work carried out by us under the supervision and guidance of **V.NAVYA SREE**, **MTech., Phd., Professsor of CSE.**As,per my acknowledgement the work has not been submitted to any other institutionor University for any degree.

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ABSTRACT

**ABSTRACT**

We come across a lot of images every day from many sources like the internet, news articles, document diagrams, and adverts. Images from these sources are left up to the viewers' interpretation. Although the majority of photographs lack descriptions, most people can still understand them without them. However, if humans require automatic image captions from it, then robots must understand some kind of image captions. Many factors make image captioning crucial. It can be applied, for instance, to automatically index images. Image indexing is crucial for content-based image retrieval (CBIR), which has numerous applications in digital libraries, web searching, biomedicine, business, the military, and education. Social media sites like Twitter and Facebook can directly generate descriptions from images.

Image captioning is the process of creating a description for an image. Recognizing the significant items, their characteristics, and their relationships in a picture is necessary for image captioning. Additionally, it must produce phrases that are both syntactically and semantically sound. The difficulties and complexity of image captioning can be handled by deep learning-based algorithms. We intend to provide a thorough analysis of current deep-learning-based image captioning methods in this survey study. To evaluate the performances, advantages, and disadvantages of the strategies, we talk about their theoretical underpinnings. We also go through the datasets and evaluation criteria that are frequently used in automatic image captioning that is based on deep learning.

**CONTENTS**

**TOPICS PAGE NO**

**1. INTRODUCTION**

1.1 Brief overview of the project 1

1.1.1 Scope 1

1.1.2 Purpose 1

1.2. Problem Statement 1

**2. LITERATURE REVIEW**

2. 2. 1 Related Work 2

2. 2 Existing system 2

2.3 Proposed System2

2 .4 Objective of the Study 2

**3. SYSTEM ANALYSIS**

3.1 SystemStudy 3

3.2 Requirement Analysis 3

3.2.1 Functional Requirements 3

3.2.2 Non Functional Requirements 3

3.3 System Requirement Specification 3

3.3.1 Software Requirements 3 3.3.2 Hardware Requirements 3

3.4 Process Model 3

**3.2 SYSTEM DESIGN 3**

3.2.1 About System Design 3

3.2.2 System Architecture 3

**3.3 UML Diagrams** 3

3.3.1 Importance of UML Modelling 3

**3.4 Object Oriented Design 3**

3.4.1 Use Case Diagram 3

3.4.2 Class Diagram 3

3.4.3 Sequence Diagram 3

3.4.4 Collaboration Diagram 3

3.4.5 Activity Diagram 3

**3.5 Data Base Design** 3

3.5.1 Table Description 3

3.5.2 E-R Diagrams 3

**4. SYSTEM IMPLEMENTATION**

4.1 About System Implementation 4

4.2 Module Description 4

4.3 Source Code 4

4.4 Results 4  **5.SYSTEM TESTING**

5.1 About Testing 5

5.2 TestingMethods (levels of testing)5

5.3 Validation and Verification 5

5.4 Test Cases 5

**6. SAMPLE CODE 6**

**7. SCREENSHOTS 7**

**8. CONCLUSION & FUTURE SCOPE 8**

**9. REFERENCES**  **9**

**10. APPENDIX 10**

**INTRODUCTION**

1. **INTRODUCTION**
   1. **BRIEF OVERVIEW OF THE PROJECT**

In this project, we examine a sizable amount of photos and videos from numerous websites, news outlets, and advertisements Images from these sources are left up to the viewer's interpretation. However, when humans are unable to read the captions for particular photos, machines must do so..

preserve the image fidelity, involves loss of data and the decoded images are not identical with the original image. Hence the lossy compression technique can be engaged for medical image diagnosis while preserving the decoded image quality and acquiesce high compression ratio thereby improving the efficiency of computing system and reduce the band width of the networks for transmission.

Image Compression is the reduce the size of the original image and it is visible naked eye. Image Compression has two types they are lossy compression and lossless compression.

Lossless Compression is the without any losing information in the image.

In the lossless compression we have some techniques are the

* Huffman coding
* Run length coding
* Predictive coding
* Arithmetic coding
* Lempel ziv Welch coding

**Huffman coding**

In Computer Science and Information theory, a Huffman code is a particular type of optimal prefix code that is commonly used for lossless data compression and process of finding and/or such a code proceeds by means of Huffman coding an algorithm developed by David A. Huffman while he was a student at MIT and published in the 1952 paper”A Method for the Construction of Minimum-Redundancy Codes”.

The output from Huffman’s algorithm can be viewed as a Variable-length code table for encoding a source symbol.

The algorithm derives this table from the estimated probability or frequency of occurrence for each possible value of the source symbol.

Huffman coding uses a specific method for choosing their presentation for each symbol, resulting in a prefix code.

The technique works by creating a binary tree of nodes. These can be stored in a regular arrary,the size of which depends on the number of symbols ,n.A node can be either a leaf node or an internal node.Intially,all nodes are leaf nodes, which contains the symbol itself,the weight of the symbol and optionally, a link to a parent node which makes it easy to read the code starting from a leaf node. Internal nodes contain a weight, links to two child nodes and an optional link to a parent node. As a common convention, bit ‘0’ represents following the left child and bit ‘1’ represents following the right child. A finished tree has up to n leaf nodes and n-1 internal nodes. A Huffman tree that omits unused symbols produces the most optimal code lengths.

**RUNLENGTH ENCODING**

Run length encoding is a very simple form of lossless data compression and it is stored in a single data value and count, rather than as the original run.

RLE may also be used to refer to graphics file format for compressing black and white images and Run length encoding with the extension rle.

For example

Consider a screen containing plain black text on a solid white background.

Let us a code

BBBBWWWWWWBBWWWWWWBBBBWWWW BBBBBW

Subsequent to applying Run length coding, coded is 4B6W2B6W4B4W5B1W.

The run-length code of the original code is 32 characters in just 16.Subsequently compacted estimation of specific code stream afford to elegant through the help of RLE.

**PREDUCTIVE CODING**

This coding predicts the estimation of every pixel by utilizing the estimation of its neighbouring pixels.Along these lines, each pixel encoded with a forecast blunder as opposed to its unique value.

In this past signals values are passed into the prediction model and it is analyaze the past signal value and it is generated predictive signal value by the prediction model.

In this reconstructed past signal with the combination of the prediction and prediction error.

**Arithmetic Coding**

Arithmetic coding is a form of entropy encoding used in lossless data compression. Normally, a string of characters such as the words “hello there “is represented using a fixed number of bits per character, as in the ASCII code. When a string is converted to arithmetic encoding, frequently used characters will be stored with fewer bits and not-so –frequently occurring characters will be stored with more bits, resulting in fewer bits used in total.

The basis of the binary arithmetic coding is a recursive probability internal subdivision process. Since it is a binary arithmetic encoder, there are only two sub internals. With each decision, the current probability interval is subdivided into two sub intervals. If the value of decision, is 1 then it is more possible symbol(MPS).otherwise, the value of decision and it is the less possible symbol(LPS).the basic operation of AE is the calculating the MPS and LPS.

**Lempel ziv Welch**

LZW is the universal “lossless data compression algorithm” created by Abraham Lempel, Jacob Ziv and Terry Welch. In this we have two types of algorithm they are “LZ77” and “LZ78” algorithms.

The first algorithm was published in 1977 hence it is name: LZ77

LZ77 compression algorithm maintains its dictionary within data themselves.

Lempel and Ziv published a second paper outlining a similar algorithm that is now referred to as LZ78 and it is maintain a separate dictionary.

LZ78 is also referred as a “LZW”.The Scenario described by Welch’s 1984 paper encodes sequences of 8 bit data as fixed length 12 bits codes.

The code from 0 to 255 represent 1 character sequences consisting of the corresponding 8-bit character, and the code 256 through 4095 are created in a dictionary for sequences encountered in the data as its encoded.

**LOSSY COMPRESSION**

Lossy compression is the loss the information of image and it has types they are

* DWT
* SWT
* DCT
* VECTOR QUANTIZATION
* MULTIRESOULTION
* FRACTAL COMPRESSION

**DISCERTE WAVELET TRANSFORM (DWT)**

Wavelet compression treats the entire image as a series of small waveforms, or signals, known as wavelets, with one per colour channel.

Ex:-Red, green and blue

A Wavelet transform is applied that quantizes the wavelets b quantizes the wavelets by measuring the distances between the Zero line and points along each wavelet and records these distances and between the Zero line and points along each wavelet and records these distance and coefficient for each pixel in the image.

The coefficient of adjacent images are averaged to produces a simplified version of the wave, which produce effectively halves the size of the image description.

The process is repeat again and again and soon producing progressively smaller waves.

Wavelet compression is used effectively to compress transient images, such as twinkling stars in a night sky.

Wavelet compression is used effectively to compress transient images, such as twinkling stars in a night sky.

Wavelet compression also supports non-uniform compression where specified parts of the image can be compressed more than others.

The Wavelet algorithms compress the entire image with ratios of up to 300:1 for colour and 50:1 for grey scale.

**DISERECTE CURVELET TRANSFORM (DCT)**

Curvelets are non-adaptive technique for multi-scale object representation.

Being an extension of the wavelet concept they are becoming popuplar in similar fields namely in image processing and scientific computing.

Curvelets Construction is the two main ideas should be followed

1. Consider polar coordinates in frequency domain.

2. Construct curvelet elements being locally supported near driven wedges.

And it is transformation is the goal of the transformation process is to decompress the pixels of image or to pack as much information as possible into the smallest number of transform coefficients.

**VECTOR QUQNTIZATION**

A Vector quantizer is composed of two operations. The first is the encoder, and the second is the decoder. The encoder takes an input vector and outputs the index of the codeword that offers the lowest deformation. In this case the lowest distortion is found by evaluating the Euclidean distance between the input Vectors and each codeword in the codebook. Onces the nearest codeword is available the index of that codeword us sent by a channel.

VQ is a powerful method for lossy compression of data such as sounds or images, because their Vector representations often occupy only small fractions of their vector spaces. We can illustrate this distribution in the case of a simple representation of a grayscale image in a 2D vector space. The Vectors will be composed by taking in pairs the values of adjacent pixels.

**FRACTAL COMPRESSION**

The fractal image compression first partitions the original image into non overloading domain regions.Then a collection of possible range regions is defined.Therange regions can overlap and need not cover the entire image, but must be larger than the domain regions, For each domain region the algorithm then searches for a suitable range region that, when applied with an appropriate affine transformation, very closely resembles the domain region.Afterward,a FIF (Fractal Image Format) file is generated for the image. This file contains information on the choice of domain regions, and the list of affine coefficients (i.e. the entries of the transformation matrix)of all associated affine transformations.so all the pixels’ data in a given region are compressed into a small set of entries of the transform matrix, with each entry, corresponding to an integer between 0and 255,taking up one byte.

* + 1. **SCOPE**
* Elimination of redundancy
* Minimize data storage and hence the cost
* Minimized bandwidth
* Less time to retrieve and transmit data
  + 1. **PURPOSE**

To develop a full functional and user interactive tool which it is used in imaging and multimedia products to reduce the burden of network transmission and huge cloud storage for organization.

* 1. **PROBLEM STATEMENT**

In previous project quality of image is good and we apply DWT ,SWT,BYTE COMPRESSION and LZW ALGORITHM used for no losing data and compression ratio is reduced then the previous project.

**LITERATURE SURVEY**

2 .**LITERATURE REVIEW**

2.1 **RELATED WORK**

* We review and describe the main categories of existing image captioning methods, including template-based image captioning, retrieval-based image captioning, and novel caption generation. Template-based approaches have fixed templates with a number of blank slots to generate captions. In these approaches, different objects, attributes, and actions are detected first and then the blank spaces in the templates are filled.
* Deep-learning-based image captioning methods can generate captions from both visual space and multimodal space. Understandably, image captioning datasets have the corresponding captions as text. In the visual space-based methods, the image features and the corresponding captions are independently passed to the language decoder. In contrast, in a multimodal space case, a shared multimodal space is learned from the images and the corresponding caption text. This multimodal representation is then passed to the language decoder.
* “ A Systematic Survey of Remote Sensing Image Captioning” Since the first RSIC study was proposed, in recent years, an increasing number of scholars have devoted themselves to contributing technical solutions, large-scale datasets and ideas with potential application value to this new research field. The related data, methods, and evaluation metrics have gradually formed an independent system different from other fields. However, to the best of our knowledge, there are no review articles focusing on RSIC in the literature, which can provide researchers with a systematic analysis of the research status, trends, challenges and future work in this field.
* “ Automatic Image and Video Caption Generation With Deep Learning: A Concise Review and Algorithmic Overlap”. This article surveys the state of the art approaches with a focus on deep learning models for image and video captioning. The models and the generated captions are evaluated by using BLEU, METEOR, CIDEr [17]–[19], and other evaluation metrics. This article is a concise review of both image and video captioning methodologies based on deep learning, focusing on the algorithmic overlap between the two.
* “Image Captioning Based on Deep Neural Networks” It has been convincingly shown that CNNs can produce a rich representation of the input image by embedding it into a fixed-length vector, such that this representation can be used for a variety of vision tasks like object recognition, detection and segmentation. Hence, image captioning methods based on encoder-decoder frameworks often use a CNN as an image encoder. The RNN network obtains historical information through continuous circulation of the hidden layer, which has better training capabilities and can perform better than mining deeper linguistic knowledge such as semantics and syntax information implicit in the word sequence.
* “ An Integrative Review of Image Captioning Research” This paper introduces some existing image captioning methods and analyzes their principles. The data sets and evaluation indexes needed in this field are introduced. Although the existing image captioning algorithms have improved the prediction effect to a certain extent, they do not realize the function of generating specific description statements according to specific situations.
* " ReFormer: The Relational Transformer for Image Captioning” State-of-the-art approaches [3, 10, 12, 17, 24, 25, 33, 42, 44, 49, 50] mainly use encoder-decoder frameworks with attention to generate captions for images. Xu et al. [44–46, 48] developed soft and hard attention mechanisms to focus on different regions in the image when generating different words. Similarly, Anderson et al used a Faster R-CNN [31] to extract regions of interest that can be attended to. Yang et al. [50] used self-critical sequence training for image captioning.
* "A Hybrid Image Compression Technique for Medical Images" in the methodlogy is the In this present a strategy to increase the compression ratio with simple computational burden and excellent decoded quality and the advantages is the by using this DWT and DCT produces the acceptable results and the future scope is the Digitizing the amplitude values is required for quantization.
* "Hybrid DWT-DCT Algorithm for Biomedical Image and Video Compression Applications" in the methodology is the in this Hybrid Algorithm performs the Discrete Cosine Transform on the Discrete Wavelet Transform Coefficients and the advantage is the performance analysis over several medical images and video shows that the hybrid algorithm achieves higher compression ratio while preserving the critical data information that results in better reconstruction and the future scope is the Hybrid scheme also performs better in a distored environment compared to standalone JPEG and SPIHT DWT schemes.
* A Comparative Study of DCT, DWT & Hybrid (DCT-DWT) Transform in the compression procedure is first the whole image is loaded to the encoder side, then we do RGB to GRAY conversion after that whole image is divided into small NXN blocks (here N corresponds to 8) then working from left to right, top to bottom the DCT is applied to each block. Each block’s elements are compressed through Quantization means dividing by some specific 8X8 matrix called Qmatrixand rounding to the nearest integer value. This QMatrix is decided by the user to keep in mind that it gives Quality levels ranging from 1 to 100, where 1 gives the poor image Quality and highest compression ratio while 100 gives best Quality of decompressed image and lowest compression ratio.

2.2 **EXISTING SYSTEM**

* Hybrid DCT/RLE Compression Technique with Data Segmentation for Electroencephalography Data—Long recording time, large number of electrodes, and high sampling rate together produce a large data size of Electroencephalography (EEG). Therefore, more bandwidth and space are required for efficient data transmission and storing. So, EEG data compression is a very important problem in order to transmit EEG data efficiently with less bandwidth and storing it in a less space. The objective of this paper is to develop an efficient algorithm for EEG compression. Firstly, the EEG signal is segmented into N segment, and then transformed through Discrete Cosine Transform (DCT). The transformed coefficients are passed through a thresholding process and the values below the threshold are set to zero. Finally, the resulting coefficients are coded using the Run-Length Encoding (RLE) scheme. The EEG signal can be recovered by an inverse process. Total time for compression and reconstruction (T), Compression Ratio (CR) and Percentage Root Mean Error Difference (PRD) are evaluated in order to check the effectiveness of the proposed algorithm. Simulation results show that there is a good improvement in the compression time in case of using compression with data segmentation. In this paper, a compression algorithm for EEG data is proposed. First, The EEG data is segmented into N segment then each segment is compressed using DCT. After that, all the coefficients below the threshold are set to zero. Finally, the resulting data is compressed using RLE. The inverse process is applied in order to recover the original EEG data. CR, PRD and T are evaluated to check the performance of the proposed system. The case of compression with data segmentation has a higher CR, and less time compared with compression without segmentation.
* `An Introduction to Image Compression In recent years, the development and demand of multimedia product grows increasingly fast, contributing to insufficient bandwidth of network and storage of memory device. Therefore, the theory of data compression becomes more and more significant for reducing the data redundancy to save more hardware space and transmission bandwidth. In computer science and information theory, data compression or source coding is the process of encoding information using fewer bits or other information-bearing units than an unencoded representation. Compression is useful because it helps reduce the consumption of expensive resources such as hard disk space or transmission bandwidth. In this paper, we briefly introduce the fundamental theory of image compression in chapter 1, two typical standards - JPEG and JPEG 2000 will be described in chapter 2. Finally, the newly proposed image compression algorithm – Shape Adaptive image Compression will be introduced in chapter 3. The DCT-based image compression such as JPEG performs very well at moderate bit rates; however, at higher compression ratio, the quality of the image degrades because of the artifacts resulting from the block-based DCT scheme. Wavelet-based coding such as JPEG 2000 on the other hand provides substantial improvement in picture quality at low bit rates because of overlapping basis functions and better energy compaction property of wavelet transforms. Because of the inherent multi-resolution nature, wavelet-based coders facilitate progressive transmission of images thereby allowing variable bit rates. We also briefly introduce the technique that utilizes the statistical characteristics for image compression. The new image compression algorithm called Shape Adaptive Image Compression, which is proposed by Huang [5], takes advantage of the local characteristics for image compaction. The SAIC compensates for the shortcoming of JPEG that regards the whole image as a single object and do not take advantage of the characteristics of image segments. However, the current data compression methods might be far away from the ultimate limits. Interesting issues like obtaining accurate models of images, optimal representations of such models, and rapidly computing such optimal representations are the grand challenges facing the data compression community. Image coding based on models of human perception, scalability, robustness, error resilience, and complexity are a few of the many challenges in image coding to be fully resolved and may affect image data compression performance in the years to come.
* A Hybrid Image Compression Technique for Medical Images Due to the bandwidth and storage limitations, medical images must be compressed before transmission and storage. However, the compression will reduce the image fidelity, especially when the images are compressed at lower bit rates. The reconstructed images suffer from blocking artifacts and the image quality will be severely degraded under the circumstance of high compression ratios. In this paper, we present a strategy to increase the compression ratio with simple computational burden and excellent decoded quality. Higher compression ratio is achieved by applying different compression thresholds for the wavelet coefficients of each DWT band (LL and HH) while DCT transform is applied on (HL and LH) bands with preserving the quality of reconstructed medical image. The retained coefficients are quantized by using adaptive quantization according to the type of transformation. Finally the entropy coding (variable shift coding) is used to encode the quantization indices. The Discrete Wavelet Transform (DWT) analyzes the signal at different frequency bands with different resolutions by decomposing the signal into an approximation and detail information. Image coded by DWT do not have the problem of blocking artifacts which the DCT approach may suffer.
* In this paper medical image compression technique using DCT-DWT is proposed. This method is used both DWT and DCT compression techniques. This method is easy to implement and give acceptable results. This compression technique is tested against different medical images using different values of compression factors (i.e. DWT and DCT quantization factors). As the quantization factors increase the Compression ratio increase and the quality measurement (PSNR) decrease. The proposed methodology provides higher compression ratios & avoids blocking artifacts. Allows good localization both in spatial & frequency domain. Transformation of the whole Image introduces inherent scaling. Better identification of which data is relevant to human perception higher compression ratio. Experimental results show that these compressed medical images preserve its quality where quantization factor is less than 0.5. Where quantization factor is larger than 0.5, the constructed image after compression will begun slowly losing its quality. Digitizing the amplitude values is required for quantization. If the amplitude values are quantized then it will result in compression up to a particular threshold. If the compression is done beyond that threshold, .5, then the picture quality of the image degrades further.
* A Comparative Study of DCT, DWT & Hybrid (DCT-DWT) Transform Image compression is process to remove the redundant information from the image so that only essential information can be stored to reduce the storage size, transmission bandwidth and transmission time. The essential information is extracted by various transforms techniques such that it can be reconstructed without losing quality and information of the image. In this paper comparative analysis of image compression is done by three transform method, which is Discrete Cosine Transform (DCT), Discrete Wavelet Transform (DWT) & Hybrid (DCT+DWT) Transform. Matlab programs were written for each of the above method and concluded based on the results obtained that hybrid DWT-DCT algorithm performs much better than the standalone JPEG-based DCT, DWT algorithms in terms of peak signal to noise ratio (PSNR), as well as visual perception at higher compression ratio. In this paper comparative analysis of various Image compression techniques for different images is done based on three parameters compression ratio(CR), mean square error (MSE), peak signal to noise ratio (PSNR). Our results show that we can achieve higher compression ratio using Hybrid technique but loss of information is more. DWT gives better compression ratio without losing more information of image. Pitfall of DWT is, it requires more processing power. DCT overcomes this disadvantage since it needs less processing power, but it gives less compression ratio. DCT based standard JPEG uses blocks of image, but there are still correlation exits across blocks. Block boundaries are noticeable in some cases. Blocking artifacts can be seen at low bit rates. In wavelet, there is no need to block the image. More robust under transmission errors. It facilitates progressive transmission of the image (scalability). Hybrid transform gives higher compression ratio but for getting that clarity of the image is partially trade off. It is more suitable for regular applications as it is having a good compression ratio along with preserving most of the information.
* A Memory-Efficient Image Compression Method Using DWT Applied to Histogram-Based Block Optimization Image compression is an essential task for storing images in digital format. In this communication, an improved and hugely memory-efficient block optimization technique is presented that incorporates byte compression and discrete wavelet transform (DWT). Instead of the common method of nulling insignificant DWT coefficients, all the DWT coefficients are stored. The only lossy part comes from block optimization without noticeable degradation in the decompressed images. The method shows huge improvement in compression and reduces image storage space. The results obtained from this technique are compared to JPEG and JPEG2000 standard which shows this can be a fast alternative to other compression methods. In this work, an improved version of compression technique is presented where together with block optimization and byte compression, DWT is applied for image compression. The method is far superior to the JPEG standard and other similar techniques, in terms of compression ratio measured in bits per pixel, as pointed out in Table 1 with typical compression ratios of the order of 1000. It does not degrade the image quality significantly, and if compared with other techniques such as JPEG and JPEG200 at the same PSNR, it simply shows far superior compression. The method, histogram-based DWT, is quite fast and can be applied to a wide variety of image files. In case of file transfers through communication links, this can make immense contribution since the method works particularly well for image files that need bigger storage space. Therefore, a fast and highly memory efficient method is presented in this communication, here, that is far superior to JPEG and JPEG2000 in terms of compression ratio with huge utilities.
* Image Compression using Digital Curvelet Transform and HWT as MCA Image compression has been always a very active field of research. A highly efficient numerical scheme is proposed to solve the combined optimization problem posed by the model for separating images into texture and piecewise smooth parts. In the proposed multi-layered image coding schemes, the MCA used in image decomposition is performed using haar wavelet transform that decomposes the image into four frequency sub-band. The results show that the proposed algorithm that is the combination of wavelet based decomposition as extraction of texture and edge parts using the haar wavelet transform and further compressing of texture and edge part using dct and the Curvelet transform respectively, give the enhanced PSNR and other statistical parameters. The results are evaluated in different bits per pixels (bpp) color format and are in a proportionate order. I.e. as the bpp increases, the PSNR improves. Other image compression performance parameters like Standard Deviation, Entropy, Compression Ratio and Class Variance are evaluated to analyze the compression performance. The results show that the proposed algorithm that is the combination of wavelet based decomposition as extraction of texture and edge parts using the haar wavelet transform and further compressing of texture using dct and edge part using the curvelet transform give the enhanced PSNR and other statistical parameters. This proves the effectiveness of the proposed algorithm over the base work used as references. The proposed MCA algorithm using the haar wavelet transform has been proved to be a very effective tool while decomposing the input image into its texture and edge parts. The results are evaluated in different bits per pixels color format and are in a proportionate order. I.e. as the bpp increases, the PSNR improves.
* Color image compression algorithm based on the DCT transform combined to an adaptive block scanning This paper considers the design of a lossy image compression algorithm dedicated to color still images. After a preprocessing step (mean removing and RGB to YCbCr transformation), the DCT transform is applied and followed by an iterative phase (using the bisection method) including the thresholding, the quantization, dequantization, the inverse DCT, YCbCr to RGB transform and the mean recovering. This is done in order to guarantee that a desired quality (fixed in advance using the well known PSNR metric) is checked. For the aim to obtain the best possible compression ratio CR, the next step is the application of a proposed adaptive scanning providing, for each (n, n) DCT block a corresponding (n n) vector containing the maximum possible run of zeros at its end. The last step is the application of a modified systematic lossless encoder. The efficiency of the proposed scheme is demonstrated by results, especially, when faced to the method presented in the recently published paper based on the block truncation coding using pattern fitting principle. In this paper, we have proposed a new efficient algorithm for color images compression. Its high performance is due to: The pre-processing step (means removing and RGB to YCbCr transformation the guaranteed retrieved quality by the proposed controllability technique. The proposed new simple and effective quantized. The new powerful lossless encoder (including the adaptive scanning) profiting from the nice property of the DCT transform that is: After the thresholding process, a long successive run of zeros is produced and located at the end of each DCT block. We are working now on the enhancement of the obtained decompressed images quality by the application (as a post processing step) of the block-artifacts removing algorithms.
* Image Compression Using DCT and Wavelet Transformations Image compression is a widely addressed researched area. Many compression standards are in place. But still here there is a scope for high compression with quality reconstruction. The JPEG standard makes use of Discrete Cosine Transform (DCT) for compression. The introduction of the wavelets gave a different dimension to the compression. This paper aims at the analysis of compression using DCT and Wavelet transform by selecting proper threshold method, better result for PSNR have been obtained. Extensive experimentation has been carried out to arrive at the conclusion. In this paper, we have considered that DCT and DWT for image compression and decompression. By considering several images as inputs, it is observed that MSE is low and PSNR is high in DWT than DCT based compression. From the results it is concluded that overall performance of DWT is better than DCT on the basis of compression rates. In DISCRETE COSINE TRANSFORM image need to be “blocked”, correlation across the block boundaries is not eliminated. This results in noticeable and annoying „blocking artifacts‟ particularly at low bit rates. Wavelets are good to represent the point singularities and it cannot represent line singularities. This Paper can further be extended for line singularities with new transform named Ridgelet Transform.
* Lossy Compression and Iterative Reconstruction for Encrypted Image This work proposes a novel scheme for lossy compression of an encrypted image with flexible compression ratio. A pseudorandom permutation is used to encrypt an original image, and the encrypted data are efficiently compressed by discarding the excessively rough and fine information of coefficients generated from orthogonal transform. After receiving the compressed data, with the aid of spatial correlation in natural image, a receiver can reconstruct the principal content of the original image by iteratively updating the values of coefficients. This way, the higher the compression ratio and the smoother the original image, the better the quality of the reconstructed image. This work proposed a novel idea for compressing and encrypted image and designed a practical scheme made up of image encryption, lossy compression, and iterative reconstruction. The original image is encrypted by pseudorandom permutation, and then compressed by discarding the excessively rough and fine information of coefficients in the transform domain. When having the compressed data and the permutation way, an iterative updating procedure is used to retrieve the values of coefficients by exploiting spatial correlation in natural image, leading to a reconstruction of original principal content. The compression ratio and the quality of reconstructed image vary with different values of compression parameters. In general, the higher the compression ratio and the smoother the original image, the better the quality of the reconstructed image. In the encryption phase of the proposed system, only the pixel positions are shuffled and the pixel values are not masked. With the values of elastic pixels, the coefficients can be generated to produce the compressed data. On the other hand, the security of encryption used here is weaker than that of standard stream cipher, which can be cooperative with previous lossless compression techniques, since the distribution of pixel-values may be revealed from an encrypted image. The lossy compression of image encrypted by more secure methods will be studied in the future.
* General Embedded Quantization for Wavelet-Based Lossy Image Coding Embedded quantization is a mechanism employed by many lossy image codecs to progressively refine the distortion of a (transformed) image. Currently, the most common approach to do so in the context of wavelet-based image coding is to couple uniform scalar dead zone quantization (USDQ) with bit plane coding (BPC). USDQ+BPC are convenient for its practicality and has proved to achieve competitive coding performance. But the quantize established by this scheme does not allow major variations. This paper introduces a multistage quantization scheme named general embedded quantization (GEQ) that provides more flexibility to the quantized. GEQ schemes can be devised for specific decoding rates achieving optimal coding performance. Practical approaches of GEQ schemes achieve coding performance similar to that of USDQ+BPC while requiring fewer quantization stages. The performance achieved by GEQ is evaluated in this paper through experimental results carried out in the framework of modern image coding systems. Embedded quantization is a fundamental mechanism employed by lossy image coding systems to generate a quality progressive code stream. This work explores embedded quantizes aimed to the wavelet-based lossy, or lossy-to-lossless, compression of images. First, general embedded quantization (GEQ) is introduced. GEQ is a multistage quantization scheme that codes arbitrary quantization intervals in each quantization stage. This provides a greater flexibility to the quantizes than that provided by other schemes. Second, the optimization problem posed to achieve optimal performance for a selected range of decoding rates is described. This specifies an appropriate metric to appraise the performance of quantizes tested. Third, an exhaustive search evaluates the performance of GEQ for two different approaches. The first approach uses a codec based on JPEG 2000, which precisely appraise the efficiency of GEQ when introduced into an image codec employing advanced coding mechanisms. The second approach uses estimates of rate and distortion, which permits the extension of the exhaustive search to quantizes that would otherwise be too complex to evaluate. Fourth, the design of the quantizes achieving best performance found in the exhaustive search is studied, and a low-complexity algorithm that produces near-optimal GEQ schemes is proposed. Fifth, the insights learned during this analysis are employed to devise a practical GEQ scheme that achieves performance close to the optimal, and that can be implemented in an image codec. Sixth, the practical GEQ is integrated in the core coding system of JPEG 2000 and evaluated in terms of coding performance and quantizer’s complexity. Experimental results suggest that the coding performance achieved by the practical GEQ is very similar to other conventional quantization schemes, though it requires fewer quantization stages. This is convenient for codecs since, in general, fewer stages implies less computational resources. This seems to indicate that the implementation of the practical GEQ into codecs may reduce computational costs without sacrificing coding performance. The development carried out in this work seeks quantizes designed to achieve optimal coding performance. Nonetheless, the flexibility provided by GEQ can also be employed to devise quantizes with other purposes, such as the reduction of the maximum distortion or the maximum rate in each stage, the accurate attainment of a target rate, or the lossless coding of images. Also, GEQ may be adopted in other disciplines such as speech or audio coding.
* Bat Optimization Based Vector Quantization Algorithm for Medical Image Compression Image compression plays a significant role in medical data storage and transmission. The lossless compression algorithms are generally preferred for medical images. The variants of lossy vector quantization algorithm are also used in many cases, where the reconstructed image quality is fairly good with optimum compression ratio. Bat optimization algorithm is formulated based on the biological trait of bats to detect prey and avoid obstacles by using echolocation. In this chapter, the application of bat optimization algorithm in medical image compression is highlighted. The bat optimization algorithm is employed here for the optimum codebook design in Vector Quantization (VQ) algorithm. The performance of the BAT-VQ compression scheme was compared with the Classical VQ, Contextual Vector Quantization (CVQ) and JPEG lossless schemes for the abdomen CT images. Satisfactory results were obtained by BAT-VQ in terms of picture quality measures. In this work, BAT-VQ compression method is proposed and experimental analysis was done for the compression of abdomen CT images. The key idea is the incorporation of BAT optimization in the codebook design for VQ algorithm. The BAT-VQ compression scheme generates efficient results in comparison with classical VQ, CVQ, and JPEG lossy techniques. The compression ratio of BAT-VQ Fig. 2.15 BAT-VQ compression results; first column represents the input image, second column represents the compressed image and the third column represents the decompressed image 2 Bat Optimization Based Vector Quantization Algorithm … 51 was less when compared with CVQ, however, in terms of picture quality metrics like PSNR, MSE, NCC, and SC, the BAT-VQ outperforms other compression techniques. The reconstructed image quality is vital since medical images play important role in disease diagnosis and hence BAT-VQ compression scheme is a good choice for telemedicine applications.
* Lossless image compression algorithm and hardware architecture for bandwidth reduction of external memory in high definition (HD) video coders, huge memory access bandwidth is the major throughput bottleneck. Lossless embedded compression is an efficient solution to alleviate the bandwidth burden, in which image are compressed before writing into local memory and decompressed after retrieving from local memory. This study proposes a hardware-oriented lossless image compression algorithm, supporting block and line random access flexibly for adapting diverse hardware video codec architectures. The major contributions are characterized as follows. First, block or pixel-level adaptive prediction is proposed to fully utilize the image spatial correlation by employing adaptive mode decision. Second, multiple-range semi-fixed (SF) variable length coding (VLC) is employed to describe the prediction residue, and adaptive block size selection is employed for SF VLC to fully utilize the statistical redundancy. In addition, Huffman VLC is further employed to represent the control syntax elements. Third, four-stage pipeline hardware architecture is proposed to implement the proposed algorithm. Simulation results show that the proposed algorithm achieves competitive rate compression performance compared with reference algorithms. The proposed hardware architecture is verified supporting real-time processing for quad-HD videos at the frequency of 166 MHz The proposed work achieves reducing memory access bandwidth by ∼55.2%, which is useful for hardwired video coding. This paper proposes hardware-oriented lossless EC algorithm for large-size image frame with random access support, targeting for efficient compression for HD applications. Block or pixel-level adaptive intra-prediction is proposed to fully utilize the spatial correlation and track the local characteristics of the image to be compressed. In addition, multiple-range SF VLC is employed for residue coding, and Huffman-based VLC tables are proposed to represent the control parameter such as prediction mode information. These two VLC techniques are employed to utilize the statistic correlation existing in variable control symbols. Intensive simulation results show that the proposed algorithm achieves competitive compression performance in terms of rate saving compared with prevailing reference algorithms. The proposed hardware architecture is designed with logic function verified. The proposed architecture is suboptimal in terms of throughput which can be improved by employing hardware parallelization in the future. The proposed algorithm and architecture result in reducing.
* Still Image Compression Using Curvelets and Logarithmic Scalar Quantization Technique The remarkable development in the field of information technology and the diversity of multimedia applications in recent years imply the development of more efficient image compression techniques to improve the data transmission and storage capacity. The recent researches showed that classical wavelets are not able to exploit optimally the geometric regularities along the contours and edges of objects. We propose in this work, a new compression method based on geometric wavelets called Curvelets, associated with a logarithmic scalar quantization technique, to improve the compression performances compared to that of classical wavelets, in terms of image quality and compression rate (PSNR and CR). This method gave encouraging results with interesting perspectives. The remarkable development in the field of information technology and the diversity of multimedia applications perspectives. In this work, we proposed an algorithm for still image compression based on the Curvelet transform FDCT via wrapping, and a non-uniform scalar quantization selected according to the characteristics of Curvelet coefficients decay. The proposed quantization technique is able to favor the most significant coefficients, so that the curved geometric structures along the image’s edges and contours are the last information to lose even at high compression rates. This technique improves also the entropy of the obtained coefficients and discards the least significant coefficients. The obtained results are judged better compared to those previously obtained by conventional wavelets and Curvelets in most cases especially for high compression rates; however this work could be improved by extrapolating the algorithm to color images and video sequences.
* New Approach for Text Based Image Compression The world is governed by internet and people’s most of their works are depending on Internet for authentication, images are most used for currency transactions. So everywhere images are used and occupy more spaces for storage. Preserve more images is becoming essential in future trends. To achieve space domination by images, image compression is vital. Though there are several image compression techniques available, improvement over existing methods are welcome. In an attempt to improve ratio of image compression, a novice approach is tried. The proposed methodology first compresses the given image and compressed image is then transformed into ASCII file based on the pixel values. Then text compression is applied to string the size of the text file. Again the reduced text file is reverted to pixel file using ASCII character values. Finally, a compressed image is generated targeting the size of file small. The experimental result of the proposed work is achieving the intended goal. The proposed method for image compression is implemented in MatLab 8.4 software and the result produced by the tools is enclosed. It is seen that the proposed approach has increased the compression ratio when compared to other three methods taken for comparison.
* An Enhanced Approach for Video Compression Video compression technique is now mature as is proven by the large number of applications that make use of DWT and DCT technology. Now day’s lot of video compression techniques proposed. With efficient compression techniques, a significant reduction in file size can be achieved with little or no adverse effect on the visual quality. This paper gives the idea about for video compression technique but not very much good for the real time video compression techniques either have a demerit of loosely techniques like DCT and DWT but here we are going to present a noble technique in which we will use object position change finding algorithm to get our video process in real time and having lossless decompressions. Compression is done in real time, such a way while maintaining the benefits of keeping all of the information of the source and also the benefits of compression during the production process. "Lossless" means that the output from the decompressor is bit for-bit identical with the original input to the compressor. The decompressed video stream should be completely identical to original. In addition to providing improved coding efficiency in real time the technique provides the ability to selectively encode, decode, and manipulate individual objects in a video stream. The technique used results in video coding that a high compression ratio can be obtained without any loss in data in real time. In this paper, it has been surveyed that the existing works on the video compression techniques. Also we have tried to analyze the different video compression techniques for effective and useful video compression. Currently, many new schemes are proposed in the field of video compression. We have seen that all the schemes discussed above, LBMC algorithm for fast block motion estimation widely used video compression techniques. Also compared with other methods fuzzy techniques are rarely used in the video compression. This survey paper very helpful for find the video compression in current trends and next level of problem identification.
* Classification on Image Compression Methods: Review Paper The expanding accessibility of individual workstations and propelled correspondence channels encourages the vision of a world in which any sort of data open among an assortment of frameworks. More tightly weave of correspondences, registering, systems administration and an amusement administration has accepted a prevailing part in our regular day to day existence. In spite of the fast advance in mass-stockpiling thickness and computerized correspondence frameworks execution, interest for information transmission data transfer capacity and limit, keep on outstripping the abilities of accessible innovations. Specifically, the vital part that picture or image signals play in our human progress which is being exchanged to this new universe of data advancements. Advanced picture and video applications require high transmission rates, extensive capacity limits and quick preparing gear. The picture handling has been utilized in various regions, especially to highlight extraction and to acquire objectives. Picture preparing by utilizing image process technique is a rising innovation and picture is utilized as a part of different fields like therapeutic and training. Throughout the years broad investigations have been done to apply strategies progressively interchanges and image transmission. This is particularly genuine when a lot of data should be prepared, in high-determination imaging. The current advance in information preparing systems and correspondence frameworks has extensively expanded the limit of data transmit. In any case, the transmitted information able to confine by non-approved individuals. In this topic various image compression techniques is discussed and also, goes for showing a versatile advanced picture preparing strategy for acknowledgment of characters in computerized pictures. The image or picture constriction is an exchange between constriction proportion and pinnacle flag to clamour proportion, better and proficient constriction, decompression calculation is yet a requesting in the field. Picture information constriction in past two decade accomplishes significant advance. Each new approach gives better execution contrast with past strategies. Picture constriction utilized at various images like medicinal pictures, characteristic picture, fake pictures and satellite picture and so forth essentially information constriction most relevant when we have to transmit or store a tremendous measure of information. The hypothesis of information constriction quells to lie increasingly huge for lessening the information repetition to spare more equipment space and transmission bandwidth. However, the present information constriction strategies may be far from definitive points of confinement. Fascinating issues like getting exact models of pictures, ideal portrayals of such models, and quickly figuring such ideal portrayals are the fantastic difficulties confronting the information constriction group. Picture coding in light of models of human observation, adaptability, vigour, mistake flexibility, and many-sided quality are a couple of the many difficulties in picture coding to be completely settled and may influence picture information constriction execution in the years to come.
* Motion Estimation and Motion Compensated Video Compression Using DCT and DWT Video compression plays an important role in real-time scouting/video conferencing applications. For the entire motion based video compression process, motion estimation is the most computationally expensive and time consuming process. Block matching techniques are the most popular and efficient of the various motion estimation techniques. Block matching algorithm in video compression select the current frame and divides in to blocks. These, helps to find motion vector for each blocks within a search range find a best match that minimize an error measure. In this paper, Full Search strategies are used to reduce computation. Video compression techniques are used to reduce the redundancy in video data. For this purpose DCT (Discrete Cosine transform) and DWT (Discrete Wavelet Transform) are used. One advantage of DCT, Find the match of low frequency values then it can increase into comparing the higher frequency. The goal of wavelet based compression is to store video data in a little space. Hence, analyzed the performance is analyzed based on compression ratio and PSNR values using these two techniques. Video compression techniques are used to reduce the redundancy in video data. For this purpose DCT (Discrete Cosine transform) and DWT (Discrete Wavelet Transform) are used. Block matching algorithm, helps to find motion vector for each blocks within a search range and finds a best match that minimize an error measure. the performance of DCT and DWT technique is compared based on compression ratio was found. That DWT performance better than DCT.
* A survey on data compression techniques: From the perspective of data quality, coding schemes, data type and applications Explosive growth of data in digital world leads to the requirement of efficient technique to store and transmit data. Due to limited resources, data compression (DC) techniques are proposed to minimize the size of data being stored or communicated. As DC concepts results to effective utilization of available storage area and communication bandwidth, numerous approaches were developed in several aspects. In order to analyze how DC techniques and its applications have evolved, a detailed survey on many existing DC techniques is carried out to address the current requirements in terms of data quality, coding schemes, type of data and applications. A comparative analysis is also performed to identify the contribution of reviewed techniques in terms of their characteristics, underlying concepts, experimental factors and limitations. Finally, this paper insight to various open issues and research directions to explore the promising areas for future developments. A DC technique plays a significant role to handle massive amount of data generated in various forms in digital world. No universal DC approaches has been proposed to effectively compress different types of data in diverse applications. Several DC approaches are proposed to compress various forms of data like text, audio, video, images and so on. This paper outlines and surveys the state-of-the-art DC concepts in several aspects. With the goal of understanding further intricacies of the DC, we have broadly divided the DC techniques based on data quality, coding schemes, data type and applications. The traditional and recently developed DC techniques are reviewed and compared by highlighting their objective, methodology used, performance metrics and suitability to various applications. Nevertheless, given the relative infancy of the field, there are still quite a number of outstanding problems that need further investigation from the perspective of proposing key techniques and advanced solutions. At the end of paper, it results to a useful guideline to select appropriate technique for intended applications or designing new DC algorithms based on the requirement.
* Perceptual Quality Assessment of Medical Images Today, healthcare professionals are viewing medical images in a variety of environments. The technologies and methodologies used to acquire, process, store, transmit and display images vary, and consequently, the ultimate visual information received by the clinicians differs significantly in perceived quality. Visual signal distortions, such as various types of noise and artifacts arising in medical image acquisition, processing, compression and transmission, affect the perceptual quality of images and potentially impact diagnoses. To optimize clinical practice, we need to understand human perception of medical image quality in practical settings, and then use what is learned to develop useful solutions for improved image quality and better image‐based diagnoses. This chapter focuses on the methodologies used to measure the perceptual quality of medical images using magnetic resonance (MR) image acquisition and computed tomography (CT) image compression as examples, where modern digital image processing technologies and statistical analysis approaches play important roles in helping with both subjective visual testing and objective quality predictions.  With the rapid growth of digital image acquisition, processing, transmission and display technologies in medical imaging field, it has become ever more important to understand how such technologies affect the perceived image quality, which may have strong impact on the diagnostic values of these images. This chapter provides a basic introduction of the methodologies that have been used to measure the perceptual quality of medical images using image acquisition and image compression as examples. The processing and measurement of medical images are often different from those of typical natural images, because medical imaging applications often involve significant domain knowledge that needs to be fully understood and taken into consideration in both the quality assessment and data analysis processes. These are clearly exemplified in the MR image acquisition and CT image compression applications elaborated in the current chapter.   Quality assessment of medical images is still at a fast evolving stage, and by no means has this chapter provided a comprehensive coverage of all the problems and methodologies in the field. It is worth noting that promising technologies, such as the SSIM index as a novel objective image quality model discussed in this chapter, is gaining significant attention recently. The potential benefits of developing, validating and deploying such objective image quality assessment methods are not limited to monitoring the acquisition, storage, communication, processing, and display of medical images for quality control purposes, but also to the optimal design of novel medical imaging methods and systems that could deliver even better image quality in more cost‐effective ways than what we have in the current systems.
* Speckle Suppression Based on Sparse Representation with Non-Local Priors As speckle seriously restricts the applications of remote sensing images in many fields, the ability to efficiently and effectively suppress speckle in a coherent imaging system is indispensable. In order to overcome the over-smoothing problem caused by the speckle suppression algorithm based on classical sparse representation, we propose a non-local speckle suppression algorithm that combines the non-local prior knowledge of the image into the sparse representation. The proposed algorithm first applies shearlet to sparsely represent the input image. We then incorporate the non-local priors as constraints into the image sparse representation de-noising problem. The de noised image is obtained by utilizing an alternating minimization algorithm to solve the corresponding constrained de-noising problem. The experimental results show that the proposed algorithm can not only significantly remove speckle noise, but also improve the visual effect and retain the texture information of the image better this paper first reviewed the history of speckle suppression and the framework of de-noising based on a sparse domain. In image de-noising, texture loss and edge blur may be caused by the de-noising model based on sparse representation, while the artificial texture may be produced by the non-local de-noising algorithm. To overcome the above problems, we proposed a new speckle suppression method based on sparse representation with non-local priors. In this new method, we added the non-local priors as the constraint to the de-noising model based on sparse representation, which can make full use of the advantages of both types of de-noising algorithms. The new method can turn speckle suppression into an optimization problem, which can be solved by the alternating minimization algorithm. Experiments on SAR images and infrared images show that the proposed algorithm has a good noise suppression effect. However, the algorithm in this paper does not experiment on other kinds of coherent images. Therefore, we will study the universality of the algorithm in our next research.
* HYBRID DWT-DCT ALGORITHM FOR BIOMEDICAL IMAGE AND VIDEO COMPRESSION APPLICATIONS Digital image and video in their raw form require an enormous amount of storage capacity. Considering the important role played by digital imaging and video in medical and health science, it is necessary to develop a system that produces high degree of compression while preserving critical image/video information. In this paper, we present a hybrid algorithm that performs the discrete cosine transform on the discrete wavelet transform coefficients. Simulation has been carried out on several medical and endoscopic images and videos. The results show that the proposed hybrid algorithm performs much better in term of peak-signal-to-noise ratio with a higher compression ratio compared to standalone DCT and DWT algorithms. The scheme is intended to be used as the image/video compressor engine in medical imaging and video applications, such as, telemedicine and wireless capsule endoscopy. In this paper, we present a new hybrid OWT-OCT algorithm for biomedical image and video compression. The proposed scheme is intended to be used in selected areas of telemedicine and wireless capsule endoscopic system, where the degree of compression and reconstruction fidelity is important. The performance analysis over several medical images and video shows that the hybrid algorithm achieves higher compression ratio while preserving the critical data information that results in better reconstruction. The hybrid scheme also performs better in a distorted environment compared to standalone JPEG and SPIHT DWT schemes.
* An Extensive Survey on Compression Algorithm for Neural Network Algorithm: Image compression is critical for productive transmission and cargo space of images. Huge or tremendous request of wireless correspondence and interactive media accessing the multimedia data through Internet is developing violently. The data compression is contance a function. That functions say to Image compression. The objective of image compression is to trim down repetition reiteration of the image information. The image data recalling as a top priority the genuine goal to be able to store or transmit data in a gainful shape. Image compression can be ordered in two sorts lossy or lossless. Lossless compression is from time to time preferred for imitation images for example, specialized illustrations, symbols or funnies. Lossless compression methods may moreover be favored for high regard content, for instance, therapeutic imagery and image filters arranged intended for authentic reasons. Defeating techniques are particularly appropriate for regular ordinary images, for example, photographs in applications where slight defeat of devotion is worthy to achieve a liberal lessening in bit rate. This work wished-for a near report and overview on image compression algorithms In this piece of writing late work on image compression has been examined and investigated in light of their carrying out & outcome. For various image compression applications every algorithm has its own advantages and drawbacks bi-directional prediction enhanced the first MRP compression execution by 46.1% which is absolutely suit for medicative image compression. Lossless Image Compression Accepting DPCM algorithm is competent for lossless compression & execution for lossless or close lossless remedial image compression. The capability of geometric multi-determination transform (all the more specifically Curvelet transformation) in order to enhance the compression execution of still images as far as PSNR and CR contrasted with that of traditional wavelets. Fuzzy technique is utilized to diminish the contrast in the images to build the compression level and keeping up the yearning image quality.
* A survey on data compression techniques: From the perspective of data quality, coding schemes, data type and applications Explosive growth of data in digital world leads to the requirement of efficient technique to store and transmit data. Due to limited resources, data compression (DC) techniques are proposed to minimize the size of data being stored or communicated. As DC concepts results to effective utilization of available storage area and communication bandwidth, numerous approaches were developed in several aspects. In order to analyze how DC techniques and its applications have evolved, a detailed survey on many existing DC techniques is carried out to address the current requirements in terms of data quality, coding schemes, type of data and applications. A comparative analysis is also performed to identify the contribution of reviewed techniques in terms of their characteristics, underlying concepts, experimental factors and limitations. Finally, this paper insight to various open issues and research directions to explore the promising areas for future developments. DC techniques plays a significant role to handle massive amount of data generated in various forms in digital world. No universal DC approaches has been proposed to effectively compress different types of data in diverse applications. Several DC approaches are proposed to compress various forms of data like text, audio, video, images and so on. This paper outlines and surveys the state-of-the-art DC concepts in several aspects. With the goal of understanding further intricacies of the DC, we have broadly divided the DC techniques based on data quality, coding schemes, data type and applications. The traditional and recently developed DC techniques are reviewed and compared by highlighting their objective, methodology used, performance metrics and suitability to various applications. Nevertheless, given the relative infancy of the field, there are still quite a number of outstanding problems that need further investigation from the perspective of proposing key techniques and advanced solutions. At the end of paper, it results to a useful guideline to select appropriate technique for intended applications or designing new DC algorithms based on the requirement.
* A proposed secure multiple watermarking technique based on DWT, DCT and SVD for application in medicine In this paper, an algorithm for multiple watermarking based on discrete wavelet transforms (DWT), discrete cosine transform (DCT) and singular value decomposition (SVD) has been proposed for healthcare applications. For identity authentication purpose, the proposed method uses three watermarks in the form of medical Lump image watermark, the doctor signature/identification code and diagnostic information of the patient as the text watermarks. In order to improve the robustness performance of the image watermark, Back Propagation Neural Network (BPNN) is applied to the extracted image watermark to reduce the noise effects on the watermarked image. The security of the image watermark is also enhanced by using Arnold transform before embedding into the cover. Further, the symptom and signature text watermarks are also encoded by lossless arithmetic compression technique and Hamming error correction code respectively. The compressed and encoded text watermark is then embedded into the cover image. Experimental results are obtained by varying the gain factor, different sizes of text watermarks and the different cover image modalities. The results are provided to illustrate that the proposed method is able to withstand a different of signal processing attacks and has been found to be giving excellent performance for robustness, imperceptibility, capacity and security simultaneously. The robustness performance of the method is also compared with other reported techniques. Finally, the visual quality of the watermarked image is evaluated by the subjective method also. This shows that the visual quality of the watermarked images is acceptable for diagnosis at different gain factors. Therefore the proposed method may find potential application in prevention of patient identity theft in healthcare applications. In this work, a novel method for multiple watermarking based on DWT, DCT and SVD has been presented using Back Propagation Neural Network. The suggested method considered gray scale images for the experimental purpose. However, the watermark embedding into color image provides greater space against the watermark embedding into gray scale image. The performance of the watermarking system will greatly depends on the choice of color space and selection of embedding color channel. The main properties of the proposed work can be identified as follows: 1. The fusion of DWT, DCT and SVD offer better performance in terms of imperceptibility, robustness and capacity as compared to DWT, DCT and SVD applied individually 2. Embedding more than one watermark within the cover image reduces the storage capacity and the bandwidth requirements. The storage and bandwidth requirements are very important in medical applications. 3. To improve the robustness of the image watermark, Back Propagation Neural Network (BPNN) is applied to the extracted watermark which gives the higher Normalized Correlation (NC) values compared to without using the BPNN. 4. Security and confidentiality are provided by scrambling the Lump watermark using Arnold transforms before embedding into the cover. 5. Lossless arithmetic compression is applieded to Symptoms watermark before embedding in to the cover for the bit compactness. The lossless compression techniques is also preffered in medical applications in which every bit information is preserved before and after the compression process. 6. To increase the robustness of the signature watermark and reduce the channel distortion, Hamming error correcting code is applied to the watermark before embedding into the cover. 7. Finally, the visual quality of the watermarked image is evaluated by the subjective method also. Therefore, proposed method provides a valuable solution for the prevention of patient identity theft in healthcare applications such as teleophthalmology, telemedicine, tele-diagnosis and tele-consultancy etc. The inclusions of many techniques were combined to improve the robustness of the watermarks, visual quality of the watermarked image, capacity and security of the watermarks which is the prime objective of the research. However, it may have increased the computational complexity to some extent which needs to be investigated separately. In addition, the suggested method of wavelet based image watermarking can be extended for their application to video watermarking. We would like to further improve the performance, which will be reported in future communication.
* Cross-Space Distortion Directed Color Image Compression Traditional color image compression is usually conducted in the YCbCr space but many color displayers only accept RGB signals as inputs. Due to the use of a non-uniform matrix in the YCbCr-RGB conversion, a low distortion achieved in the YCbCr space cannot guarantee a low distortion for the RGB signals. To solve this problem, we propose a novel compression scheme for color images through defining a cross-space distortion so as to reduce as much as possible the distortion in the RGB space. To this end, we first derive the relationship between the distortions in the YCbCr space and RGB space. Then, we develop two solutions to implement color image compression for the most popular 4:2:0 chroma format. The first solution focuses on the design of a new spatial down-sampling method to generate the 4:2:0 YCbCr image for a high-efficiency compression. The second one provides a novel way to reduce the distortion of the compressed color image by controlling the quantization error of the 4:2:0 YCbCr image, especially the one generated by using the traditional spatial down-sampling. Experimental results show that both proposed solutions offer a remarkable quality gain over some state-of-the-art approaches when tested on various textured color images. In this paper, we firstly revealed the distortion relationship between the RGB space and the YCbCr space for the degraded color images. Then, we proposed two cross-space distortion directed methods, i.e., the CSDDS and CSDEC algorithms, to compress color images. The first method is applied to get a more efficient down-sampling for the generation of the 4:2:0 YCbCr image and the second one is used to control the quantization distortion occurring on the 4:2:0 YCbCr image, especially the one obtained by using the traditional spatial down-sampling. More importantly, both methods are carried out in the YCbCr space but lead to a lower distortion in the RGB space. When we apply them to the color image compression, the CSDDS-based coding offers a lower complexity and the CSDEC-based one provides a higher compression efficiency, thus making them adapting well to different scenarios. Moreover, a significant improvement has been achieved by using either proposed coding method, both objectively and subjectively.
* A hybrid image compression algorithm based on JPEG and Fuzzy transform we propose a new hybrid image compression algorithm which combines the F-transform and the JPEG. At first, we apply the direct F-transform and then, the JPEG compression. Conversely, the JPEG decompression is followed by the inverse F-transform to obtain the decompressed image. This scheme brings three benefits: (i) the direct F-transform filters out high frequencies so that the JPEG can reach a higher compression ratio; (ii) the JPEG color quantization can be omitted in order to achieve greater decompressed image quality; (iii) the JPEG-decompressed image is processed by by the inverse F-transform w.r.t. the adjoint partition almost lossless. The paper justifies the proposed hybrid algorithm by benchmarks which show that the hybrid algorithm achieves significantly higher decompressed image quality than the JPEG .We have presented a new, hybrid compression algorithm which combines the direct F-transform with the JPEG in such a way that the first is followed by the second. Conversely, the reconstruction is obtained by the JPEG followed by the it. In this paper, we justified three main benefits of the proposed combination: after the direct F-transform application the JPEG can reach a higher compression ratio; the JPEG color quantization can be omitted; the JPEGdecompressed image followed by the inverse F-transform is almost lossless. We have compared qualities of decompressed images obtained by the pure JPEG and “JPEG plus F-transform” algorithms. Both qualitative and visual criteria were taken into account. We have concluded that the quality of decompressed images by the “JPEG plus F-transform” is higher than that of the pure JPEG provided that the compression ratio for both methods was same.
* Development of an Efficient and Secure Image Transposal Algorithm Using 16 \*16 Quantization Table – In later a long time, different mystery sharing plans for computerized pictures have been created in arrange to advance communication security. Past strategies in the writing have made endeavours efforts endeavours to accomplish the merits properties for a great mystery picture transposing such as execute (k,n) limit, basic recuperation, no pixel development, the produced covert image are important, the arrange of pictures is elective and lossless recuperation of the mystery image. To the leading of our information, no past mystery sharing scheme accomplishes all the over properties with great quality of important pictures. In this paper, we proposed puzzle image montages based on data stowing away hypothesis to make strides the quality of important pictures with lower computation and great expansibility. In the light of, the proposed plans have the important points of lossless and elective arrange recuperation and no pixel development expansion extension development. This is observing with past advance appear the execution of the planned conspires. The calculations displayed permit distinctive aligned of protection for the data covered up in the covering-document. As a result we work that gives less compression time.The strategies we are executing here too give a more effective method to verifying the client to get to the unique image. By the distinctive parameter we calculated here we discover ultimately that our proposed work is more proficient than the other procedure.
* A Novel Approach to Compression and Encryption of Large Color Images - Satellite images usually has greater size and high redundancy which makes communication systems face bandwidth and storage issues. In addition to that, privacy of the images is also to be preserved. Hence, satellite image communication requires high image compression and unbreakable encryption. This paper combines the compression and encryption techniques into two encoding phases. In the first encoding phase, the proposed JPEG-lossless compression algorithm is optimized by using sub sampling technique instead of conventional down sampling approach to reduce color resolution to lower bandwidth of the input space image. Then, in the second encoding phase, compressed image is encrypted using one dimensional chaotic image encryption algorithm by generating logistic maps and cubic maps. The experiments were carried out on various satellite images of different file formats using MATLAB image processing toolbox functions like compress and dct. From the results, it is observed that MSE, PSNR, compression ratio of the compression scheme is around 2%, 56% and 76% respectively, and encryption method showed UACI, NPCR and Information entropy of around 33.5%, 99.3% and 7.85 respectively, that shows an enhanced performance comparatively. Hence the proposed method assists space researchers in working with large satellite images for secured image transmission. In this paper, optimized JPEG-lossless compression algorithm and one-dimensional chaotic image encryption algorithm is used. The proposed optimized JPEG-lossless compression algorithm overcomes the issues of storage space requirements thereby, compressing the color images with high compression ratio. Compressed images are encrypted using the one-dimensional chaotic image encryption algorithm. Chaotic image encryption solves the key space issue and degree of randomness. Performance of compression is measured by compression ratio of 76%, MSE calculated is average of 2% and PSNR is average of 56%. Performance of encryption is evaluated by UACI of 33.5% and NPCR of 99.3%. Information entropy of the encrypted image is nearly equal to value of 8 that is the value proved theoretically, thereby showing high degree of randomness among image pixels. Since, the proposed compression system reconstructs the image with same high resolution as the original image, the compression is effective. The encrypted image is strong enough to defend brute force attacks to prove unbreakable encryption. Hence, it assists space image researchers for optimized satellite image communication with less bandwidth occupancy and security. In future this research may be carried out towards making automatic compression and encryption of large satellite images for a better and improved satellite communication that is secure and bandwidth constrained. The improved techniques can also be developed to reduce execution time overhead.
* Image Compression Using the 2-D Wavelet Transform The 2-D orthogonal wavelet transform decomposes images into both spatial and spectrally local coefficients. The transformed coef ficients were coded hierarchically and individually quantized in accordance with the local estimated noise sensitivity of the human visual system (HVS). The algorithm can be mapped easily onto VLSI. For the Miss America and Lena monochrome images, the technique gave high to acceptable quality reconstruction at compression ratios of 0.3-0.2 and 0.64-0.43 hits per pixel (bpp), respectively. We have applied our method to two standard monochrome test images, Miss America and Lena; the coded reconstructions are shown in Figs. 4 and 5, respectively. The Miss America image is the first frame of a test sequence and is 352 by 288 pixels (CIF format) in size. The Lena image is 512 by 512 pixels in size. The SNR values are calculated over the whole of the image (including the edges). Our results achieve better compression ratios for a given picture quality than the standard subband coding methods. Additionally, our algorithm is significantly simpler to implement in hardware to achieve real-time performance. This is important for the coding of video sequences [3]. We find that the errors introduced by our methods are less visually annoying than for DCT compressed images due to the lack of blocking effects. At very high compression ratios visual degradation is introduced, mainly as blotchiness in flat areas and slight fuzziness around sharp discontinuities. In particular, the background of the Miss America and Lena images, and Lena’s face and shoulder become blotchy. Also their hair and Lena’s feather lose their sharpness. Finally, our method is equally applicable to the compression of color images in YUV format. In conclusion, our results indicate that the combination of HVS compatible filters with finite support and a quantizes which introduces noise in the visually least important and noise insensitive parts of the image gives a significant improvement in compression/image quality over block-based transform methods. Finally, the 4-tap Daubechies filter and the coder we use are much simpler to implement in hardware than DCT, VQ or other sub band coding methods. We are currently incorporating this method in a video codec, and implementing it in VLSI.
* An Edge Preserving Differential Image Coding Scheme Differential encoding techniques are fast and easy to implement. However, a major problem with the use of differential encoding for images is the rapid edge degradation encountered when using such systems. This makes differential encoding techniques of limited utility especially when coding medical or scientific images, where edge preservation is of utmost importance. We present a simple, easy to implement differential image coding system with excellent edge preservation properties. The coding system can be used over variable rate channels which makes it especially attractive for use in the packet network environment.
* Perceptual Quality Assessment of Medical Images Today, healthcare professionals are viewing medical images in a variety of environments. The technologies and methodologies used to acquire process, store, transmit and display images vary, and consequently, the ultimate visual information received by the clinicians differs significantly in perceived quality. Visual signal distortions, such as various types of noise and artifacts arising in medical image acquisition, processing, compression and transmission, affect the perceptual quality of images and potentially impact diagnoses. To optimize clinical practice, we need to understand human perception of medical image quality in practical settings, and then use what is learned to develop useful solutions for improved image quality and better image‐based diagnoses. This chapter focuses on the methodologies used to measure the perceptual quality of medical images using magnetic resonance (MR) image acquisition and computed tomography (CT) image compression as examples, where modern digital image processing technologies and statistical analysis approaches play important roles in helping with both subjective visual testing and objective quality predictions.  With the rapid growth of digital image acquisition, processing, transmission and display technologies in medical imaging field, it has become ever more important to understand how such technologies affect the perceived image quality, which may have strong impact on the diagnostic values of these images. This chapter provides a basic introduction of the methodologies that have been used to measure the perceptual quality of medical images using image acquisition and image compression as examples. The processing and measurement of medical images are often different from those of typical natural images, because medical imaging applications often involve significant domain knowledge that needs to be fully understood and taken into consideration in both the quality assessment and data analysis processes. These are clearly exemplified in the MR image acquisition and CT image compression applications elaborated in the current chapter.   Quality assessment of medical images is still at a fast evolving stage, and by no means has this chapter provided a comprehensive coverage of all the problems and methodologies in the field. It is worth noting that promising technologies, such as the SSIM index as a novel objective image quality model discussed in this chapter, is gaining significant attention recently. The potential benefits of developing, validating and deploying such objective image quality assessment methods are not limited to monitoring the acquisition, storage, communication, processing, and display of medical images for quality control purposes, but also to the optimal design of novel medical imaging methods and systems that could deliver even better image quality in more cost‐effective ways than what we have in the current systems.
* Speckle Suppression Based on Sparse Representation with Non-Local Priors : As speckle seriously restricts the applications of remote sensing images in many fields, the ability to efficiently and effectively suppress speckle in a coherent imaging system is indispensable. In order to overcome the over-smoothing problem caused by the speckle suppression algorithm based on classical sparse representation, we propose a non-local speckle suppression algorithm that combines the non-local prior knowledge of the image into the sparse representation. The proposed algorithm first applies shearlet to sparsely represent the input image. We then incorporate the non-local priors as constraints into the image sparse representation de-noising problem. The de noised image is obtained by utilizing an alternating minimization algorithm to solve the corresponding constrained de-noising problem. The experimental results show that the proposed algorithm can not only significantly remove speckle noise, but also improve the visual effect and retain the texture information of the image better. This paper first reviewed the history of speckle suppression and the framework of de-noising based on a sparse domain. In image de-noising, texture loss and edge blur may be caused by the de-noising model based on sparse representation, while the artificial texture may be produced by the non-local de-noising algorithm. To overcome the above problems, we proposed a new speckle suppression method based on sparse representation with non-local priors. In this new method, we added the non-local priors as the constraint to the de-noising model based on sparse representation, which can make full use of the advantages of both types of de-noising algorithms. The new method can turn speckle suppression into an optimization problem, which can be solved by the alternating minimization algorithm. Experiments on SAR images and infrared images show that the proposed algorithm has a good noise suppression effect. However, the algorithm in this paper does not experiment on other kinds of coherent images. Therefore, we will study the universality of the algorithm in our next research.

2.3 PROPOSED SYSTEM

First we consider the image then we perform preprocessing .in the preprocessing we have follow the sieving the image and the image has a two types they are color image and gray image .gray image has only one color is black and the color image has three planes they are red plane ,green plane and blue plane

In the preprocessing we perform we add some noise data to the image.in the sieving a color image perform has the dividing an image into three planes they are red, green and blue. Then we perform curvelet operation on the mage because it is gather curve information of the image and the apply curvelet of the individual plane of the image and the result is the red curvelet, greencurvelet and blue curvelet .And we process we apply swt and dwt because it is give quality of the image and it is preserve the data of the image .now we perform the inverse sieving is the combine of the individual apply of the curvelet plane of the image and the apply dwt and dwt also. Reconstruct compressed image is the result of the inverse sieving process. and later we apply dct to the result of the image. and it is gives to the compressed image and later we apply inverse dct to the result of the after apply dct. and it is gives to the reconstructed image also knows as original image and it is gives high compression rate and image quality is better than the original image .

Reconstructed image

Inverse dct

Compressed image

Dct

Reconstruct compressed image

Inverse sieving

Dwt + swt

Curvelet

Sieving

image

Blue

Green

Red

Noise removes

Pre processing

Addition noise (salt and pepper)

image

Fig 2.3.1 proposed system

2.4 **OBJECTIVES OF THE STUDY**

The major objective of the system to improve the super resolution and contrast of the image using curve let's with cycle spinning.

**Objectives:**

The project is mainly useful for the following things

1. improving quality of the image in form of contrast and resolution
2. reduce error rate
3. reduce Noise ratio
4. provide comparison in between various DWT,SWT and DCT
5. Increase compression rate
6. Good quality image and without loss data after compressed image with various compression techniques.

**3.System Analysis**

System Analysis is the process of analyzing a system with the potential goal of improving or modifying the system. Analysis is breaking down the problem into smaller elements for study and ultimately providing a better solution. During the process of system development, Analysis is an important aspect. This involves gathering and interpreting facts, diagnosing the problem and using the information to recommend improvements to the system. Ultimately, the goal is to give a computerized solution.

3.1 System Study

**3.1.1 Feasibility Study**

Feasibility study is an important phase in the software development process. It enables the developer to have an assessment of the product being developed. It refers to the feasibility study of the product in the product in terms of outcomes of the product, operational use and technical support required for implementing it. Feasibility study should be performed on the basis of various criteria and parameters. Here the feasibility study can be performed in four ways such as operational feasibility, technical feasibility, economic feasibility, behavioural feasibility.

**3.1.2 Operational Feasibility**

It refers to the feasibility of the product to be operational. Some products may work very well at design and implementation but may fail in the real time environment. It includes the study of additional human resource required and their technical expertise. This application will also work in any environment without any problem since we are implementing this project in Matlab, which is Operating System independent.

**3.1.3 Technical Feasibility**

It refers to whether the software that is available in the market fully supports the present application. It studies the pros and cons of using particular software for the development and its feasibility. It also studies the additional training needed to be given to the people to make the application work. For this project Image Super Resolution and Contrast Enhancement Using Curvelets With Cycle Spinning we need not recruit any additional staff to make use of this application. If we train our staff for one hour then it will be enough to work with application.

**3.1.4 Economic Feasibility**

It refers to the benefits or outcomes we are deriving from the product as compared to the total cost we are spending for developing the product. If the benefits are more or less the same as the older system, then it is not feasible to develop the product. In this product if we have developed this application then the amount of time spent in preparing the schedules, sending it different branches and monitor the work will be reduced which indirectly increases the production for the company.

**3.1.5 Behavioural Feasibility**

People are inherently resistant to change and computer has been known to facilitate changes. An estimate should be made of how strong the user is likely to move towards the development of computerized system. These are various levels of users in order to ensure proper authentication and authorization and security of sensitive data of the organization.

**3.2 REQUIREMENT ANALYSIS**

We are overcoming the tedious manual procedure by this approach involving automatic report generations and providing with required information.

**3.2.1 Functional Requirements**

This section describes the functional requirements of the system which are expressed in natural language style. They are as follows:

* Read the JPEG image
* Convert the JPEG image into Gray Scale Image
* To improve contrast and resolution perform bilinear interpolation and PSNR measures
* To improve contrast and resolution perform bi-cubic interpolation and PSNR measures
* To improve contrast and resolution perform DWT with Zero Padding and PSNR measures
* To improve contrast and resolution perform DWT +SWT and PSNR measures
* To improve contrast and resolution perform CURVE LET with Zero Padding and PSNR measures
* To improve contrast and resolution perform CURVE LET with Cycle Spinning and PSNR measures
* Comparison Reports Generation

**2.2.2 Non Functional Requirements**

* **Usability**

This section includes all of those requirements that effect usability. It will be very easy to use for the naive user. The software must have a simple, user-friendly interface so user of the can save time and confusion.

* **Reliability**

The system is more reliable because of the qualities that are inherited from the chosen platform Matlab. The code build by using Matlab simulator works more reliable in real time environment.

* **Performance**

The system exhibits high performance because it is well optimized and is developed by using high level languages which will give response to the end user in very less time.

* **Supportability**

The system is designed to be the cross platform supportable. The system is supported on a wide range of hardware and any software platform which is having Matlab built into the system. This application is being developed using Matlab; hence it is extremely portable.

* **Implementation**

The system is implemented in Matlab simulating environment and windows 7 are used as the platform.

**3.3 SYSTEM REQUIREMENT SPECIFICATION**

The System Requirements Specification (SRS) begins the translation process that converts the software requirements into the language the developers will use. The SRS draws on the use-cases from the User Requirement Document (URD) and analyzes the situations from a number of perspectives to discover and eliminate inconsistencies, ambiguities, and omissions before development progresses significantly under mistaken assumptions.

**3.3.1 Software Specifications**

The minimal software specifications of the proposed system are,

* Operating System : Windows XP
* Technology : Matlab 11
* Tool : Matlab
* Front End : Matlab Command Interface
* Database : color images

**3.3.2 Hardware Specifications**

The minimal hardware specifications of the proposed system are,

* Processor : Pentium IV
* RAM : 2 GB
* Hard Disk : 40 GB

3.4 PROCESS MODEL

3.4.1 SPIRAL MODEL

Spiral model is a combination of sequential and prototype model. This model is best used for large projects which involves continuous enhancements. There are specific activities which are done in one iteration (spiral) where the output is a small prototype of the large software. The same activities are then repeated for all the spirals till the entire software is build.

The steps in the spiral model can be generalized as follows:

1. The new system requirements are defined in as much detail as possible. This usually involves interviewing a number of users representing all the external or internal users and other aspects of the existing system.
2. A preliminary design is created for the new system.
3. A first prototype of the new system is constructed from the preliminary design. This is usually a scaled-down system, and represents an approximation of the characteristics of the final product.
4. A second prototype is evolved by a fourfold procedure: (1) evaluating the first prototype in terms of its strengths, weaknesses, and risks; (2) defining the requirements of the second prototype; (3) planning and designing the second prototype; (4) constructing and testing the second prototype.
5. At the customer's option, the entire project can be aborted if the risk is deemed too great. Risk factors might involve development cost overruns, operating-cost miscalculation, or any other factor that could, in the customer's judgment, result in a less-than-satisfactory final product.
6. The existing prototype is evaluated in the same manner as was the previous prototype, and, if necessary, another prototype is developed from it according to the fourfold procedure outlined above.
7. The preceding steps are iterated until the customer is satisfied that the refined prototype represents the final product desired.
8. The final system is constructed, based on the refined prototype.
9. The final system is thoroughly evaluated and tested. Routine maintenance is carried out on a continuing basis to prevent large-scale failures and to minimize downtime.

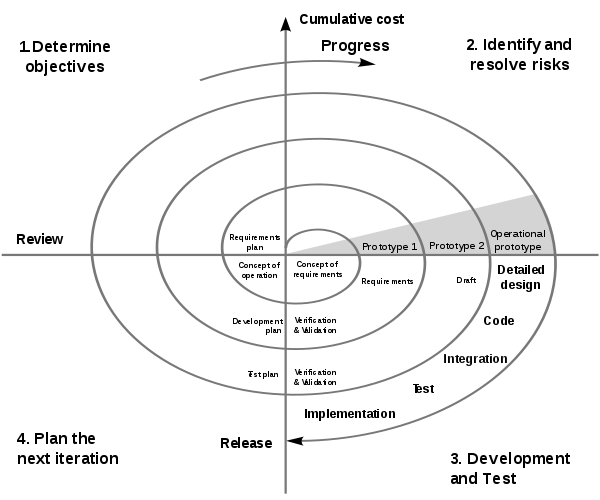


Fig.3.4.1: Spiral model

**3.2. System Design**

**3.2.1 ABOUT SYSTEM DESIGN**

Once the analysis phase is completed, the next stage is to determine in broad outline form how the problem might solve. During system design, we are beginning to move from logical to physical level.

System design involves architectural and detailed design of the system. Architectural design involves identifying software components, decomposing them into processing modules and conceptual data structures and specifying the interconnections among components.

Detailed design is concerned with how to package processing modules and how to implement the processing algorithms, data structures and interconnections of standard algorithms, invention of new algorithms and design of data representations and packaging of software products. Two kinds of approaches are available:

* Top down approach
* Bottom up approach

**Top down Approach**

This type of design starts from upper level modules. Since the detailed activities usually performed in the lower level routines are not provided stubs are written.

**Bottom up Approach**

Design being performed from smallest and lowest level modules one at a time. For each module in bottom up approach a short idea provided in order the needed approach so, that the module is asked to perform the way it will when embedded within the larger system. When bottom level modules are tested attention turns to those on the next level that use the lower level once they are designed individually and then liked with the previously examined lower level modules.

**3.2.2 System Architecture**

Design is a multi-step process that focuses on data structure software architecture, procedural details, (algorithms etc.) and interface between modules. The design process also translates the requirements into the presentation of software that can be accessed for quality before coding begins. Computer software design changes continuously as new methods; better analysis and broader understanding evolved. Software Design is at relatively early stage in its revolution. Therefore, Software Design methodology lacks the depth, flexibility and quantitative nature that are normally associated with more classical engineering disciplines. However, techniques for software designs do exist, criteria for design qualities are available and design notation can be applied.

**3.3 UML DIAGRAMS**

3.3.1 Importance of UML in modeling

The unified modeling language allows the software engineer to express an analysis model using the modeling notation that is governed by a set of syntactic semantic and pragmatic rules. A UML system is represented using five different views that describe the system from distinctly different perspective. Each view is defined by a set of diagram, which is as follows.

1. **User Model View**

* This view represents the system from the user’s perspective.
* The analysis representation describes a usage scenario from the end-users perspective**.**

1. **Structural model view**
   * + In this model the data and functionality are arrived from inside the system.
     + This model view models the static structures.
2. **Behavioral Model View**
   * + - It represents the dynamic of behavioral as parts of the system, depicting the interactions of collection between various structural elements described in the user model and structural model view.
3. **Implementation Model View**
   * + - In this the structural and behavioral as parts of the system are represented as they are to be built
4. **Environmental Model View**
   * + - In this the structural and behavioral aspects of the environment in which the system is to be implemented are represented.

**3.4 OBJECT ORIENTED DESIGN**

**UML DIAGRAMS**

Diagrams are graphical representation of set of element. Diagrams project a system or visualize a system from different angles and perspectives. The UML has nine diagrams these diagrams can be classified in to following groups.

**Static:**

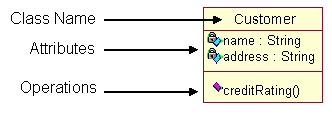
* Class diagrams
* Object diagrams
* Component diagrams
* Deployment diagrams

**Dynamic:**

* Use case diagram
* Sequence diagram
* Collaboration diagram
* State chart diagram
* Activity diagram

**Class Diagram**

This shows a set of classes, interfaces, collaborations and their relationships. There are the most common diagrams in modeling the object oriented systems and are used to give the static view of a system. It is graphically rendered as a rectangle. Classes contain name, attributes and their operations. And the relationships that exit between the classes are Aggregation, Association, Generalization and Dependency.



**Object Diagram**

It involves a set of objects and their relationships and is used to show the data structures, the static snapshots of instances of the elements in a class diagram. Like class diagram, the object diagram also address the static design view or process view of a system.

**Component Diagram**

It shows a set of components and their relationships and is used to illustrate the static implementation view of a system. They are related to class diagrams where the components map to one or more classes, interfaces of collaborations.

**Deployment Diagram**

It shows a set of nodes and their relationships. They are used to show the static deployment view of the architecture of a system. They are related to the component diagrams where a node encloses one or more components.

**Use case Diagram**

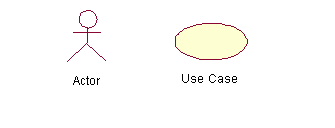
It shows a set of use cases, actors and their relationships. These diagrams illustrate the static use case view of a system and are important in organizing and modeling the behaviors of a system.

The two main components of a use case diagram are use cases and actors.

**Sequence Diagram & collaboration Diagram**

These two diagrams are semantically same i.e. the dynamic of a system can be modelled using one diagram and transform it to other kind of a diagram without loss of information. Both

Form the interaction diagram.

****

**Sequence Diagram**

Sequence diagram is an interaction diagram which focuses on the time ordering of messages, it shows a set of objects and messages exchange between these objects. This diagram illustrates the dynamic view of a system.

**Collaboration Diagram**

This diagram is an interaction diagram that stress or emphasizes the structural organization of the objects that send and receive messages. It shows a set of objects, links between objects and messages send and received by those objects. There are used to illustrate the dynamic view of a system.

**State Chart Diagram**

State chart diagram shows a state machine consisting of states, transitions and activities these illustrates the dynamic view of system. They focus on the event ordered behaviour of an object.

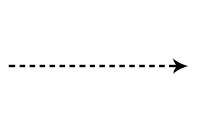
**Activity Diagram**

Activity diagram shows the flow from one activity to another within a system. The activities may be sequential or branching objects that act and are acted upon.

**Relationships in UML**

There are different types of relationships in the UML. They are:

1. Dependency
2. Association
3. Aggregation
4. Composition
5. Generalization
6. Realization
7. **Dependency:** This is relationship between two classes whenever one class is completely dependent on the other class. Graphically the dashed line represents it with arrow pointing to the class that it is being depended on.

****

1. **Association:** Association is a generic relationship between two classes and is modeled by a line connecting the two classes. This line also shows the feature multiplicity.

**classdiagram-association**

1. **Aggregation:** Aggregation includes the whole part of the relationship. It is represented by the symbol.

**http://www.dotnetcoders.com/web/learning/uml/images/classdiagram-aggregation.png**

1. **Composition:** Composition relationship means the class is a member of another class. It cannot be present by itself. It is represented by
2. **Generalization:** Generalization relationship means “is-a” relationship. A generalization has a triangle pointing to the super class. It is represented by

**Importance of Data Flow Diagram**

Data flow diagram (DFD) represents the flows of data between different processes in a business. It is a graphical technique that depicts information flow and the transforms that are applied as data move form input to output. It provides a simple, intuitive method for describing business processes without focusing on the details of computer systems. DFDs are attractive technique because they provide what users do rather than what computers do.

Representation of Components

DFDs only involve four symbols. They are:

* Process
* Data Object
* Data Store
* External entity

|  |  |
| --- | --- |
| http://members.tripod.com/~myyee/cs457/process.gif | **Process** Transform of incoming data flow(s) to outgoing flow(s). |
| http://members.tripod.com/~myyee/cs457/data.gif | **Data Flow** Movement of data in the system. |  |
| http://members.tripod.com/~myyee/cs457/datastore.gif | **Data Store** Data repositories for data that are not moving. It may be as simple as a buffer or a queue or a s sophisticated as a relational database. |  |
| http://members.tripod.com/~myyee/cs457/external.gif | **External Entity** Sources of destinations outside the specified system boundary. |  |

**Relationship and Rules**

Relationship

The DFD may be used for any level of data abstraction. DFD can be partitioned into levels. Each level has more information flow and data functional details than the previous level.

Highest level is Context Diagram. Some important points are:

* 1 bubble (process) represents the entire system.
* Data arrows show input and output.
* Data Stores NOT shown. They are within the system.

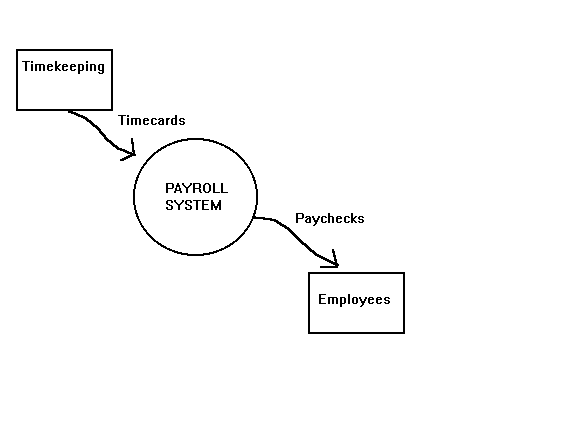


Diagram above is an example of Context Level DFD

Next Level is Level 0 DFD. Some important points are:

* Level 0 DFD must balance with the context diagram it describes.
* Input going into a process are different from outputs leaving the process.
* Data stores are first shown at this level.

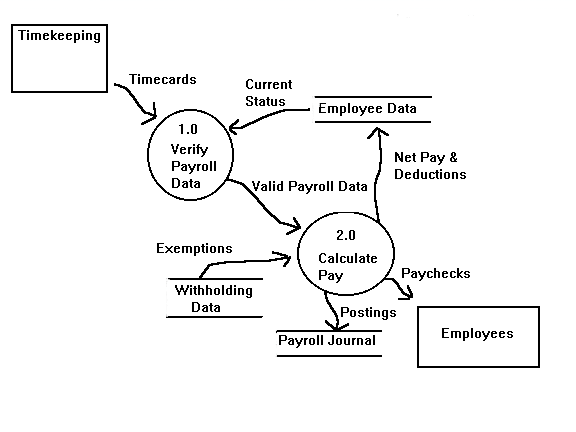


Diagram above show an example of Level 1 DFD

Next level is Level 1 DFD. Some important points are:

* Level 1 DFD must balance with the Level 0 it describes.
* Input going into a process is different from outputs leaving the process.
* Continue to show data stores.

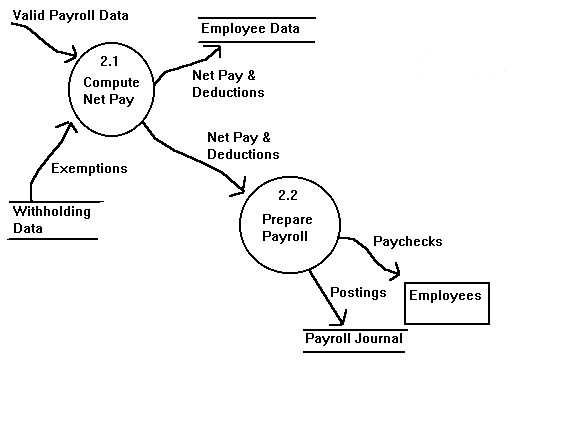


Diagram above show an example of Level 1 DFD

A DFD may look similar to a flow chart. However, there is a significant difference with the data flow diagram. The arrows in DFDs show that there is a flow of data between the two components and not that the component is sending the data that must be executed in the following component. A component in DFD may not continue execution when sending data and during execution of the component receiving the data. The component sending data can send multiple sets of data along several connections. In fact, a DFD node can be a component that never ends.

Rules

* + - In DFDs, all arrows must be labelled.
    - The information flow continuity, that is all the input and the output to each refinement, must maintain the same in order to be able to produce a consistent system.

**Strengths and Weaknesses**

Strengths

* DFDs have diagrams that are easy to understand, check and change data.
* DFDs help tremendously in depicting information about how an organization operations.
* They give a very clear and simple look at the organization of the interfaces between an application and the people or other applications that use it.

Weaknesses

* Modification to a data layout in DFDs may cause the entire layout to be changed. This is because the specific changed data will bring different data to units that it accesses. Therefore, evaluation of the possible of the effect of the modification must be considered first.
* The number of units in a DFD in a large application is high. Therefore, maintenance is harder, more costly and error prone. This is because the ability to access the data is passed explicitly from one component to the other. This is why changes are impractical to be made on DFDs especially in large system.

**Appropriate and Inappropriate Domain of Application and Example**

Appropriate Domain of Application

* DFDs are excellent guide for validating the compatibility of the process and designs of the system. This is because in order to design applications successfully, especially large ones, the design of both the processes and the data stores is important. In addition, the data must be consistent with each other. For example, there must be process to store the data in the data stores and the data stores must supply the data views accessed by the processes. Since DFDs depict the relationships between processes, data store, and data views, this made DFD the perfect guide for validating compatibility.
* DFDs are appropriate diagrams for designing high-level application architecture. This is because it is a fact that the larger the application is to be developed the more important the architecture is. For example, building a box does not need an architect but a 10-story building does. In most architectural design, they are represented as diagrams because diagrams are the best way to depict multiple relationships among multiple components. This is applicable to software design, too and DFDs helps tremendously in showing the architecture design of the system r application.
* DFDs are especially useful for depicting system flow charts. DFDs are used to show the flows of data among batch-job steps.

Inappropriate Use

DFDs are inappropriate to use in a large system because if changes are to be made on a specific unit, there is a possibility that the whole DFD need to be changed. This is because the change may result in different data flow into the next unit. Therefore, the whole application or system may need modification too.

**Tools Related to DFD**

Data Flow Diagram Tool (DFDT) is one of Integrated Software Software Development System (ISDS) that enforces Software Engineering Principles. DFDT is set to be the second most important tool after Project Management Tool (PMT) in ISDS. DFDT contains processes, data flows, external entities and data store. In order to design a consistent DFD, there are some rules that need to be followed in DFDT.

* In Context Diagram, the process could be considered as the project itself.
* In Level 0 of DFD, the processes could be considered as the module(s) in the system.
* In Level 1 of DFD, the processes could be considered as the sub-module(s) of function(s) of the project or module.
* Level 2 or so on, similar to Level 1.

Other tools and software that are related with DFDs modelling tools are:

* **Information Based Modelling Tool (IBMS)**

IBMS is a educational freeware CASE Tool for database design. It is based on its own modelling methodology - The Two-Stage Entity-Relationship (TSER) approach which comes with a DFD modelling.

* **First STEP**

First STEP is a business Management Tool Software that allows allowing decision makers the power to design, document, analyze, refine, incrementally improve and redesign business processes.

3.4 Object Oriented Design

3.4.1 Use case Diagram

3.4.2 Sequence Diagram

3.4.3 Activity Diagram

3.4.4 Data Flow Diagram

3.4.1 **USE CASE DIAGRAM**

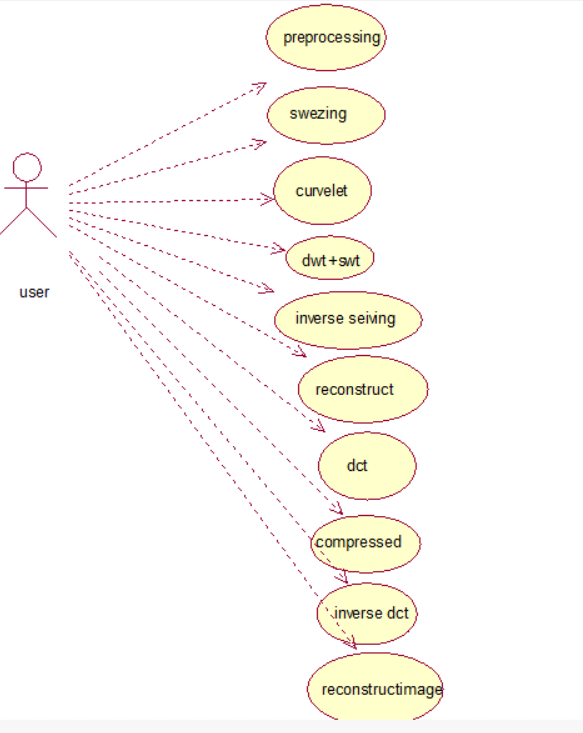
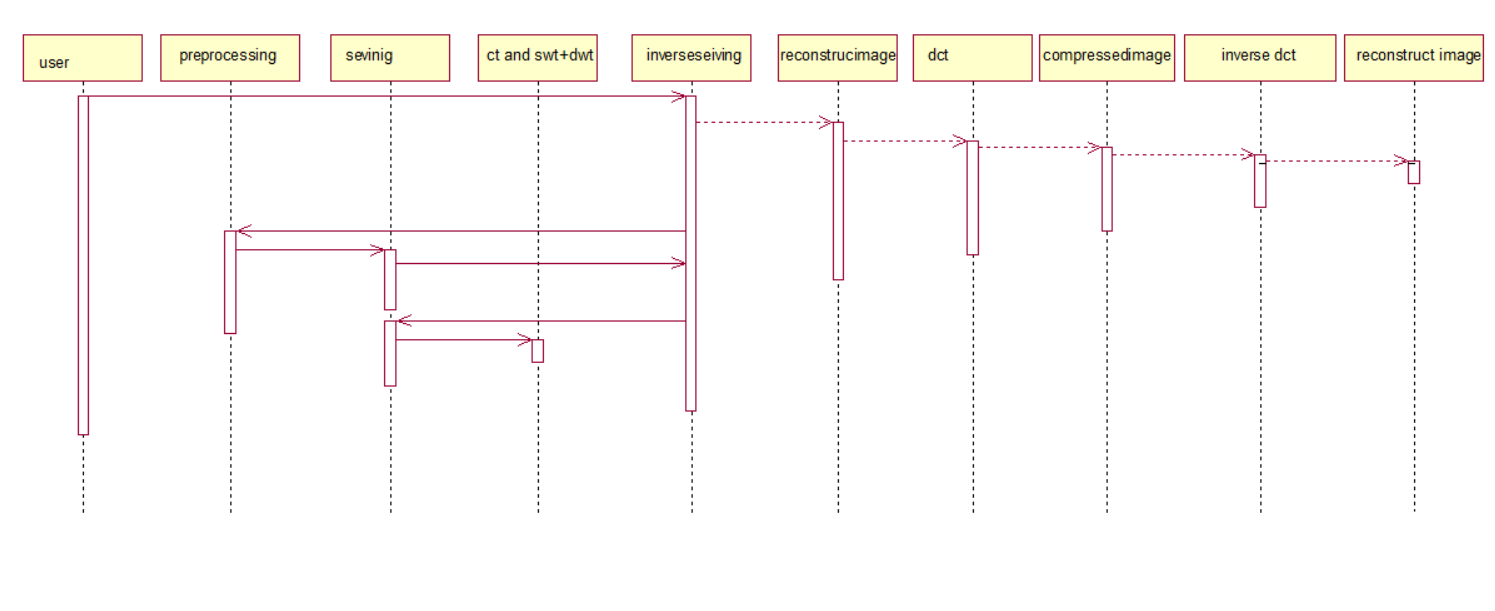


Fig 4.1 use case diagram for image compression

A Use Case Diagram in the Unified Modelling Language (UML) is a type of Behavioural diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases **.**The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.

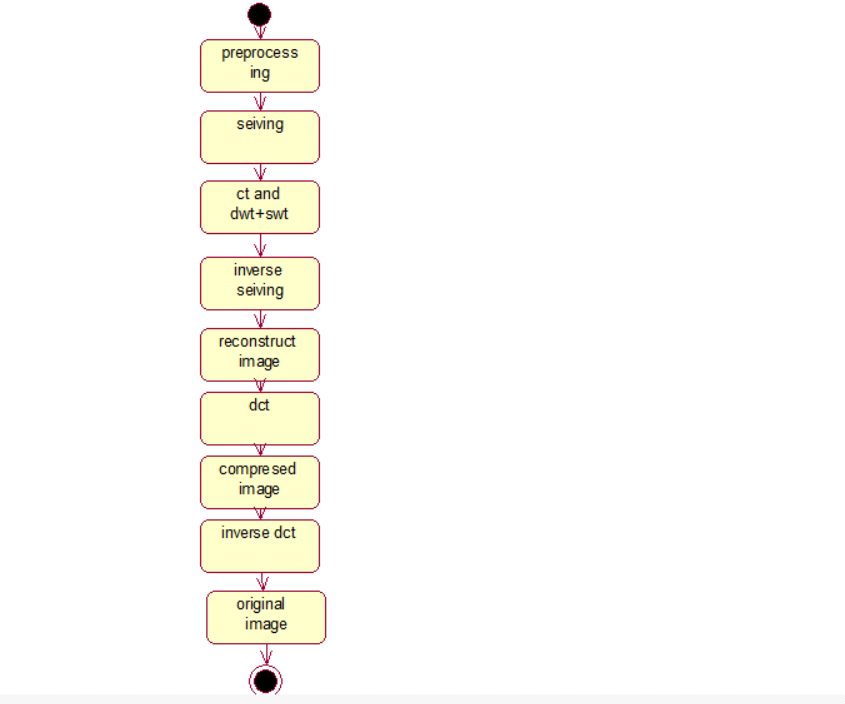
**3.4.2 SEQUENCE DIAGRAM**

****

**Fig 3.4.2 sequence diagram for image**

**A sequence diagram** in Unified Modelling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams. A sequence diagram shows, as parallel vertical lines (lifelines), different processes or objects that live simultaneously, and, as horizontal arrows, the messages exchanged between them, in the order in which they occur. This allows the specification of simple runtime scenarios in a graphical manner. These are horizontal arrows with the message name written above them. Solid arrows with full heads are synchronous calls, solid arrows with stick heads are asynchronous calls and dashed arrows with stick heads are return messages. Activation boxes, or method-call boxes, are opaque rectangles drawn on top of lifelines to represent that processes are being performed in response to the message. Objects calling methods on themselves use messages and add new activation boxes on top of any others to indicate a further level of processing.

**3.4.3 ACTIVITY DIAGRAM**

****

**Fig 4.3 Activity Diagram for image**

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modelling Language, activity diagrams can be used to describe the business and operational step-by- step workflows of components in a system. An activity diagram shows the overall flow of control. Activity diagrams are constructed from a limited repertoire of shapes, connected with arrows.The most important shape types:

* rounded rectangles represent activities
* Diamonds represent decisions.
* Bars represent the start (split) or end (join) of concurrent activities.
* A black circle represents the start (initial state) of the workflow.

**3.4 Data Flow Diagram**

**4. SYSTEM IMPLEMENTATION**

Implementation is the stage where the theoretical design is turned into a working system. The most crucial stage in achieving a new successful system and in giving confidence is implementing the system.

It involves careful planning, investigation of the current system and its constraints on implementation, design of methods to achieve the change over and an evaluation of change over methods a part from planning. Two major tasks of preparing the implementation are education and training of the users and testing of the system.

The more complex the system being implemented, the more involved will be the system analysis and design effort required just for implementation.

The implementation phase comprises of several activities. The required hardware and software acquisition is carried out. The system may require some software to be developed. For this Programs are written and tested. The user then changes over to his new fully tested system and the old system is discontinued.

**4.1 MODULES**

The system after careful analysis has been identified to be presented with the following modules

1. Pre processing

2. Sieving

3. Curvelet Cycle Spinning

4. DWT + SWT

5. DCT

6. Compression Rate

**4.1.1 Pre Processing**

Preprocessing images commonly involves removing low-frequency background noise, normalizing the intensity of the individual particles images, removing reflections, and masking portions of images. Image preprocessing is the technique of enhancing data images prior to computational processing.

**4.1.2 Sieving**

Sieving is the filter in the image compression we use like this the color image contain three planes they are red plane , green plane and blue plane .It is the step after the preprocessing and before curvelet cycle spinning. Now our data is image and it is sieving by the red plane , green plane and blue plane.

**4.1.3 Curvelet Cycle Spinning**

**4.1.4 Dwt + SWT**

The interpolated high frequency sub-bands and therefore the SWT high frequency sub-bands have identical size which implies they will be another with one another. The new corrected high frequency sub-bands are often interpolated additional for higher enlargement. Conjointly it's renowned that within the moving ridge domain, the low resolution image is obtained by low pass filtering of the high resolution image. In alternative words, low frequency sub-band is that the low resolution of the first image. Therefore, rather than victimization low frequency sub-band, that contains less info than the first high resolution image, we have a tendency to ar victimization the input image for the interpolation of low frequency sub-band image. Victimization input image rather than low frequency sub-band will increase the standard of the super resolved image.

**4.1.5 DCT**

Curvlets are non-adaptive technique for multi-scale object representation.

Being an extension of the wavelet concept they are becoming popular in similar fields namely in image processing and scientific computing.

Curvlets Construction:-

Two main ideas should be followed

1. Consider polar coordinates in frequency domain

2. Construct curvlet elements being locally supported near driven wedges.

Transformation:-

The goal of the transformation process is to decompress the pixels of image or to pack as much information as possible into the smallest number of transform coefficients.

Quantization:-

The quantization stage then selectively eliminates the coefficients that carry the least

Information.

These coefficients have the smallest impact on reconstruction of image quality.

New Multiscale Transform:-

Candies and donoho developed a new multi-scale transform and they called it as curvlet transform this is used to capture image information more efficiently than the wavelet transform by providing the elements in addition to possessing the qualities of wavelet.

Quantizer Design and coding:-

This is the most commonly used scalar quantities for transform based image compression due to its simplicity.

Two commonly used linear staircase quantizes are the midtread and the midrise

Quantizes.

Existing Quantizer

From MATLAB tool box, it is observed that the quantizes is defined as:

y=Q\_T(x)

Where: Q\_T(x) = 0, if |x|&lt; T

Q\_T(x) = sgn(x) \* [x/T] , otherwise

The input values for quantizes are created with evenly spacing and bin size (T) is

Assumed as 0.1.

For decompression, de-quantized values are computed using the following equation.

Dq=sgn (Q) \* (abs (Q) +0.5)\*T

**4.1.6 Compression Rate**

Compression ratio is the size of the compressed image of an original image. The original image is compressed when we perform some techniques of compression like DWT, SWT, and DCT etc. These techniques are helpful to quality of image and storing without loss data of the image. The compression ratio is not stored in the JPEG file, as far as I know. Even commercial image software contains features to "estimate the compression level". Even if the compression level is stored in the file header.

Compression ratio = original image / compressed image

**4.3 Source Code**

Function s = func\_cyclespin2(x, i , j)

%generate the cycle spinning version of the input x according to its row

%and column shifts, i and j, respectively.

[l1, l2] = size(x);

z = x ((l1+1-i):l1, :);

z (i+1:l1, :) = x (1:(l1-i),:);

s = z (:,( l2+1-j):l2);

S (: , j+1:l2) = z(:,1:(l2-j));

end

Function result = func\_psnr\_color (img1, img2)

%calculate the psnr value of two images, by averaging over R, G and B

%channels.

img1 = double (img1);

img2 = double (img2);

result = 0;

% for i=1:3

% f = img1 (: ,:, i);

% g = img2 (:, i);

Q = 255; MSE = 0;

[M, N] = size (f);

h = f - g;

MSE = sum (sum (h.\* h));

MSE=MSE/M/N;

result=10\*log10 (Q\*Q/MSE) +result;

% end

% result = result/3;

end

%%%IMAGE Resolution Enhancement%%%

clc;

close all;

clear all;

%-------------------------------------------------------------------

Img=uigetfile ('.jpg','select the source image');

i=imread (img);

% i=imresize (i, [256 256]);

% figure (1), imshow (i), title ('Original low resolution image’);

% %-----------------------------------------------------------

%

% if size (i, 3)>1

% g=rgb2gray (i);

% end

g=im2double (i);

% %%%%%%%%%%%%%%%%%%%%%%

%

%

Add path('E:\New folder\project requirements\curvlets');

M0=g;

n=256;

%M0 = rescale (crop (g, 128,[100 240]), .05,.95);

sigma = .06;

M = M0 + randn (n)\*sigma;

% some options for the curvelet transform

options.nbscales = log2 (size (M, 1))-2;

Options = n;

% the threshold is tricky to set because of the redundancy of the transform

T = 3/4\*sigma;

% transform / threshold / inverse

C = perform\_curvelet\_transform (M, options);

CT = perform\_thresholding(C, T);

MC = perform\_curvelet\_transform (CT, options);

% display

imageplot ({M0 M MC}, {'Original' 'Noisy' 'Curvelets'});

disp (' ');

disp('fdct\_wrapping\_demo\_denoise.m -- Image denoising using Curvelets');

disp (' ');

disp('Denoising is achieved by hard-thresholding of the curvelet coefficients.');

Disp (‘we select the thresholding at 3\*sigma\_jl for all but the finest scale');

Disp ('where it is set at 4\*sigmajl; here sigma\_jl is the noise level of a');

Disp ('coefficient at scale j and angle l (equal to the noise level times');

Disp ('the l2 norm of the corresponding curvelet). There are many ways to compute');

disp ('the sigma\_jl''s, e.g. by computing the norm of each individual curvelet,');

disp ('and in this demo, we do an exact computation by applying a forward curvelet');

disp ('transform on an image containing a delta function at its center.');

disp (' ');

% fdct\_wrapping\_demo\_denoise.m -- Image denoising using Curvelets

Img = double (imread ('Lena.jpg'));

n = size (img, 1);

Sigma = 20;

is\_real = 1;

noisy\_img = img + sigma\*randn (n);

Disp (‘compute all thresholds');

F = ones (n);

X = fftshift (ifft2 (F)) \* sqrt (prod (size (F)));

tic, C = fdct\_wrapping(X, 0, 2); toc;

% Compute norm of curvelets (exact)

E = cell (size(C));

for s=1: length(C)

E{s} = cell (size(C{s}));

for w=1: length(C{s})

A = C{s}{w};

E{s}{w} = sqrt(sum(sum(A.\*conj(A))) / prod(size(A)));

end

end

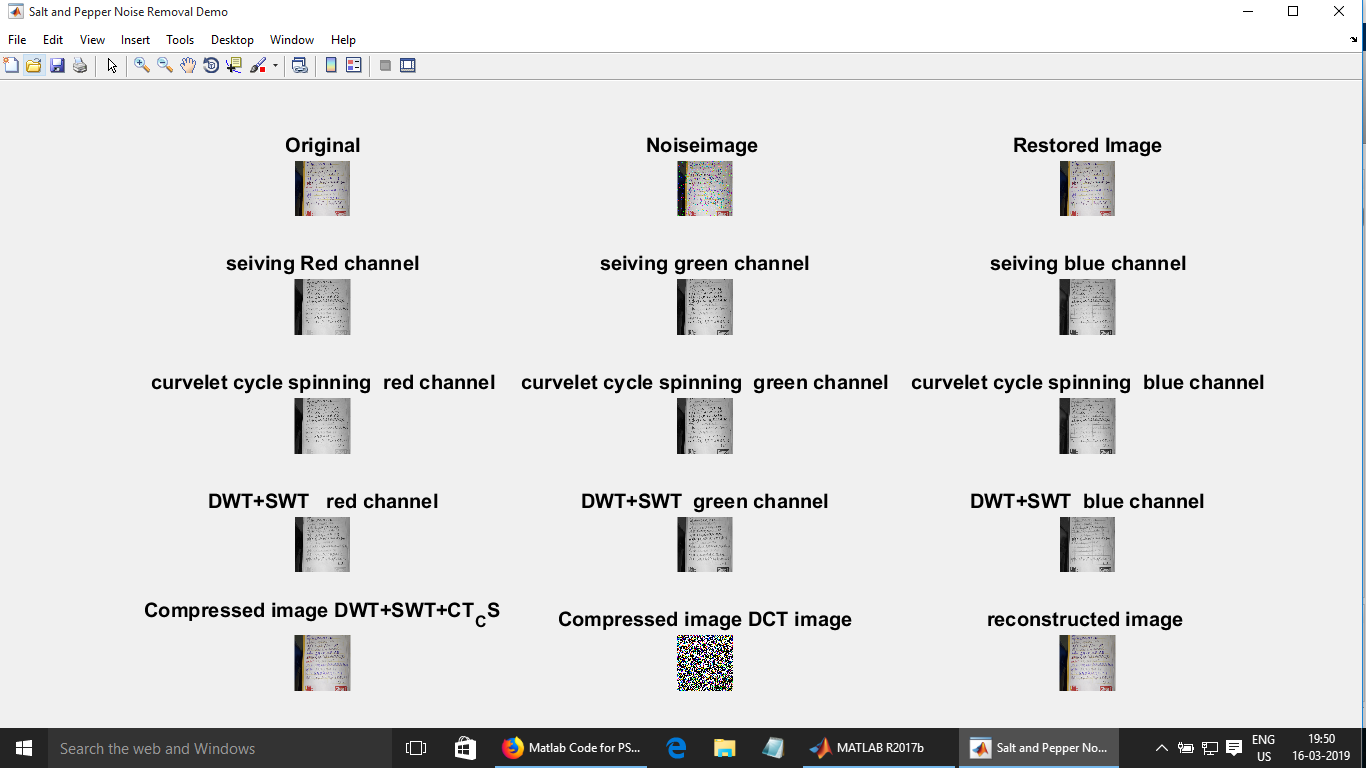
% Take curvelet transform

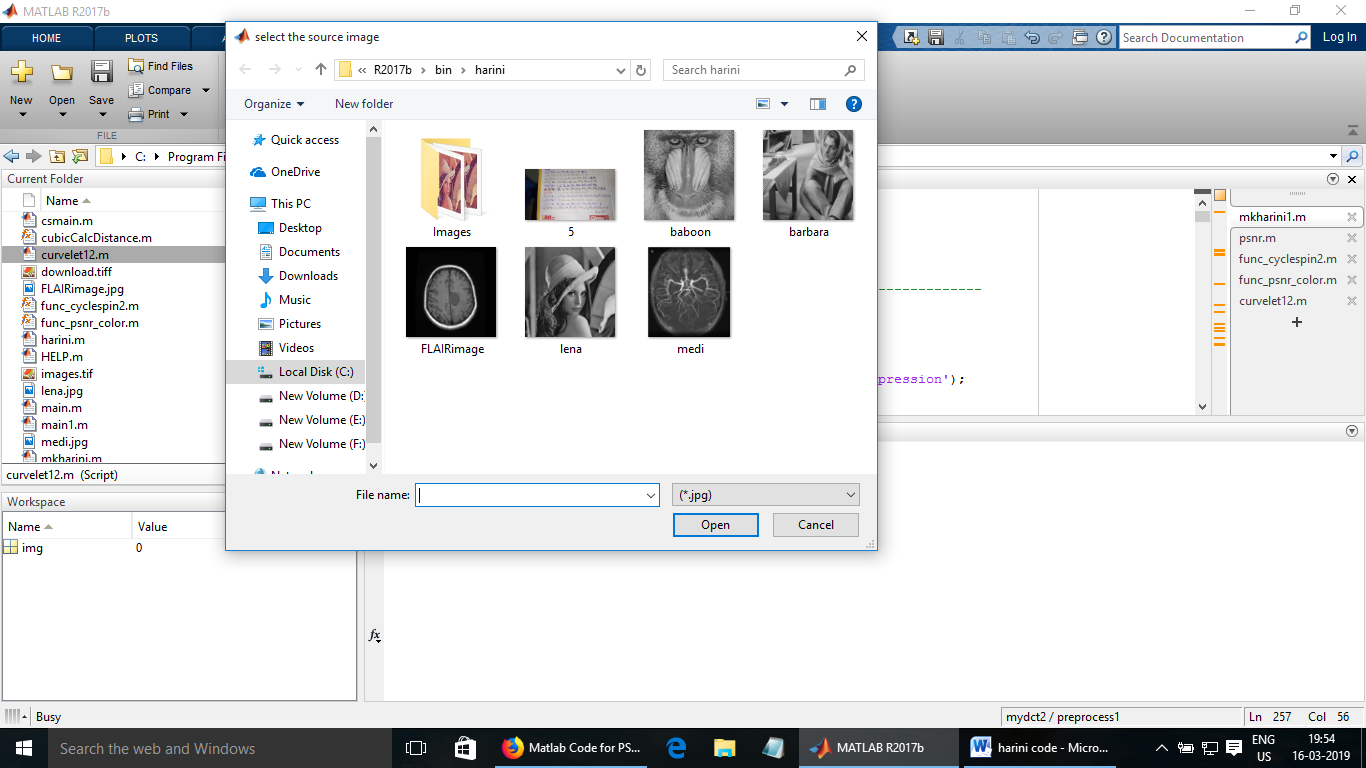
disp(' ');

disp('Take curvelet transform: fdct\_wrapping');

tic; C = fdct\_wrapping (noisy\_img,1 ,2); toc;

**4.4 Results**

****

****

5. Testing

Software testing is a critical element of software quality assurance and represents the ultimate reviews of specification, design and coding. Testing represents interesting anomaly for the software. During earlier definition and development phases, it was attempted to build software from an abstract concept to tangible implementation.

The testing phase involves the testing of the developed system using various test data. Preparation of the test data plays a vital role in the system testing. After preparing the test data the system under study was tested using those test data. While testing the system, errors were found and corrected by using the following testing steps and corrections are also noted for future use. Thus, a series of testing is performed for the proposed system, before the system was ready for the implementation.

Testing is the process of detecting errors. Testing performs a very critical role for quality assurance and for ensuring the reliability of software. The results of testing are used later on during maintenance also

The aim of testing is often to demonstrate that a program works by showing that it has no errors. The basic purpose of testing phase is to detect the errors that may be present in the program. Hence one should not start testing with the intent of showing that a program works, but the intent should be to show that a program doesn’t work.

**TESTING OBJECTIVES**

* Testing is a process of executing a program with the intent of finding an error.
* A successful test is one that uncovers an as yet undiscovered error.
* A good test case is one that has a high probability of finding error, if it exists.
* The tests are inadequate to detect possibly present errors.

5.2 LEVELS OF TESTING

In order to uncover the errors present in different phases we have the concept of levels of testing. The basic levels of testing are,

Client Needs Acceptance Testing

Requirements System Testing

Design Integration Testing

Code Unit Testing

Fig 5.1: Levels of testing

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| TEST CASE ID | TESTCASE OBJECTIVE | TEST STEPS | EXPECTED RESULT | ACTUAL RESULT | STATUS |
| 1 | Read the JPEG image | Input gave JPEG image through file selector button | Image Read and create matlab Matrix | Image read and created in Matrix in Work Directory | PASS |
| 2 | Read the JPEG image | Input gave GRAY image through file selector button | Image Read and create matlab Matrix | Image read and generate error message in Command window | PASS |

Unit testing

Table 5.2 unit testing

Unit testing focuses verification effort on the smallest unit of software i.e. the module. Using the detailed design and the process specifications testing is done to uncover errors within the module. All modules must be successful in the unit test before integration

**Integration Testing**

After the unit testing we have to perform integration testing. The goal here is to see if modules can be integrated properly, the emphasis being on testing interfaces between modules. This testing activity can be considered as testing the design and testing module interactions.

In this project integrating all the modules forms the main system. When integrating all the modules we have checked whether the integration effects working of any of the services by giving different combinations of inputs with which the two services run perfectly before Integration.

Integration testing is a systematic technique for constructing the program structure, while at the same time conducting tests to uncover errors associated with the interface. All modules are combined in the testing step. Then the entire program is tested as a whole.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TESTCASE ID** | **TESTCASE OBJECTIVE** | **TESTCASE STEPS** | **EXPECTED RESULT** | **ACTUAL RESULT** | **STATUS** |
| **1** | Check the interface link between the DWT , SWT and curvelet module | Read the image | Generate output image with all module | As expected | Pass |
| **2** | Check the PSNR Value Computation | Read the image | Generate output image with all module and compute PSNR values | As expected | Pass |
|  | | | | | |

Table.5.3.1 : Integration Testing

**Acceptance Testing**

Acceptance Test is performed with realistic data of the client to demonstrate that the software is working satisfactorily. Testing here is focused on external behavior of the system; the internal logic of program is not emphasized.

Test cases should be selected so that the largest number of attributes of an equivalence class is exercised at once. The testing phase is an important part of software development. It is the process of finding errors and missing operations and also a complete verification to determine whether the objectives are met and the user requirements are satisfied.

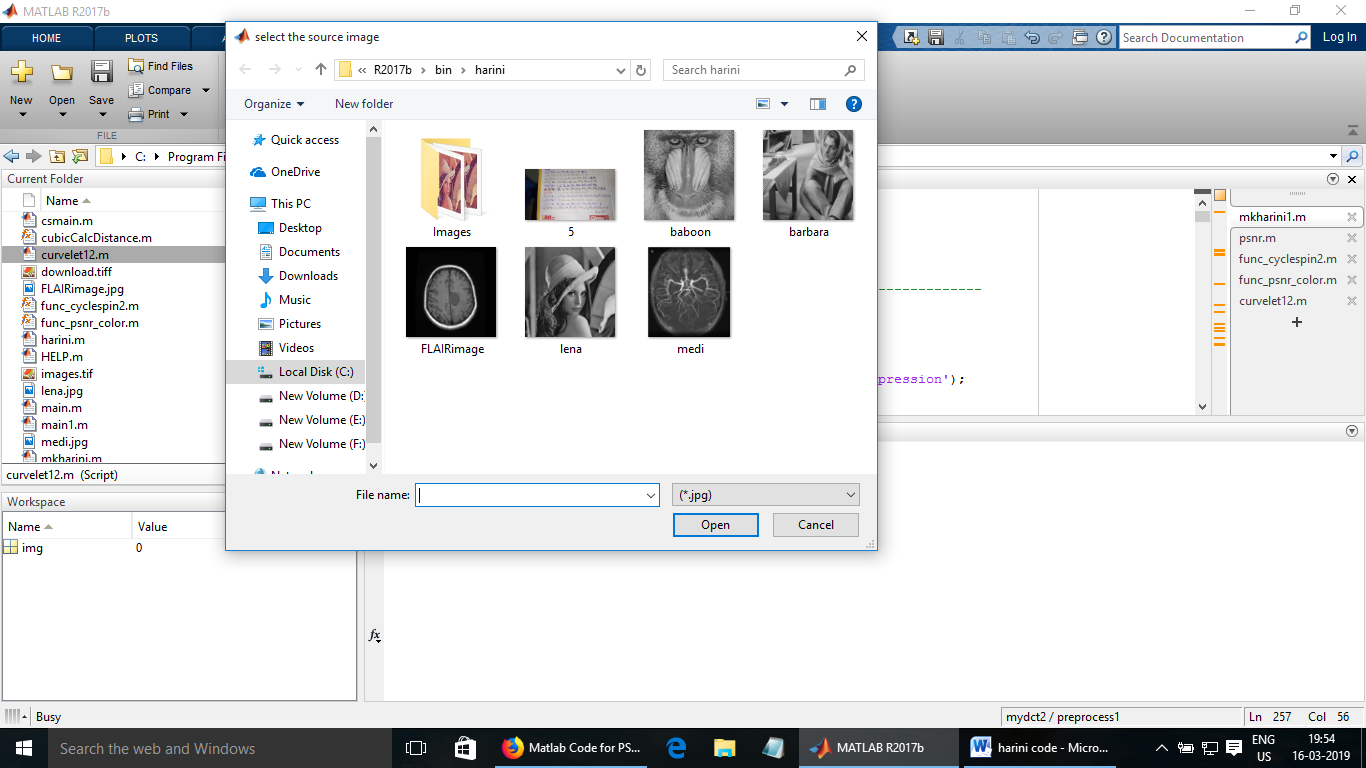
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TEST CASE ID** | **TEST CASE OBJECTIVE** | **TEST CASE STEPS** | **EXPECTED RESULT** | **ACTUAL RESULT** | **STATUS** |
| **1** | JPEG | Valid | PSNR computation is done | As expected | Pass |
| Invalid | Error message | As expected | Pass |

Table.5.3.2: Acceptance Testing

**5.4 Test Cases**

**5.4.1 Case 1:**

The test case 1 is we run the code and it is ask the dialog box is the which you want select image as shown in the dialog box and the image contain format is jpeg and it is size more than 256.and the test cases is pass.



Test Case 2:

The test case 2 is show the we run the code and it is ask the dialog box is the which you want select image as shown in the dialog box and the image contain format is jpeg and it is size more than 256.and the test cases is fail.

Error

Error using imread>get\_full\_filename (line 516)

File "index.jpg" does not exist.

Error in imread (line 340)

fullname = get\_full\_filename(filename);

Error in mkharini1 (line 9)

i=imread(img);

**CONCLUSION**

The proposed work focused on an image compression technique based on the interpolation of the high frequency sub bands obtained by DWT, correcting the high frequency sub-band estimation by using SWT high frequency sub-bands, and the input image. The proposed technique uses DWT to decompose an image into different sub-bands, and then the high frequency sub-band images have been interpolated. The interpolated high frequency sub- band coefficients have been corrected by using the high frequency sub-bands achieved by SWT of the input image. An original image is interpolated with half of the interpolation factor used for interpolation the high frequency sub-bands. Afterwards all these images have been combined using IDCT to generate a reconstructed imaged.

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**APPENDIX**

**DIGITAL IMAGE PROCESSING**

An image may be defined as a two dimensional functional f(x, y), where x and y are spatial coordinates and the amplitude of at any pair of coordinates(x, y) is called intensity or gray scale.

Pixel is term most widely used to denote the elements of a digital image. One useful paradigm is to consider three types of computized processes in this continuum: low, mid, high-level processes.

Low–level process involves primitive operations such as image pre processing to reduce noise, contrast enhancement, and image sharpening.

Mid-level process on images involves tasks such as segmentation.

Higher-level processing involves “making sense” of an ensemble of recognized objects, as in image analysis.

**NOTATION**

New function is created by the following syntax

Function name

**Keyboard keys**

Return tabs

File edit

**MATLAB WORKING ENVIRONMENT**

MATLAB is an interactive program for numerical computation and data visualization; it is used extensively by control engineers for analysis and design. There are many different toolboxes available which extend the basic functions of MATLAB into different application areas; in these tutorials, we will make extensive use of the Control Systems Toolbox. MATLAB is supported on UNIX, Macintosh, and Windows environments; a student version of MATLAB is available for personal computers. For more information on MATLAB, please visit the [Math Works](http://www.mathworks.com/) home.

The idea behind these tutorials is that you can view them in one window while running MATLAB in another window. You should be able to re-do all of the plots and calculations in the tutorials by cutting and pasting text from the tutorials into the MATLAB Command Window or an [m-file](http://ctms.engin.umich.edu/CTMS/index.php?aux=Extras_Mfile).

In this section we give a brief overview of same important operational aspects of using mat lab

**MATLAB DESKTOP**

It contains 5 sub windows they are

1. Command window
2. Workspace browser window
3. Current directory window
4. Command history window
5. Figure window

## matlab diagram.jpg

## Fig. Matlab Desktop

## The Command Window is where the user types Matlab Commands and expressions at the prompt (>>).

Matlab defines the Workspace Window as the set of variables that uses creates in a work session. The workspace Browser shows these variables and some information about them. Double Clicking on a variable in the work-space browser launches the array editor.

Current Directory tab above the work space tab shows the contents of the current directory.

For example in the windows operating system the path might be as follow c:\MATLAB\work, indicating that directory , “work” is a subdirectory of the main directory “MATLAB”, which is installed in Dive C.

**DIGITAL IMAGE REPRESENTATION**

An image may be defined as a two-dimensional function f(x, y) where x and y are spatial coordinators

F is the amplitude at any coordinates (x, y).

Gray level is the single intensity of the image.

Colour image are formed by a combination of individual 2-D images.

For example, in the RGB.colour image contains Red, Blue, Green and it has three intensities.

Converting such an image to digital form requires that the coordinate as well as the amplitude, be digitized.

Digitizing the coordinate value is called “sampling”.

Digitizing the amplitude values is called quantization

**COORDINATE CONVENTIONS**

The result of sampling and quantization is a matrix of real numbers.

We use the image in the form of assume that an image f(x, y) is sampled so that resulting image has M rows and N columns we say that image is of size “m × n”.

The values of the coordinates (x, y) are discrete quantities.

**READING IMAGES**

Images are read into the MATLAB environment using function imread whose syntax is

Imread (‘filename’)

|  |  |  |
| --- | --- | --- |
| FORMAT NAME | DESCRIPPTION | RECOGNIZED EXTENSIONS |
| TIFF | Tagged image file format | .tiff, .tiff |
| >PEG | Joint photographic expert group | .jpg, jpeg. |
| GIF | Graphics interchange format | .gif |
| BMP | Windows bit map | .bmp |
| PNG | Portable network graphics | .png |
| XWD | X window dump | .xwd |

Gif is supported by imread function but not in write function.

Here file name is a string containing the complete name of the image file.

For example, command line

>> = imread (‘chest ray .jpg’);

The simplest way to read an image from a specified directory is to include a full or relative path to that directory in filename,

For example÷

>> f= imread (‘D: \my images\chest x ray.jpg’);

Reads the image from a folder called my images on the D: drive where as

>> f= imread (‘.\my images \chestxray.jpg’);

**SIZE**

Function size gives the row and column dimension of an image:

>>Size (f)

Ans=

1024 1024

This function is particularly useful in programming when used in the following form to determine automatically the size of an image

>> (M, N) = size (f);

This syntax returns the number of rows (M) and columns (N) in the image.

The whos function displays additional information about an array for instance, the statement

>>whos f

Gives

|  |  |  |  |
| --- | --- | --- | --- |
| NAME | SIZE | BYTES | CLASS |
| F | 1024×1024 | 1048576 | Unit8 array |

Grand total is 1048576elements using 1048576 bytes

DISPLAYING IMAGES

Images are displayed on the Matlab desktop using function inshow, which has the basic syntax.

Imshow (f,G)

Where f is an image array G is the number of intensity levels.

If G is amitted it defaults to 256 levels.

Using this syntax.

Imshow (f,(low, high))

Display black image as values are less than or equal to to low values and as well as the white image as value are less than or equal to to high values.

Imshow (f, [ ])

Function pixval is used frequently to display the intensity values of individual pixels interactively.

Euclidean distance between the initial and current cursor locations.

The syntax form of interest here is

Pixval

Which shows the cursor at last image displayed .clicking the x button on the cursor window turns it off.

If another image is displayed with the other image and we use the following syntax.

>>figure, imshow (g)

Using the statement

>>imshow (f), figure, imshow (g)

Suppose that we have just read an image h and finds that using imshow (h) produces the images

>>imshow (h, [ ])

It is clear that this image has a low dynamic range,which can be remedied for display purposes by using the statement.

WRITING IMAGES

Images are written to disc using function imwrite, which has the following basic syntax.

Imwrite (f,’filename’)

The string contained in filename must include a recognized file format extension for example for example

>>imwrite (f,’patient10\_run1.tif’);

Or alternatively,

>> imwrite (f,’patient10\_run1.tif”)

If filename contains no path information, then imwrite saves the file in the current working directory.

Imwrite is only applicable for the JPEG images is

Imwrite (f,’filename.jpg,’ ‘qualtiy’, q)

Q is the integer between 0and 100.

In order to get an idea of the compression achieved and to obtain other image file details, we can us function iminfo, which has the syntax.

Imfinfo ‘filename’

Where filename is the complete file name of the image stored in disk .for example

>>imfinfo bubble25.jpg

Outputs the following

Filename: ‘bubbles25.jpg’

Filemod date; ’04-jan-2003’ 12:31:26’

File size: 13849

Format: ‘jpg’

Width: 714

Height: 682

Bit depth: 8

Colour type: ‘gray scale’

**DATA CLASSES**

Although we work with integer coordinates, the values of pixels themselves are not restricted to be integers in MATLAB.

The first eight entries in the table are referred to as numeric data classes.

The ninth entry in the char class.

The last entry is referred to as the logical data class.

**IMAGE TYPES**

The tool box support four types of images

Intensity

Binary

Indexed

RGB

INTENSITY

An intensity image is a data matrix whose values have been scaled to represent intensities.

The elements of an intensity image are of class unit 8 or unit 32.

Integer values within the range [0,255] and [0, 65535].

Values of scaled, class double intensity images are in the range [0,1] by convection.

BINARY

A binary image is a logical array of 0s and 1s.

A numeric array is converted a binary using function logical .

The statement is followed by

B= logical (A)

To test if an array is logical we use the islogical function

Islogical ( )

Example

Islogical (c) name

CONVETING BETWEEN DATA CLASS AND IMAGE TYPES

Converting between data classes and image types is a frequent operation in IPT applications.

CONVERTING BETWEEN DATA CLASSES

Converting between data classes is straight forward .the general syntax is

B =data class\_ name (A).

Where data\_class\_name is one of the names in the first coloumn of table below.

|  |  |  |
| --- | --- | --- |
| NAME | CONVERTS INPUT TO | VALID INPUT IMAGE DATA CLASSES |
| Im2unit8 | Unit8 | Logical,unit8, unit16, and double |
| Im2unit16 | Unit 16 | Logical,unit8,unit16, and double |
| Mat2gray | Double (in range (0,1) | double |
| Im2double | double | Logical,unit8,unit16,and double |
| Im2bw | logical | Unit8,unit16,and double |

Vectors

Let's start off by creating something simple, like a vector. Enter each element of the vector (separated by a space) between brackets, and set it equal to a variable. For example, to create the vector **a**, enter the following into the MATLAB command window (you can **Copy** and **Paste** from your browser into MATLAB to make it easy) and MATLAB should return the following:

a = [1 2 3 4 5 6 9 8 7]

a =

1 2 3 4 5 6 9 8 7

Let's say you want to create a vector with elements between 0 and 20 evenly spaced in increments of two (this method is frequently used to create a time vector):

t = 0:2:20

t =

0 2 4 6 8 10 12 14 16 18 20

Manipulating vectors is almost as easy as creating them. First, suppose you would like to add 2 to each of the elements in the vector **a**. The equation for that looks like:

b = a + 2

b =

3 4 5 6 7 8 11 10 9

Now suppose, you would like to add two vectors together. If the two vectors are the same length, it is easy. Simply add the two as shown below:

c = a + b

c =

4 6 8 10 12 14 20 18 16

Subtraction of vectors of the same length works exactly the same way.

## Functions

To make life easier, MATLAB includes many standard functions. Each function is a block of code that accomplishes a specific task. MATLAB contains all of the standard functions such as sin, cos, log, exp, sqrt, as well as many others. Commonly used constants such as pi, and i or j for the square root of -1, are also incorporated into MATLAB.

sin (pi/4)

ans =

0.7071

To determine the usage of any function, type help [function name] at the MATLAB command window.

MATLAB even allows you to write your own functions with the **function** command; follow the link to learn how to write your own functions and see a listing of the functions we created for this tutorial.

## Plotting

It is also easy to create plots in MATLAB. Suppose you wanted to plot a sine wave as a function of time. First, make a time vector (the semicolon after each statement tells MATLAB we don't want to see all the values) and then compute the sin value at each time. The commands after the plot function (title, xlabel, ylabel) will add annotations to the plot.

t = 0:0.25:7;

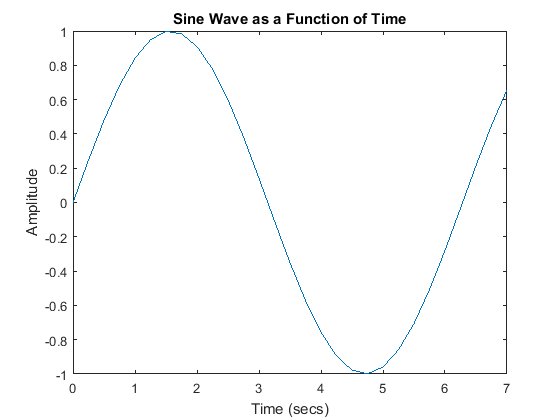
y = sin (t);

plot (t,y)

title ('Sine Wave as a Function of Time')

xlabel('Time (secs)')

ylabel('Amplitude')



The plot contains approximately one period of a sine wave. Basic plotting is very easy in MATLAB, and the plot command has extensive add-on capabilities. You may visit the [plotting](http://ctms.engin.umich.edu/CTMS/index.php?aux=Extras_Plot) page to learn more.

## Polynomials as Vectors

In MATLAB, a polynomial is represented by a vector. To create a polynomial in MATLAB, simply enter each coefficient of the polynomial into the vector in descending order. For instance, let's say you have the following polynomial:

(1)$$
s^4 + 3s^3 - 15s^2 - 2s +9
$$

To enter this into MATLAB, just enter it as a vector in the following manner:

x = [1 3 -15 -2 9]

x =

1 3 -15 -2 9

MATLAB can interpret a vector of length n+1 as an nth order polynomial. Thus, if your polynomial is missing any coefficients, you must enter zeros in the appropriate place in the vector. For example,

(2)$$
s^4 + 1
$$

would be represented in MATLAB as:

y = [1 0 0 0 1]

y =

1 0 0 0 1

You can find the value of a polynomial using the polyval function. For example, to find the value of the above polynomial at s = 2,

z = polyval([1 0 0 0 1],2)

z =

17

You can also extract the roots of a polynomial. This is useful when you have a high-order polynomial such as

(3)$$
s^4 + 3s^3 - 15s^2 - 2s + 9
$$

Finding the roots would be as easy as entering the following command:

roots ([1 3 -15 -2 9])

ans =

-5.5745

2.5836

-0.7951

0.7860

Let's say you want to multiply two polynomials together. The product of two polynomials is found by taking the convolution of their coefficients. MATLAB's function conv will do this for you.

x = [1 2];

y = [1 4 8];

z = conv(x, y)

z =

1 6 16 16

Dividing two polynomials is just as easy. The deconv function will return the remainder as well as the result. Let's divide z by y and see if we get x.

[xx, R] = deconv (z, y)

xx =

1 2

R =

0 0 0 0

As you can see, this is just the polynomial/vector x from before. If y had not gone into z evenly, the remainder vector would have been something other than zero.

## Polynomials Using the s Variable

Another way to represent a polynomial is to use the Laplace variable s within MATLAB. This method is mainly used throughout these tutorials. Let's ignore the details of the Laplace domain for now and just represent polynomials with the s variable. To define the variable, type the following into the MATLAB command window:

s = tf('s')

s =

s

Continuous-time transfer function.

Recall the polynomial given above:

(4)$$
s^4 + 3s^3 - 15s^2 - 2s +9
$$

To represent this in MATLAB, type the following into the MATLAB command window:

Polynomial = s^4 + 3\*s^3 - 15\*s^2 - 2\*s + 9

Polynomial =

S^4 + 3 s^3 - 15 s^2 - 2 s + 9

Continuous-time transfer function.

Instead of using the roots function, we can use the zero function to find the roots of the polynomial.

zero (polynomial)

ans =

-5.5745

2.5836

-0.7951

0.7860

As you can see, the result is the same as above using the roots command and the coefficients of the polynomial.

You can also multiply two polynomials together using the s variable. Let's redefine x and y.

x = s + 2;

y = s^2 + 4\*s + 8;

z = x \* y

z =

S^3 + 6 s^2 + 16 s + 16

Continuous-time transfer function.

The resulting polynomial has the same coefficients as the resulting vector from the conv function above.

## Matrices

Entering matrices into MATLAB is the same as entering a vector, except each row of elements is separated by a semicolon (;) or a return:

B = [1 2 3 4; 5 6 7 8; 9 10 11 12]

B = [1 2 3 4

5 6 7 8

9 10 11 12]

B =

1 2 3 4

5 6 7 8

9 10 11 12

B =

1 2 3 4

5 6 7 8

9 10 11 12

Matrices in MATLAB can be manipulated in many ways. For one, you can find the transpose of a matrix using the apostrophe key:

C = B'

C =

1 5 9

2 6 10

3 7 11

4 8 12

It should be noted that if *C* has been complex, the apostrophe would have actually given the complex conjugate transpose. To get the transpose in this case, use.' (The two commands are the same if the matrix is not complex).

Now you can multiply the two matrices *B* and *C* together. Remember that order matters when multiplying matrices.

D = B \* C

D = C \* B

D =

30 70 110

70 174 278

110 278 446

D =

107 122 137 152

122 140 158 176

137 158 179 200

152 176 200 224

Another option for matrix manipulation is that you can multiply the corresponding elements of two matrices using the.\* operator (the matrices must be the same size to do this).

E = [1 2; 3 4]

F = [2 3; 4 5]

G = E .\* F

E =

1 2

3 4

F =

2 3

4 5

G =

2 6

12 20

If you have a square matrix, like *E*, you can also multiply it by itself as many times as you like by raising it to a given power.

E^3

ans =

37 54

81 118

If you wanted to cube each element in the matrix, just use the element-by-element cubing.

E. ^3

ans =

1 8

27 64

You can also find the inverse of a matrix:

X = inv(E)

X =

-2.0000 1.0000

1.5000 -0.5000

or its eigenvalues:

eig (E)

ans =

-0.3723

5.3723

There is even a function to find the coefficients of the characteristic polynomial of a matrix. The poly function creates a vector that includes the coefficients of the characteristic polynomial.

p = poly (E)

p =

1.0000 -5.0000 -2.0000

Remember that the eigenvalues of a matrix are the same as the roots of its characteristic polynomial:

roots (p)

ans =

5.3723

-0.3723

## Printing

Printing in MATLAB is pretty easy. Just follow the steps illustrated below:

**Macintosh**

* To print a plot or an m-file from a Macintosh, just click on the plot or m-file, select **Print** under the **File** menu, and hit **Return**.

**Windows**

* To print a plot or a m-file from a computer running Windows, just select **Print** from the **File** menu in the window of the plot or m-file, and hit **Return**.

**UNIX**

* To print a plot on a UNIX workstations enter the command: print -P<printer name>.
* If you want to save the plot and print it later, enter the command: print plot.ps.
* Sometime later, you could print the plot using the command lpr -P plot.ps if you are using a HP workstation to print, you would instead use the command lpr -d plot.ps.
* To print a m-file, just print it the way you would any other file, using the command lpr -P *name of m-file*.m. If you are using a HP workstation to print, you would instead use the command lpr -d plot.ps *name of m-file*.m.

## Using m-files in MATLAB

There are slightly different things you need to know for each platform.

**Macintosh**

* There is a built-in editor for m-files; choose **New M-file** from the **File** menu. You can also use any other editor you like (but be sure to save the files in text format and load them when you start MATLAB).

**Windows**

* Running MATLAB from Windows is very similar to running it on a Macintosh. However, you need to know that your m-file will be saved in the clipboard. Therefore, you must make sure that it is saved as filename.m.

**UNIX**

* You will need to run an editor separately from MATLAB. The best strategy is to make a directory for all your m-files, then cd to that directory before running both MATLAB and the editor. To start MATLAB from your Xterm window, simply type: mat lab.

You can either type commands directly into MATLAB, or put all of the commands that you will need together in a m-file, and just run the file. If you put all of your m-filesin the same directory that you run MATLAB from, then MATLAB will always find them.

## Getting Help in MATLAB

MATLAB has a fairly good on-line help, type:

help command name

for more information on any given command. You do need to know the name of the command that you are looking for; a list of the all the ones used in these tutorials is given in the **command listing**; a link to this page can be found at top right of this page.

## Determination of Data Types

MATLAB provides various functions for identifying data type of a variable.

Following table provides the functions for determining the data type of a variable –

|  |  |
| --- | --- |
| **Function** | **Purpose** |
| Is | Detect state |
| Isa | Determine if input is object of specified class |
| Iscell | Determine whether input is cell array |
| Iscellstr | Determine whether input is cell array of strings |
| Ischar | Determine whether item is character array |
| Isfield | Determine whether input is structure array field |
| Isfloat | Determine if input is floating-point array |
| Ishandle | True for Handle Graphics object handles |
| isinteger | Determine if input is integer array |
| Isjava | Determine if input is Java object |
| islogical | Determine if input is logical array |
| isnumeric | Determine if input is numeric array |
| Isobject | Determine if input is MATLAB object |
| Isreal | Check if input is real array |
| Isscalar | Determine whether input is scalar |
| isstr | Determine whether input is character array |
| isstruct | Determine whether input is structure array |
| is vector | Determine whether input is vector |
| class | Determine class of object |
| validateattributes | Check validity of array |
| whos | List variables in workspace, with sizes and types |