



Republic of Iraq  
Ministry of Higher Education and Scientific Research  
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# Images and Audio Compression

A graduation project is submitted to the Multimedia department in partial fulfillment of the requirements for the degree of Bachelor in information technology in multimedia

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿ هُوَ الَّذِي خَلَقَ السَّمَاوَاتِ وَالْأَرْضَ فِي سِتَّةِ أَيَّامٍ

ثُمَّ اسْتَوَىٰ عَلَى الْعَرْشِ يَعْلَمُ مَا يَلْجُ فِي الْأَرْضِ وَمَا

يَخْرُجُ مِنْهَا وَمَا يَنْزِلُ مِنَ السَّمَاءِ وَمَا يَعْرُجُ فِيهَا

﴿ وَهُوَ مَعَكُمْ أَيْنَ مَا كُنْتُمْ وَاللَّهُ بِمَا تَعْمَلُونَ بَصِيرٌ

صدق الله العلي العظيم (سورة الحديد ٤)

## الاهداء

الى من كَلَّه اللهُ بالوقار والهيبة .. الى من علمني العطاء بدون انتظار  
الى من أحمل اسمه بكل افتخار..ارجو من الله ان يمد بعمره ليرى  
ثماراً قد حان قطافها بعد طول انتظار

(والدي العزيز )

الى ملاكي في الحياة .. الى معنى الحب والحنان والتفاني .. الى  
بسمة الحياة وسر الوجود .. الى من كان دعائها سر نجاحي  
وحنانها بلسم جراحي .. الى التي غمرتني بحنانها وكانت خير

الام المثالية

(امي الحبيبة )

الى من ارى التفاؤل في عينيه والسعادة في ابتسامته .. الى القلب النقي  
الذي خفق لي حباً وخوفاً علي .. الى من حفزني على المثابرة  
والاستمرار وعدم اليأس

(نصفي الاخر الشريك الروحي )

الى من تميزوا بالعطاء وتحلّوا بالأخاء .. الى من معهم سعدت .. و  
رافقوني في دروب الحياة السعيدة والحزينة .. الى من عرفت كيف  
اجدهم علموني الا اضيعهم

(اصدقائنا والزملاء )

## الشكر والتقدير

إلهي لا يطيب الليل الا بشرك ولا يطيب النهار

الا بطاعتك ولا تطيب اللحظات الا بذكرك

ولا تطيب الجنة الا برويتك ...

الله عز وجل

إلى من بلغ الرسالة وأدى الأمانة ونصح

الامة الى نبي الرحمة ونور العالمين

سيدنا محمد صلى الله عليه وسلم

الى الدكتورة الفاضلة (المشرفة على بحثنا الست لمياء عبد نور ) لما

قدمته لنا لأجل اتمام هذا المشروع و الشكر موصول الى رئاسة

واساتذة قسم الوسائط المتعددة وكل من قدم لنا المساعدة وشجعنا

على الاستمرار

## Abstract:

The compression of digital image and audio play an important role in order to achieve different objectives, in storage space, transmission speed and so on. The purpose of this project to work with compression technique that was applied with image and audio files. A type of file is often large in size, entering the computer and occupying space a lot of memory and we need a great deal of time in the case of transfer in the form of packages so the need for data compression (which is converting the data to a lesser size) has become to be suitable with higher storage efficiency in the case of multiple data transfer.

We will use two compression methods in this project, the method of compressing images and digital audio using the DCT algorithm for images and the haar wavelet algorithm for sound was adopted as one of the solutions that reduce the size of the data required for the compression of images and digital audio, as we reduce the size of the treasury of files and images and sound and storage as low as possible, while reducing the loss of data as much as possible.

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# Chapter One

Introduction

## 1-1 Introduction

In 1883 the discovery of Morse code by the world Samuel Morse was a manifestation of the development aspects of the communication process, And an indirect input to data compression science as a means of speeding up a process

Transmission, The natural limitations of transmission or communication are slow and loss-prone The need to change the encoding by encoding another smaller and carries the same information, Than It will speed up the transmission process and reduce the likelihood of loss and error, , Was the idea of Samuel

Morse represents repeated characters with short codes so the text contains a "character Highly repetitive will give it a small representation "and, conversely, give it a normal encoding

It will consume more space and time, Morse built his idea of English as a table It includes English characters and corresponding corresponding encoding and has been marked as encoding Frequency of occurrence for each character where the lower encoding of the repeating character is based Larger , Compressed data, in the context of computer science, science (and art) to represent information in a compact format

It has been one of the critical technologies enabled for digital multimedia revolution ever since Contracts Most people often use compression software such as zip code, GZIP, WinZip) and many more (to reduce file size before storing or moving in Media embedded techniques are compressed in more and more programs and are compressed Data is often without people that know it. Data compression has become a common requirement

For most application programs, as well as an important and active research area in computer science. Without techniques

Compression, it could have been any of the growing Internet, digital TV, Mobile communication or Increased video communication techniques and process developments. Typical examples of application areas are They are connected and motivated by data compression

The internet is increasingly utilized as the transport framework for nowadays communication. The common technique for the transmission of speech, Voice over IP (VoIP), has been used for about.



The internet is increasingly utilized as the transport framework for nowadays communication. The common technique for the transmission of speech, Voice over IP (VoIP), has been used for about 20 years and replaced analog as well as ISDN telephony extensively. Also the spreading of musical content, called Audio over IP (AoIP), has been well-established. However, this trend mainly applies for broadcast scenarios but not for low-latency, bidirectional communication, which shall be the use case in the following. To allow the transmission of continuous, analog signals it is necessary to convert the signal into a digital representation, fragment it into blocks, and encapsulate it into an IP packet. Thereafter, the actual transport over the IP network can occur before a receiver can extract the audio segment from the packet, and convert it to the analogue domain again for the purpose of replaying it. All these steps introduce a certain amount of delay, conflicting with the requirement of low latency in many AoIP applications. Especially, interactive scenarios like distributed musical performances, which require very low latency, seem to be difficult to realize. Besides various system approaches, many specific problems of IP based musical interaction such as issues related to transmission delay or the necessity of audio device synchronization has been analyzed. Also, the severe problem of error concealment in case of packet loss due to non-optimum network conditions has been investigated. Simplest concealment schemes like block interpolation, repetition, and silencing or noise substitution are known to perform only with a moderate quality. Techniques considering the actual signal and resynthesizing it are hence more promising. Possible systems are sinusoidal analysis/synthesis, adapted waveform similarity overlap-add, and model-based variants. In this study, Kauppinen's approach of audio extrapolation, based on auto-regressive modeling, is used to substitute missing audio fragments. The quality of the concealment mainly depends on the used signal model, obtained with prediction.

The focus of this survey lies on the exact evaluation of the prediction

0	256	512	768	1024	-0.1	-0.05	0	0.05	0.1	n	x[n]
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Figure 1: Extrapolation of a missing audio fragment scheme's influence on the audio quality, considering its algorithmic complexity and usability in an AoIP scenario. Section 2 recaps Kauppinen's audio signal extrapolation algorithm and the application in an AoIP scenario whereas section 3 introduces different prediction techniques. The setup of the undertaken experiments and the corresponding results are explained in section 4.

## **1-2 The concept of Compression**

Is to reduce the number of bits needed to represent the data can be compressed data to save storage capacity and transfer The files are quickly reduced and the costs of storage devices and network bandwidth are usually resorted to, Compression process, to reduce the size of the file to process digital images, store, transfer and summarize information Duplicate, , Or remove the information facing the human eye, difficult to see from here the quality An image may be affected by the pressure technique and at the pressure level adopted by the compression technique To be either "undiminished" that the image is undressed pressure, similar to the first case, ,Because Information is not thrown (dropped) when you reduce (decrease) the file size, and can be pressed Is incomplete when any nonessential information is discarded during the process.

Usually, the undelete pressure is used in the main files  
Access files should pay attention to the fact that the images respond in different ways to the compression process as can  
For certain types of optical properties, such as subtle color variations, To produce visual processes Intended and owns digital images reproduced from photo formats, Fan A wide range of gradients that usually yield large files.

## **1-3 Type of Compression**

### **1-3 -1 Compress files:**

The main purpose of file compression is to reduce its size to occupy a smaller space on the computer. The compression of the file does not change anything in terms of its content or composition, but only a measure The reservoir space to be occupied within the computer. We recommend that you compress a file in the following situations:

- When you need to free up space on your computer, start by compressing large files that you use frequently
- When you need to send files by e-mail

All compressed files are almost finished with the extension. zip but you can also notice and be wary of that Some of them end with the rar extension and this is because of different programs that use compression Files.

Several programs are used (some of which are commercial and others are available for free) in compression files. Most of these programs have the same basic functions and also provide compression functions.

You can compress a file, a file group, or an entire folder. When you press a folder, all the files and subfolders inside are also pressed. Often, when you press a folder then the pressure is removed then the resulting folder has the original structure. But this does not always happen. It is important to keep the same structure when it removes file compression and should always check that the compressed file may be maintained by removing the pressure yourself. (Pressing does not delete or change Zip file, so you do not have to press it again).

When you finish compressing a file you will notice that the file (zip) that resulted in accompanying the original file is in the same folder. In fact what happens is the clone of the original file, and the cloned file is compressed. These two files are independent of each other and this means that you can change, move or delete one without affecting the other. Note: When you change an original file (for example, add objects) it becomes different for the compressed file, which means that if you remove the compression it will be different for the modified file.

When you remove a file, you return it to its original state. Some programs allow you to compress such as WinZip and Power Archive, browse the contents of the compressed file and the existing files inside. This means that if you have a .doc file in your compressed file, you can open the last one see what it is. However, you will not be able to save any changes you make to this file. If you want to use this compressed file (changes occur in it, etc.) this file first opens it and starts the job.

Files do not shrink as much as the size of the file is reduced by changing the content of this file. Simple text files shrink considerably while less formatted files shrink. Image reduction is simple.

### **1-3 -2 Video compression**

Video compression uses modern encoding techniques to reduce redundancy in most video data. Video compression algorithms and spatial codecs, video compression is the practical implementation of source encoding. In information theory, in fact, most video codecs also use compression techniques.

Sound at the same time to compress separate data streams but side by side as a single package. Some video compression programs usually work on groups in the form of an adjacent pixel box, often. These blocks are called pixels (macros), and these groups are compared to pixels or blocks of pixels from one frame to another, video compression codec only sends differences within those blocks in video fields with more.

Motion compression should symbolize more data to keep up with the larger number of pixels that change.

### **1-3-3 Compress images**

Compress images and reduce the size in bytes of the graphics file without degradation of image quality. Unacceptable level. Lower file size allows more images to be stored in a certain amount of disk or memory space as it reduces the time required to send images to more than one network or download them from web pages.

There are many different ways you can compress image files to use the Internet. The two most common compression formats for graphic images are JPEG format and often GIF format. The JPEG method is used for photographs, the GIF method is usually used for line art. And other forms of geometric images are relatively simple and include other methods of compressing images. The use of rubbing talons and waves did not gain these widely accepted methods for use on the Internet. Has to write these lines however, both methods augur well because they provide proportions. Compression is higher than JPEG or GIF modes. Some types of images have another new method that may solve. In a timely manner the GIF store is a PNG format text file or program that can be compressed without errors but only to a certain extent this is called (Lossy Compression). After this point, errors are entered into the text and program files, it is important to have Lossless compression due to one error can cause serious damage to the meaning of a text file or cause.

The program does not perform in compressing images. A small loss in quality is usually not noticeable. No. There is a "critical point" to any pressure that works perfectly, but then becomes impossible when it is. There is some tolerance to loss, the pressure factor can be greater than it can when it is not.

There is a loss of tolerance. For this reason, graphs and images can be compressed over files or Scripts.

### 1-3-4 Audio **compression**

Audio data compression, not to be confused with dynamic range compression, has the potential to reduce the transmission bandwidth and storage requirements of audio data. Audio compression algorithms are implemented in software as audio codecs. Lossy audio compression algorithms provide higher compression at the cost of fidelity and are used in numerous audio applications. These algorithms almost all rely on psychoacoustics to eliminate or reduce fidelity of less audible sounds, thereby reducing the space required to store or transmit them.

In both lossy and lossless compression, information redundancy is reduced, using methods such as coding, pattern recognition, and linear prediction to reduce the amount of information used to represent the uncompressed data.

The acceptable trade-off between loss of audio quality and transmission or storage size depends upon the application. For example, one 640 MB compact disc (CD) holds approximately one hour of uncompressed high fidelity music, less than 2 hours of music compressed losslessly, or 7 hours of music compressed in the MP3 format at a medium bit rate. A digital sound recorder can typically store around 200 hours of clearly intelligible speech in 640 MB.

Lossless audio compression produces a representation of digital data that decompress to an exact digital duplicate of the original audio stream, unlike playback from lossy compression techniques such as Vorbis and MP3. Compression ratios are around 50–60% of original size, which is similar to those for generic lossless data compression. Lossless compression is unable to attain high compression ratios due to the complexity of waveforms and the rapid changes in sound forms. Codecs like FLAC, Shorten, and TTA use linear prediction to estimate the spectrum of the signal. Many of these algorithms use convolution with the filter  $[-1 \ 1]$  to slightly whiten or flatten the spectrum, thereby allowing traditional lossless compression to work more efficiently. The process is reversed upon decompression.

When audio files are to be processed, either by further compression or for editing, it is desirable to work from an unchanged original (uncompressed or losslessly compressed). Processing of a lossily compressed file for some purpose usually produces a final result inferior to the creation of the same compressed file from an uncompressed original. In addition to sound editing or mixing, lossless audio compression is often used for archival storage, or as master copies.

A number of lossless audio compression formats exist. Shorten was an early lossless format. Newer ones include Free Lossless Audio Codec (FLAC), Apple's Apple Lossless (ALAC), MPEG-4 ALS, Microsoft's Windows Media Audio 9 Lossless (WMA Lossless), Monkey's Audio, TTA, and WavPack. See list of lossless codecs for a complete listing.

### **1-4 Goal of Project**

The main objective of this project is to examining different compression method for different type of files, these methods are used to reduce the size of the data of the type of images and sound as much as possible in order to provide a larger storage space and reduce the time of transfer to another computer or time downloaded from the Internet, and this is the subject and the pressure of the most important topics and the most sensitive and accurate In the field of computer science and we have used two important algorithms are dct and haar in the compression of audio files and digital images and calculate the standards of precision MSE and PSNR.

# Chapter Two

Materials and methods

## 2-1 Type of photos

### 2-1 -1-Binary Image

The simplest images are black and white or symbolize zero and one A binary image can be referred to in the sense (1 bit per pixel) each pixel takes a single value such as

The zero pixel is also one image can consist of other image types image The gray level using the so-called threshold each band (Band) corresponds to one color. Note/ The binary digital image does not have a third color but only the white and black values of the image after conversion All are zeros or one either black or white can convert all kinds of images into pictures Bilaterally through the so-called threshold.

### 2-1-2-Color Image

Color images have a specific model consisting of (3 Band) each band one color means three colors A monochrome image of each color indicated by a particular representation is red, green, blue (called RGB) takes 8 bits of 24-bit color image signal (24 bits per pixel).

Digital images that support colors by assigning three boxes with each pixel to select The intensity of the three basic colors (red, green and blue) and each box contains 8 bits for writing them

For example, the intensity of the green may be 00100000, that is, there are 24 bits per pixel, But some pictures have

It has only 8 houses and contains only 256 colors. It is a three-dimensional image  $m * n * 3$  Its elements are of double type and fall within the field  $[0,1]$  and each pixel of the image is produced For incorporating the red, green and blue vehicle to give the proper color as per vehicle From The three vehicles are marked with two dimensions  $m * n$ . The red vehicle represents (0) the black color **Figure (1)** Red color and so on for the rest of green and blue vehicles and the installation of these The three vehicles give the picture the true color, the following figure illustrates this type of image.

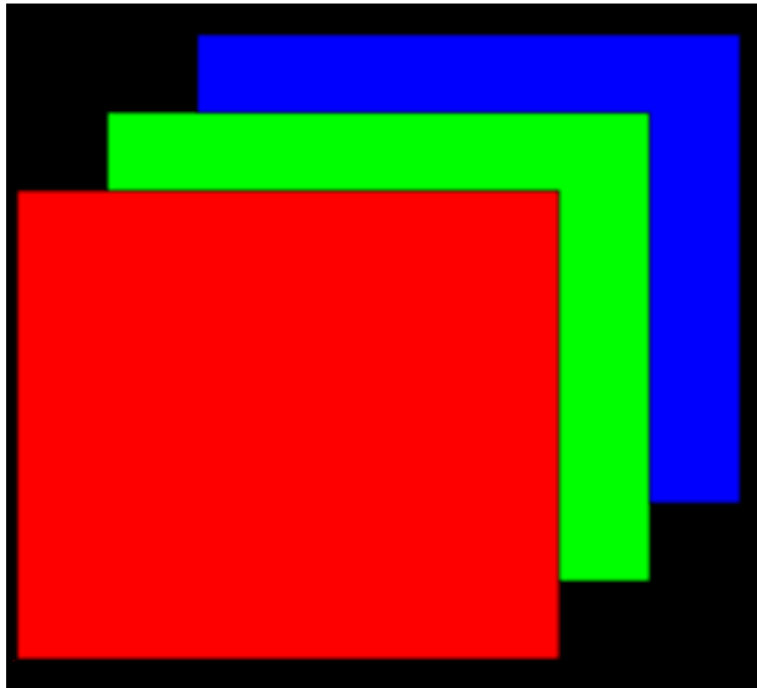




**Figure (1) Color image**

Images of any type include GIF, Bmp, JPEG, PNG, RAW

Etc. The colored image is a digital image containing the color information for each pixel to get Visually acceptable results, it is necessary to provide three samples (color channels) per pixel Which are interpreted As coordinates in some color space typically uses RGB color space in screens But other areas such as YCbCr, HSV, In another picture Color contacts. A three values per pixel and they measure the intensity and discoloration of actual light information Stored in digital image data is the brightness information in each spectral range usually stored The color image in memory as a map Small integer triplets or rarely three separate bitmaps, One per channel.



**Figure (2) RGB color image layers**

Separate R, G, B and eight-bit image layers per sample (24 bits per pixel) seems sufficient for most Uses, but the artifacts may still faint ranges still visible in some images smoothly Varying, especially those subject to treatment. Particularly applications that require may use 10 bits Per sample or more.

Color Basics Each pixel in color images has three values, a combination of Red, green, blue to represent new color Each color has values from 0 to 255, that is for color

Red 256 different value (from light to dark) and to green and blue the same, when combined All possibilities of the three colors we get number 16,777,216 different color.

### 2-1-3-Gray scale Image

This represents images based on one color of the image or the so-called (Monochrome) It has information about lighting for the image only and does not have color information about this information The brightness of the image levels is bit 8 The pixels for the data for different levels mean  $2^8=256$  means 0 to 256 different light levels of this type of image. Easy conversion to binary images.

It is a black and white image with gray scale and its intensity is represented by numbers of 0 to 255 where one represents white color and intensity when 255 is the color of this pixel It is black and when this image is represented on the computer, it is represented by equal columns and rows . Equivalent of pixels Each pixel has an 8-bit intensity limit of 0 to 255.

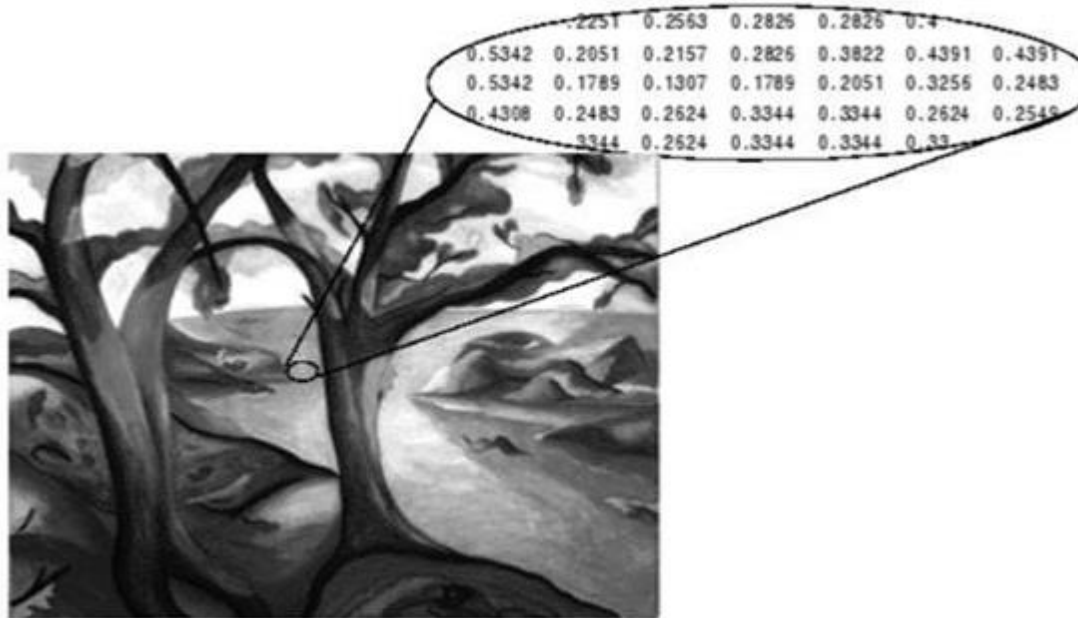
Gray is a collection of monochromatic shades from black to white. Therefore, the image is gray It contains only shades of gray and the gray image number contains 256 degrees of chromaticity Bright white to dark black.

Gray or( gray level )the picture is just one where the only colors are shades of the colour grey. The reason to differentiate these images from any other type of color image is that less

Information needs to be provided for each pixel. In fact gray 'Color' is red Green and blue components are all equally dense in RGB space, so they are only Necessary to determine the value of one density per pixel, as opposed to the three intensity necessary to determine each pixel in Full color picture. Gray scale intensity is often stored as an 8-bit number giving 256 different shades Of possible gray from black to white. If the levels are evenly spaced then the difference between straight gray levels is much better than the standard gray power solution for the human eye .Pictures Gray is very common, due in part to much of the display and photo taking devices today can Supports only 8-bit images In addition, gray images are quite adequate for many tasks and so on There is no need.

Gray is a collection of gray shades without clear color. The darkest shade possible black, it is Total absence of the transmitter or reflect light. The lighter shade is possible white, the entire transfer or light reflection On all visible wavelength image. Shades of gray medium are represented by equal levels The brightness of the three basic colors (red, green and blue) of the transmitted light, or equal amounts Of the three basic dyes (cyan, magenta and yellow) for reflected light.

It is a two-dimensional matrix of  $m * n$  size and its elements are double and fall within  $[0,1]$ , where 0 represents black and 1 is white, and 1 is the domain Between them represent gray scale gradients, the following figure illustrates this type of image.



**Figure (3) Gray image**

#### **2-1-4 Multi spatial Image**

Take by special cameras where there are many band bands that may arrive in some Sometimes to hundreds of band and when working on them fall these bandits in a certain way called

(Mapping) layout or tab so that corresponding to the third type of images means becoming multiple To a colored image (combining red gradients merged with red color) and by a projection process The image becomes three basic colors only. [6]

## 2-2 Sound file format

- **wav** - standard audio file format used mainly in Windows PCs. Commonly used for storing uncompressed (PCM), CD-quality sound files, which means that they can be large in size - around 10MB per minute of music. It is less well known that wave files can also be encoded with a variety of codecs to reduce the file size (for example the GSM or mp3 codecs). A list of common wave file codecs can be found.
- **mp3** - the MPEG Layer-3 format is the most popular format for downloading and storing music. By eliminating portions of the audio file that are essentially inaudible, mp3 files are compressed to roughly one-tenth the size of an equivalent PCM file while maintaining good audio quality. We recommend the mp3 format for music storage. It is not that good for voice storage. for a sample mp3 encoded wav file.
- **ogg** - a free, open source container format supporting a variety of codecs, the most popular of which is the audio codec Vorbis. Vorbis files are often compared to MP3 files in terms of quality. But the simple fact mp3 are so much more broadly supported makes it difficult to recommend ogg files.
- **gsm** - designed for telephony use in Europe, gsm is a very practical format for telephone quality voice. It makes a good compromise between file size and quality. We recommend this format for voice. Note that wav files can also be encoded with the gsm codec. for a sample gsm encoded wav file.
- **dct** - A variable codec format designed for dictation. It has dictation header information and can be encrypted (often required by medical confidentiality laws). for a list of codecs supported in dct files. The standard DCT
- **flac** - a lossless compression codec. You can think of lossless compression as like zip but for audio. If you compress a PCM file to flac and then restore it again it will be a perfect copy of the original. (All the other codecs discussed here are lossy which means a small part of the quality is lost). The cost of this losslessness is that the compression ratio is not good. But we recommend flac for archiving PCM files where quality is important (eg. broadcast or music use).
- **au** - the standard audio file format used by Sun, Unix and Java. The audio in au files can be PCM or compressed with the ulaw, alaw or G729 codecs.
- **aiff** - the standard audio file format used by Apple. It is like a wav file for the Mac.

- **vox** - the vox format most commonly uses the Dialogic ADPCM (Adaptive Differential Pulse Code Modulation) codec. Similar to other ADPCM formats, it compresses to 4-bits. Vox format files are similar to wave files except that the vox files contain no information about the file itself so the codec sample rate and number of channels must first be specified in order to play a vox file. Vox a very old file type and is pretty poor. We do not recommend it for anything except for supporting legacy systems.
- **raw** - a raw file can contain audio in any codec but is usually used with PCM audio data. It is rarely used except for technical tests.

### 2-2-1 Proprietary Formats (supported by our software)

- **wma** - the popular Windows Media Audio format owned by Microsoft. Designed with Digital Rights Management (DRM) abilities for copy protection.
- **aac** - the Advanced Audio Coding format is based on the MPEG4 audio standard owned by Dolby. A copy-protected version of this format has been developed by Apple for use in music downloaded from their iTunes Music Store.
- **atrac** (.wav) - the older style Sony ATRAC format. It always has a .wav file extension. To open these files simply install the ATRAC3 drivers.
- **ra** - a Real Audio format designed for streaming audio over the Internet. The .ra format allows files to be stored in a self-contained fashion on a computer, with all of the audio data contained inside the file itself.
- **ram** - a text file that contains a link to the Internet address where the Real Audio file is stored. The .ram file contains no audio data itself.
- **dss** - Digital Speech Standard files are an Olympus proprietary format. It is a fairly old and poor codec. Prefer gsm or mp3 where the recorder allows.
- **msv** - a Sony proprietary format for Memory Stick compressed voice files. You might need a Sony plugin to load this. Click [\\_](#)
- **dvf** - a Sony proprietary format for compressed voice files; commonly used by Sony dictation recorders. You might need a Sony plugin to load this.

## 2-2-2 Other Formats

- *atrac* (*.oma*, *.omg*, *.atp*) - the newer style Sony proprietary format designed for minidisc use. It always has a *.oma*, *.omg* or *.atp* file extension. It is similar to mp3 and probably only useful if you are reading files from minidisks or writing for minidisks. Note most of these files are rights managed so you cannot open them in any software programs.
- *mid* - the midi file is not an audio file format at all. It is just a list of musical notes which a synthesizer can play.
- *ape* - the file format from Monkey's Audio is claimed to give about 50% compression without loss in audio quality.

## 2-3 compression methods

### 2-3-1-Lossy data compression

In information technology, compression with loss of information is a means of data encryption Which pressure data to lose some information, the process aims to reduce the amount of information that Stored or sent by computer, Different versions of the cat image, explain how Dispense with a few data and how to convert the image to a lower quality after losing information from The normal loss of a certain amount of data without the user notice any change in the image , Compression with loss of information is the most commonly used to compress multimedia (files, Images, files Audio, video )especially in applications such as streaming media and Internet telephony, By contrast, this method can't be used in text files and bank records but rather from Better to use other compression methods do not lose data.



Figure (4-a) Low compression(high quality) JPEG



b- High compression (low quality) JPEG

Many types of digital data can be compressed in a way that reduces the size of the files you want stored in the computer without loss of complete information in the original image file. An example, a shift of two digits to a set of digital dots with the color level and brightness level at each point. If the image contains points of the same color you can reduce the number of these points without any loss. The original text contains a certain amount of information; there is a minimum file size that

It can store all the data, for example most people know that a zip file is smaller than the original file but does not mean that if we continue to compress it will become empty, on the contrary

It will become larger in size. In many cases, files, data, and tables contain more information than is needed for a specific purpose, for example, there may be more detailed images than the eye can distinguish when they are in their largest size; similarly, an audio file does not need a lot of fine detail. During the development of information compression technology with the loss of the similarity of human perception

The process is very complex when the ideal file is a file that is similar to human perception with a larger quantity of information

Other times the loss of a little file quality is acceptable to reduce size. While reducing data (compression, be it with loss or without) is the main objective of converting encoding it also allows achieving other goals: one may represent more accurate data for the data of the original image. Repeated compression and decompression may lead to gradual loss of quality, and this is unlike a process of lossless compression where information will not be lost as the other type is provided. Theoretical foundations, information on data compression with loss by theory of rate distortion rate theory. Distortion is highly dependent on the estimation of the theory of default and the theory of decision in order to design a distortion model

Sensory perception and judgment of aesthetics. This is very similar to coding theory.

### **2-3-2 Lossless data compression**

Compacting undamaged data or compressing undamaged data is a way to compress data you press a file by recording the data that it contains in a more subtle method does not perform the compression method. This will lose any of the original data when decompressing using the undamaged compression with files. Programs and images, such as medical x-ray image, where no loss of data can be tolerated.



Lossless Is a class of data compression algorithms that allow the original data to be rebuilt Completely compressed data by contrast, Lossy allows only reconstruction to approximation

The original data, although this usually improves the compression rates (thus reducing the file size).

Lossless data compression is used in many applications, for example, it is used in A compressed file format and the GNU tool Gzip tool are often also used as a component within technologies Lossy data compression Lossless compression is used in situations where it is important that the parent and the compressed data be Are identical or where deviations from the original data can be harmful and are examples of redistributable programs Executable, text documents, source code and some image file formats Such as PNG or GIF, Use Lossless compression only, while others such as TIFF and MNG may be used either Lossless or Lossy Methods. Lossless audio formats are often used for archive or production purposes,

While smaller lossy audio files are typically used on portable players in situations Other where unlimited or unlimited storage space, redundant audio is unnecessary.

### **2-3-3 Improved images**

Image optimization can be used to improve image capture or modification by changing Size, color, contrast, or brightness, or to compare or analyze images in terms of features that are not The human eye can pick them up. This has opened many new fields in private applications Processing images. However, the use of such processes raises concerns about the accuracy of the match the origin. Image processing features, for example, include: Using filters and color curves Color management tools.

## 2-4 method

### 2-4-1 Image Compression Using the Discrete Cosine Transform

The discrete cosine transform (DCT) is a technique for converting a signal into elementary frequency components. It is widely used in image compression. Here we develop some simple functions to compute the DCT and to compress images. These functions illustrate the power of Mathematica in the prototyping of image processing algorithms.

With the advance of the information age, the need for mass information storage and fast Communication links grows. Storing images in less memory leads to a direct reduction in storage cost and faster data transmissions. Image compression is to reduce irrelevance and redundancy of image data in order to be able to store or transmit data in an efficient form. Compression is achieved by the removal of one or more of the three basic data redundancies: Coding, Inter pixel and psycho visual redundancy. Now a day's mostly used image compression technique is DCT because of its energy compaction property. The DCT is almost similar to the K – L Transform where coefficients are approximated by Eigen values and Eigen vectors. Shape Adaptive DCT compression is used for images with irregular shapes but time of conversion is high. SA-DCT is used in MPEG – 4 for encoding the image after dividing the image into shapes. In SA-DCT image is processed as a sequence of discrete intensity levels, the first row is processed first and then second, this process is continued for all the rows of the image.

SA-DCT of a 1-D sequence of length N is

$$C(u) = \alpha(u) \sum_{x=0}^{N-1} f(x) \cos \left[ \frac{\pi(2x+1)u}{2N} \right] \quad (1)$$

For  $u = 0, 1, 2, \dots, N-1$ .

Similarly, the inverse transformation is defined as

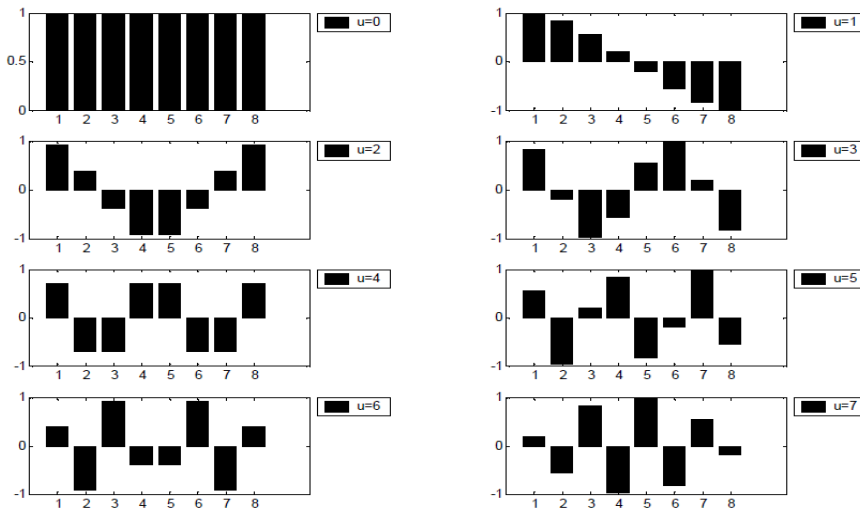
$$f(x) = \sum_{u=0}^{N-1} \alpha(u) C(u) \left[ \frac{\pi(2x+1)u}{2N} \right] \quad (2)$$

For  $x = 0, 1, 2, \dots, N-1$ .

In both equations (1) and (2)  $\alpha(u)$  is defined as

$$\alpha(u) = \begin{cases} \sqrt{\frac{1}{N}}, & u = 0 \\ x \sqrt{\frac{2}{N}}, & u \neq 0 \end{cases} \quad (3)$$

Thus, the first transform coefficient is the average value of the sample sequence. This value is referred to as the “DC Coefficient”. All other transform coefficients are called the “AC Coefficients”. The first the top-left waveform ( $u = 0$ ) renders a constant (DC) value, whereas, all other waveforms ( $u = 1, 2, \dots, 7$ ) give waveform sat progressively increasing frequencies.



**Figure 3 One dimensional cosine basis functions (N=8)**

These waveforms are called the cosine basis function. Note that these basis functions are orthogonal. Hence, multiplication of any waveform in Figure 3 with another waveform followed by a summation over all sample points yields a zero (scalar) value, whereas multiplication of any waveform in Figure 3 with itself followed by a summation yields a constant (scalar) value. Orthogonal waveforms are independent, that is, none of the basis functions can be represented as a combination of other basis functions.

If the input sequence has more than  $N$  sample points then it can be divided into subsequences of length  $N$  and DCT can be applied to these chunks independently. Here, a very important point to note is that in each such computation the values of the basis function points will not change. Only the values of  $f(x)$  will change in each sub-sequence.

This is a very important property, since it shows that the basis functions can be pre-computed offline and then multiplied with the sub-sequences. This reduces the number of mathematical operations (i.e., multiplications and additions) thereby rendering computation Efficiency.

The 2-D DCT is a direct extension of the 1-D case and is given by

$$C(u, v) = \alpha(u)\alpha(v) \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} f(x, y) \cos \left[ \frac{\pi(2x+1)u}{2M} \right] \cos \left[ \frac{\pi(2y+1)v}{2N} \right] \quad (4)$$

$\alpha(u)$  &  $\alpha(v)$  is defined as

$$\alpha(u) \& \alpha(v) = \begin{cases} \sqrt{\frac{1}{N}}, & u, v = 0 \\ \sqrt{\frac{2}{N}}, & u, v \neq 0 \end{cases} \quad (5)$$

For  $u, v = 0, 1, 2, \dots, N-1$

The inverse transform is defined as

$$f(x, y) = \alpha(u)\alpha(v) \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} C(u, v) \cos \left[ \frac{\pi(2x+1)u}{2M} \right] \cos \left[ \frac{\pi(2y+1)v}{2N} \right] \quad (6)$$

For  $x, y = 0, 1, 2, \dots, N-1$

### (a) Complete and orthonormal DCT basis in the trapezoid block

A matrix 'C' is said to be complete and orthogonal [11] if it satisfy the condition that inverse of the matrix is equal to the transpose of matrix i.e.  $C^{-1} = C^T$ . The Discrete Cosine Transform basis function is complete and orthogonal since this basis function matrix obeys the orthogonal property. Here, we define the trapezoid as a region that has  $M$  rows (or columns) and if the number of pixels in the  $m^{\text{th}}$  row ( $m = 0, 1, \dots, M-1$ ) is denoted by  $K(m)$ , then

$$K(m) + K(M-1-m) \text{ is a constant.} \quad (7)$$

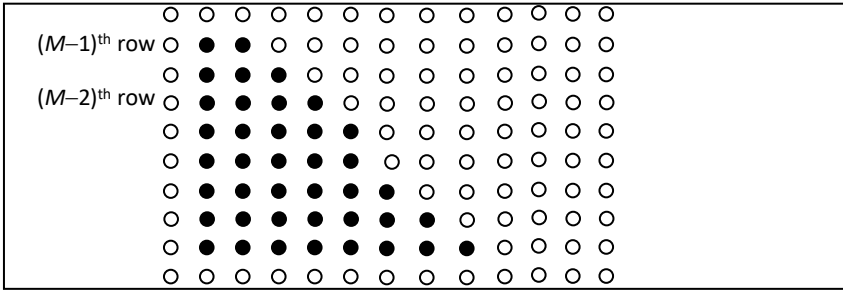


Fig.2. 1: A “trapezoid” region that satisfies (7) and the starting point of each row are aligned at the same column. Black dots mean the pixels in the trapezoid region.

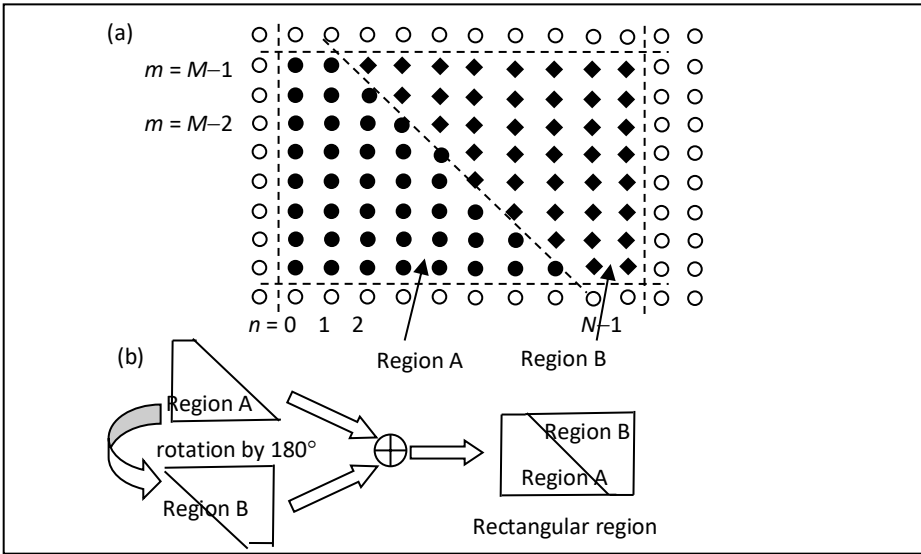


Fig.2.2: Extending the trapezoid region in Fig. 1 into a rectangular region,  $\bullet$  means the pixels in the original trapezoid region (Region A) and  $\blacklozenge$  means the pixels in the rectangular region but not in the original trapezoid region (Region B).

Note that the definition in (7) is more general than the traditional definition of the “trapezoid”. In Fig. 2.1, we show an example of a trapezoid region that satisfies (7) and the starting points of each row are aligned at the same column:

To derive the DCT bases that are orthogonal for the trapezoid region that satisfies (4), we can first use the method in Fig. 2.2(b) to convert the trapezoid region into an  $M \times N$  rectangular region where

$$N = K(m) + K(M-1-m) \tag{8}$$

The obtained rectangular region is shown in Fig. 2.2(a). It consists of two parts: Region A (the original trapezoid region) and region B (the extended region).

Note that, if (8) is satisfied, Region A and Region B have the same number of points ( $MN/2$ ) (See Fig. 2).

We can use the following process to derive the complete and orthonormal DCT basis set for the trapezoid block with right angles:

Step 1: First use the method as in Fig. 2 to construct an  $M$  by  $N$  rectangular region. Then use (2) to obtain the orthonormal DCT basis for the rectangular region.

Step 2: Select the DCT basis functions that are even

Step 3: multiple the DCT coefficients by root 2, then results forms a complete orthonormal basis set in the right trapezoid block.

### **(b) Tri DCT based image compression**

In Tri DCT based image compression the image is segmented into even and uneven parts by using a watershed segmentation algorithm. The even part of the image is processed with Tri-DCT based image compression. The uneven parts are divided into complete blocks and incomplete blocks. Complete blocks are processed with JPEG image compression technique and incomplete blocks are processed with SA-DCT image compression technique. All the processed image are coded with a rice code.

The below figure shows the flow chat of Tri-DCT based image compression

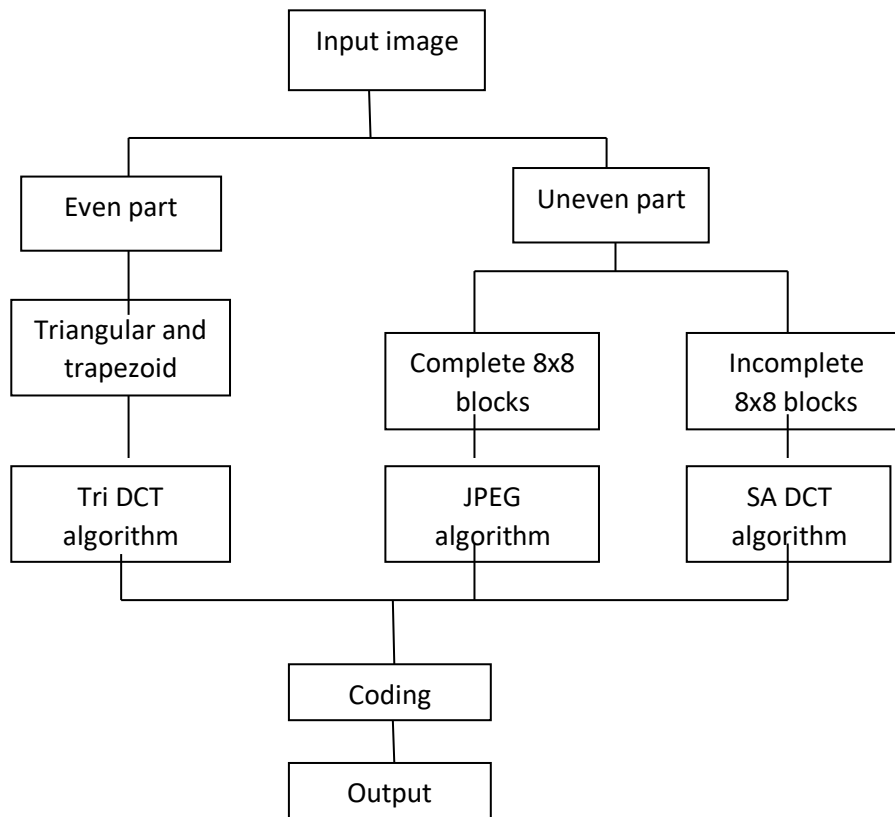


Fig. 3.1 Tri –DCT image compression flow chat

## 2-4-2 Haar Wavelets

A Haar wavelet is the simplest type of wavelet. In discrete form, Haar wavelets are related to a mathematical operation called the Haar transform. The Haar transform serves as a prototype for all other wavelet transforms. Studying the Haar transform in detail will provide a good foundation for understanding the more sophisticated wavelet transforms which we shall describe in the next chapter. In this chapter we shall describe how the Haar transform can be used for compressing audio signals and for removing noise. Our discussion of these applications will set the stage for the more powerful wavelet transforms to come and their applications to these same problems. One distinctive feature that the Haar transform enjoys is that it lends itself easily to simple hand calculations. We shall illustrate many concepts by both simple hand calculations and more involved computer computations.

### (a) Compression of audio signals

In this section we show how this redistribution of energy can be used to compress audio signals. By compressing an audio signal we mean converting the signal data into a new format that requires less bits to transmit. When we use the term, audio signal, we are speaking somewhat loosely. Many of the signals we have in mind are indeed the result of taking discrete samples of a sound signal—as in the data in a computer audio file, or on a compact disc—but the techniques developed here also apply to digital data transmissions and to other digital signals, such as digitized electrocardiograms or digitized electroencephalograms.



There are two basic categories of compression techniques. The first category is lossless compression.

Lossless compression methods achieve completely error free decompression of the original signal. Typical lossless methods are Huffman compression, LZW compression, arithmetic compression, or run-length compression. Combinations of these techniques are used in popular lossless compression programs, such as the kind that produce files. Unfortunately, the compression ratios that can be obtained with lossless methods are rarely more than 2:1 for audio files consisting of music or speech. The second category is lossy compression. A lossy compression method is one which produces inaccuracies in the decompressed signal. Lossy techniques are used when these inaccuracies are so small as to be imperceptible. The advantage of lossy techniques over lossless ones is that much higher compression ratios can be attained. With wavelet compression methods, which are lossy, if we are willing to accept the slight inaccuracies in the decompressed signal, then we can obtain compression ratios of 10:1, or 20:1, or as high as 50:1 or even 100:1. In order to illustrate the general principles of wavelet compression of signals, we shall examine, in a somewhat simplified way, how the Haar wavelet transform can be used to compress some test signals. For example, Signal 1 in Figure 1.4(a) can be very effectively

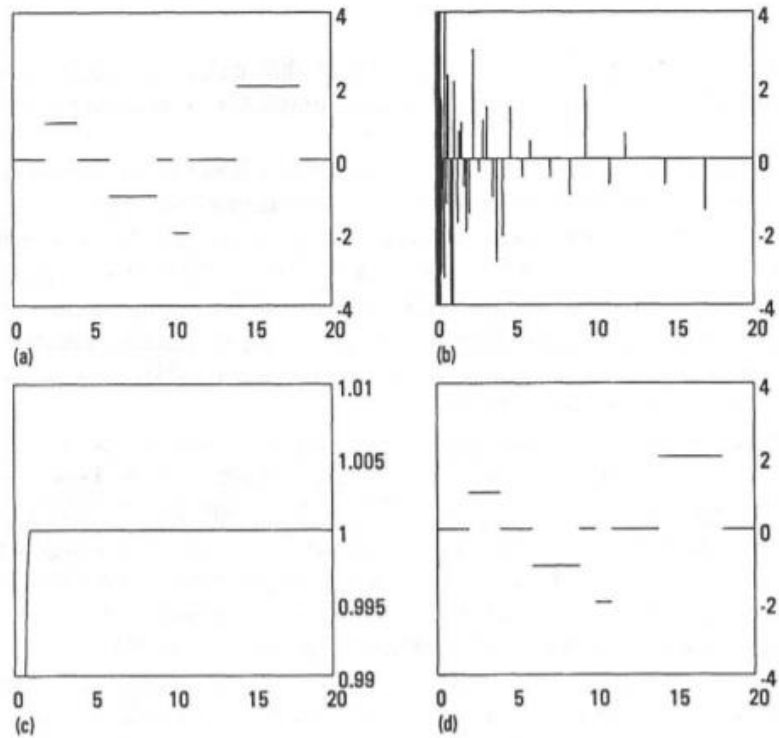


FIGURE 1.4

(a) Signal 1, (b) 10-level Haar transform of Signal 1, (c) energy map of Haar transform, (d) 20:1 compression of Signal 1, 100% of energy

### (b) Wavelet transform (WT)

is a signal processing technique was developed as a method to obtain simultaneous, have high resolution frequency and time, Wavelet Transform (WT) too for image processing and compressing from the Fourier transform (FT) and has been widely used to signal processing application. The WT presents an improvement over the STFT and possesses multidimensional characters and are able to adjust their scale to the nature of a signal features.

Singularities and irregular structures in signal waveform often carry important information from an informatics-theoretic point of view. Wavelet Transform (WT) is Analyzes provides a kind of mathematical functions in zoom out or zoom in, on those interesting structures of sound and image . Wavelets can be are able to capture deterministic features and orthonormal. Therefore, WT can decompose a signal into translation parameters and localized contributions labeled by socalled dilation. These parameters represent the information of different frequency component contained in the analyzed signals.Wavelet transform or wavelet analysis is a recently developed mathematical tool for many problems. One of the popular families of wavelet is Haar wavelets. Haar wavelet function in fact the Daubechies wavelet of order 1. Due to its simplicity, the Haar wavelet had become an effective tool for solving many problems arising in many branches of sciences. Haar wavelet functions have been used since year at 1910. It was introduced by the Hungarian mathematician Alfred Haar .

A short introduction to the continuous wavelet transform (CWT) is presented next. For more details on this subject, interested in these topics, readers can consult in Lange et al. or other texts. In order to build a robust pattern matching method, we also applied the CWT in MS peak detection.

In contrast to the algorithm proposed by Mallat we directly apply the CWT over the raw spectrum and utilize the information over the 1D CWT coefficients matrixes, which provide additional information on how the CWT coefficients change over scales.

Dolphins family in mammals have good hearing of sensitivity. It is caused by a network system senses of hearing has been well. Dolphins can be hearing of click sounds with frequencies range 1-150 kHz.

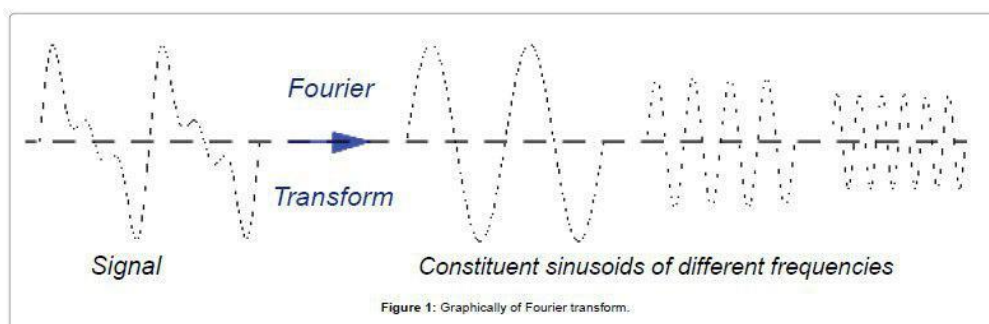
Previous research by looking at a whistle sound vocalizations of dolphins and a clicking sound is .Vocalizations research about stimulatory ever done with object Guppy fish in [13-16]. In this article discuss about haar wavelet method to spectral analysis continuous wavelet transform 1D using whistle sound and position dolphins (*Tursiops aduncus*), dolphins measured in captive of safari park, Cisarua, Indonesia. Data analysis in this research with MATLAB R2011a software with haar wavelet method in signal processing using MATLAB R2011.

### (c) Wavelet Method

In mathematically, the process of Fourier analysis is represented by the Fourier transform:

$$F(\omega) = \int_{-\infty}^{\infty} f(t) e^{-j\omega t} dt$$

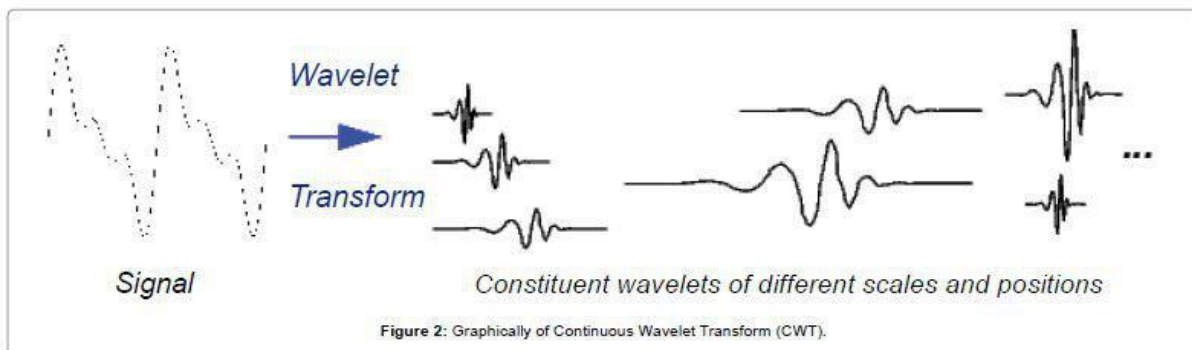
Which is the sum over all time of the signal  $f(t)$  multiplied by a complex exponential. (Recall that a complex exponential can be broken down into real and imaginary sinusoidal components.).The results of the transform are the Fourier coefficients  $F(\omega)$ , which when multiplied by a sinusoid of frequency yield the constituent sinusoidal components of the original signal. Graphically, the process of Fourier transform



Similarly, the Continuous Wavelet Transform (CWT) is defined as the sum over all time of the signal multiplied by scaled, shifted versions of the wavelet function  $\psi$ :

$$C(\text{scale}, \text{position}) = \int_{-\infty}^{\infty} f(t) \psi(\text{scale}, \text{position}, t) dt$$

The results of the Continuous Wavelet Transform (CWT) are many wavelet coefficients  $C$ , which are a function of scale and position. Multiplying each coefficient by the appropriately scaled and shifted wavelet yields the constituent wavelets of the original signal. Graphically, the process of Continuous Wavelet Transform



## Notation

Considers  $n$  locations in chromosome at which the relative copy number is measured by the  $\log_2$ -ratios of fluorescence intensities between in tumor and reference samples. A  $\log_2$ -ratio of 0 for a location means no aberration is observed at this locus whereas a positive or negative value indicates a possible gain or loss at the locus. Denote by  $Y(X_i)$  observed copy of number make changes at the  $i$ -th genomic location  $X_i$  for  $i = 1, \dots, n$ . In the additive measurement error model is postulated for relating the true latent signal  $f(X_i)$  and the observed copy number change  $Y(X_i)$ . This method model can be expressed as:

$$Y(X_i) = f(X_i) + \epsilon_i,$$

where function of  $\{\epsilon_i, i = 1, \dots, n\}$  are identically distributed and independent  $N(0, \sigma^2)$  and  $\sigma$  is standard deviation (SD). In what follows, we will describe the wavelet analysis and various thresholding methods for denoising the data.

## 2-4-3 Error Metrics

Two of the error metrics used to compare the various image compression techniques are the Mean Square Error (MSE) and the Peak Signal to Noise Ratio (PSNR). The MSE is the cumulative squared error between the compressed and the original image, whereas PSNR is a measure of the peak error. The mathematical formulae for the two are :

### 1- MSE

$$\frac{1}{MN} \sum_{y=1}^M \sum_{x=1}^N [I(x,y) - I'(x,y)]^2$$

## 2- PSNR

$$\text{PSNR} = 20 * \log_{10} (255 / \sqrt{\text{MSE}})$$

where  $I(x,y)$  is the original image,  $I'(x,y)$  is the approximated version (which is actually the decompressed image) and  $M,N$  are the dimensions of the images. A lower value for MSE means lesser error, and as seen from the inverse relation between the MSE and PSNR, this translates to a high value of PSNR. Logically, a higher value of PSNR is good because it means that the ratio of Signal to Noise is higher. Here, the 'signal' is the original image, and the 'noise' is the error in reconstruction. So, if you find a compression scheme having a lower MSE (and a high PSNR), you can recognise that it is a better one.

# Chapter Three

Practical Work



### 3-1 Introduction

The applies practical to project by implement compression algorithms using programming tools which is DCT and Haar on to groups of sound and images files , where it was used DCT to compressed images files , while used Haar to compressed sound files

### 3-2 project tools :

- (a) Programming Language: we used MATLAB that is a multi-paradigm numerical computing environment and proprietary programming language developed by Math Works. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, C#, Java, Fortran and Python. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing abilities. An additional package, Simulink, adds graphical multi-domain simulation and model-based design for dynamic and embedded systems.
- (b) Hardware Component we used computer that characteristics:  
Core i 5 , 1.9 GHZ as speed of processor , 4 th , Ram 4 GB , hard 500GB.

### 3-3 Applications of Programs:

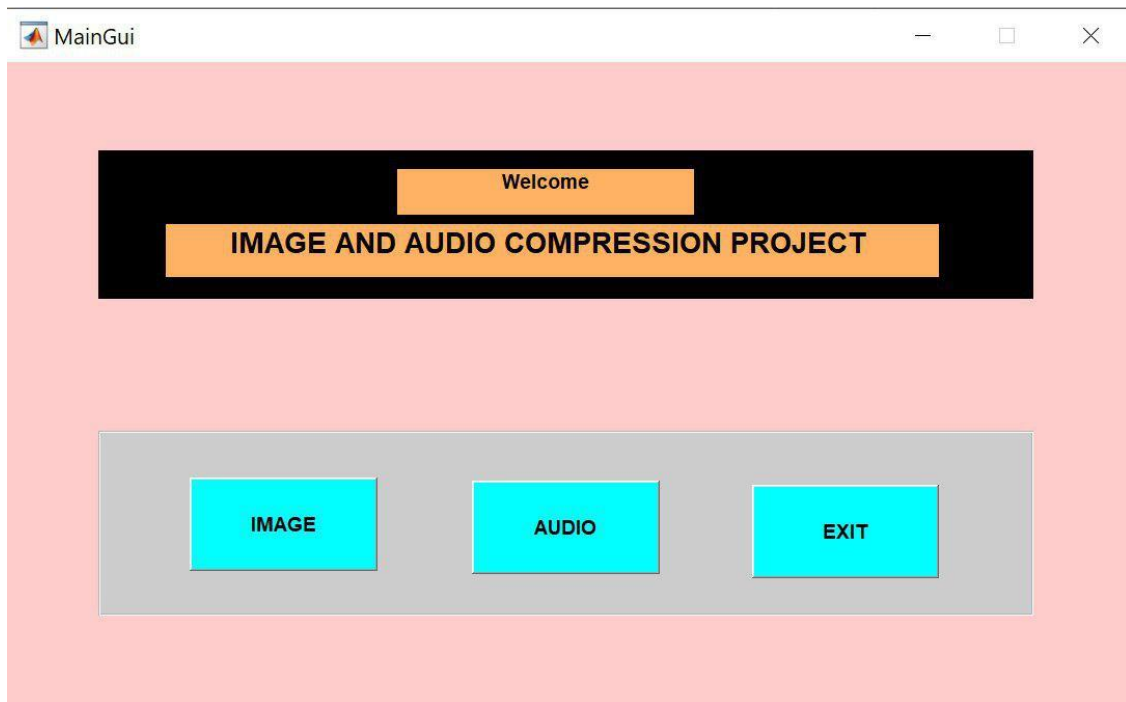
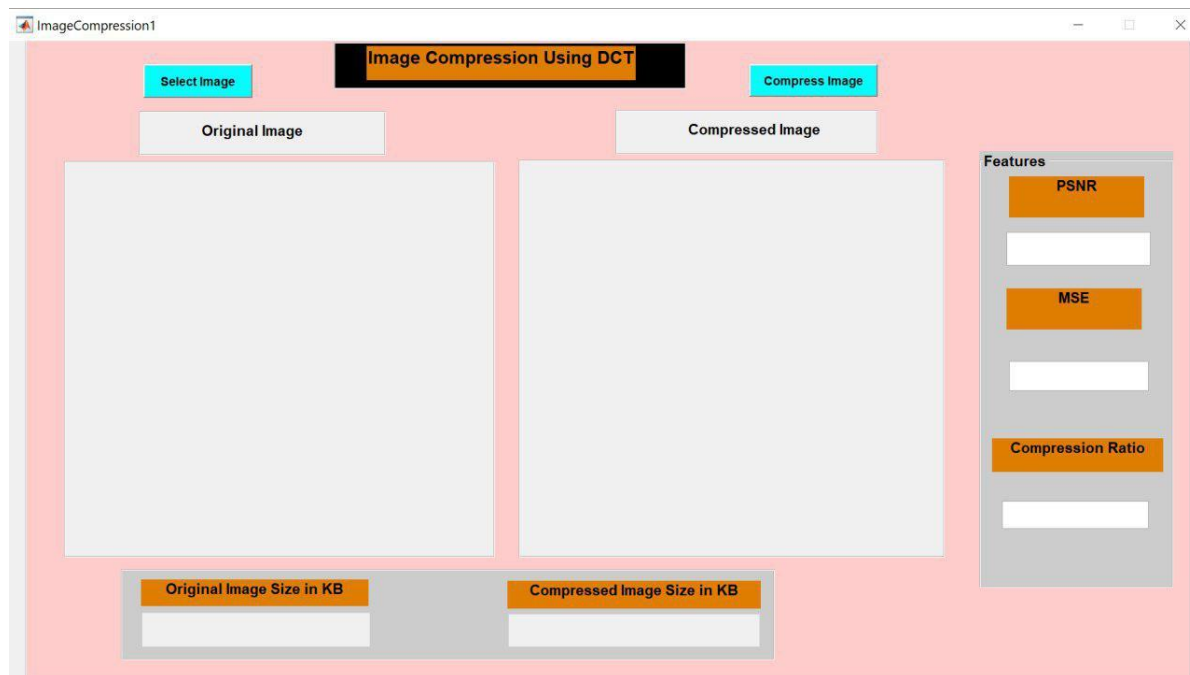
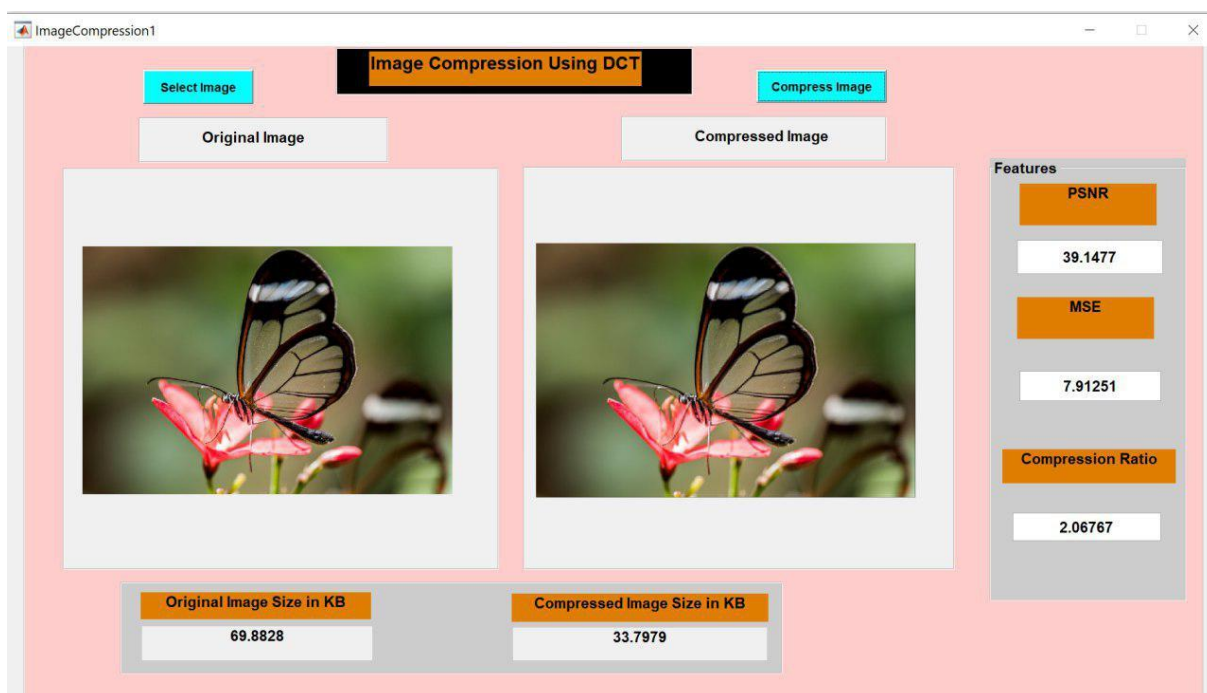


Fig3.1 Main User Interface



**fig 3.2 Interface image Before Compression**



**Fig3.3 interface Images after Compression**

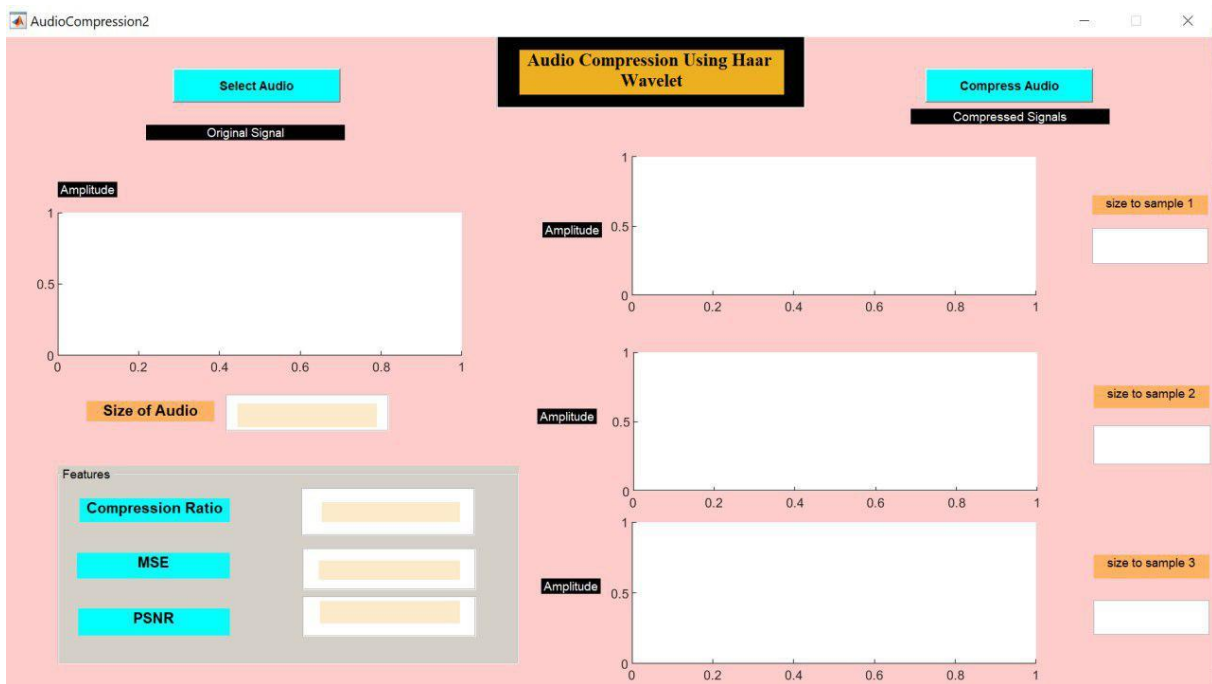


fig 3.4 Interface sound Before Compression

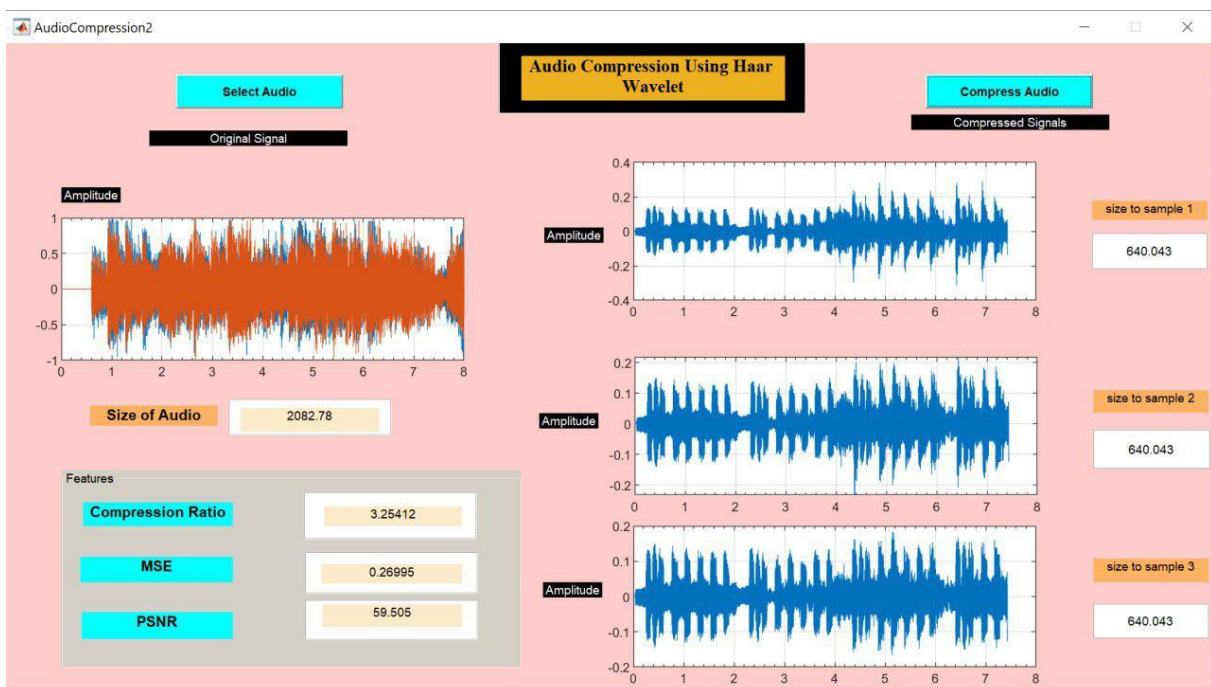


fig 3.5 Interface sound after Compression

**3-4 Samples:**

**(a) Samples image**



**Img1 (original image)**



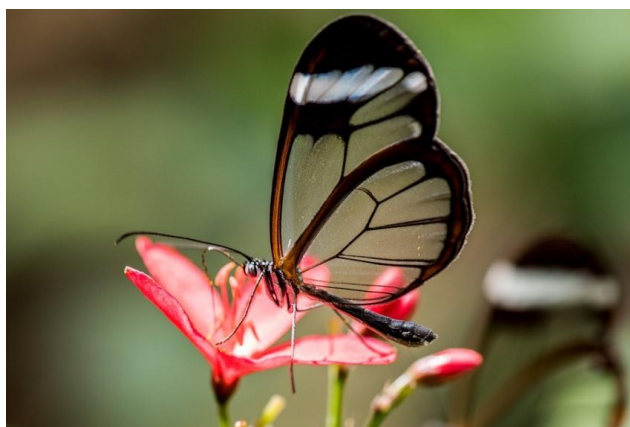
**Compressed image**



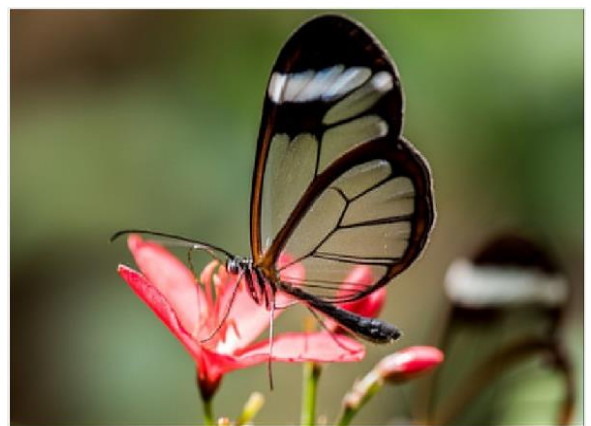
**Img2 (original image)**



**Compressed image**



**Img4 (original image)**



**Compressed image**



**Img6 (original image)**



**Compressed image**



**Img5 (original image)**



**Compressed image**



**Img7 (original image)**



**Compressed image**



**Img12 (original image)**



**Compressed image**



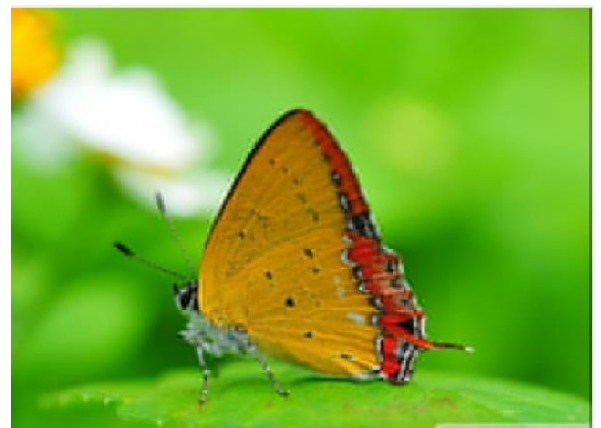
**Img8 (original image)**



**Compressed image**



**Img14 (original image)**



**Compressed image**



**Img9 (original image)**



**Compressed image**



**Img17 (original image)**



**Compressed image**








**Img16 (original image)**






**Compressed image**








## (b) Samples sound

 MmrDiab	4/15/2019 10:56 PM	WAV Audio File (V...	2,083 KB
 muc1	4/6/2019 10:00 PM	MP3 Audio File (V...	158 KB
 muc2	4/6/2019 10:27 PM	MP3 Audio File (V...	127 KB
 music1	4/11/2019 3:05 PM	WAV Audio File (V...	2,068 KB
 muz1	4/11/2019 3:05 PM	WAV Audio File (V...	2,068 KB




### Original Sample

 output1	4/17/2019 9:52 PM	WAV Audio File (V...	641 KB
 output2	4/17/2019 9:52 PM	WAV Audio File (V...	641 KB
 output3	4/17/2019 9:52 PM	WAV Audio File (V...	641 KB






### Compressed Sample

 handel	4/14/2019 12:25 PM	WAV Audio File (V...	143 KB
 Hath	4/15/2019 11:08 PM	WAV Audio File (V...	2,164 KB
 Havana3	4/12/2019 9:45 PM	MP3 Audio File (V...	35 KB
 Hobak	4/15/2019 10:45 PM	WAV Audio File (V...	2,137 KB
 Husam	4/15/2019 10:53 PM	WAV Audio File (V...	2,218 KB




### Original Sample

 output1	4/17/2019 9:50 PM	WAV Audio File (V...	641 KB
 output2	4/17/2019 9:50 PM	WAV Audio File (V...	641 KB
 output3	4/17/2019 9:50 PM	WAV Audio File (V...	641 KB





### Compressed Sample

 handel	4/14/2019 12:25 PM	WAV Audio File (V...	143 KB
 Hath	4/15/2019 11:08 PM	WAV Audio File (V...	2,164 KB
 Havana3	4/12/2019 9:45 PM	MP3 Audio File (V...	35 KB
 Hobak	4/15/2019 10:45 PM	WAV Audio File (V...	2,137 KB
 Husam	4/15/2019 10:53 PM	WAV Audio File (V...	2,218 KB




### Original Sample

 output1	4/17/2019 9:51 PM	WAV Audio File (V...	641 KB
 output2	4/17/2019 9:51 PM	WAV Audio File (V...	641 KB
 output3	4/17/2019 9:51 PM	WAV Audio File (V...	641 KB






### Compressed Sample

 muc1	4/6/2019 10:00 PM	MP3 Audio File (V...	158 KB
 muc2	4/6/2019 10:27 PM	MP3 Audio File (V...	127 KB
 music1	4/11/2019 3:05 PM	WAV Audio File (V...	2,068 KB
 muz1	4/11/2019 3:05 PM	WAV Audio File (V...	2,068 KB




### Original Sample

 output1	4/17/2019 9:53 PM	WAV Audio File (V...	641 KB
 output2	4/17/2019 9:53 PM	WAV Audio File (V...	641 KB
 output3	4/17/2019 9:53 PM	WAV Audio File (V...	641 KB

### Compressed Sample

 handel	4/14/2019 12:25 PM	WAV Audio File (V...	143 KB
 Hath	4/15/2019 11:08 PM	WAV Audio File (V...	2,164 KB
 Havana3	4/12/2019 9:45 PM	MP3 Audio File (V...	35 KB
 Hobak	4/15/2019 10:45 PM	WAV Audio File (V...	2,137 KB
 Husam	4/15/2019 10:53 PM	WAV Audio File (V...	2,218 KB

### Original Sample

 output1	4/17/2019 9:49 PM	WAV Audio File (V...	641 KB
 output2	4/17/2019 9:49 PM	WAV Audio File (V...	641 KB
 output3	4/17/2019 9:49 PM	WAV Audio File (V...	641 KB

### Compressed Sample

### 3-5 The results:

(a) Image

(b) CR: Compression Ratio

(c) MSE: Mean Square Error

(d) PSNR: Peak Signal to Noise Ratio

Image	CR	MSE	PSNR	Run Time
Img1(jpg)	4.03731	47.5106	31.3629	18 s
Img2(jpg)	1.65554	30.9055	33.2304	6 s
Img4(jpg)	2.06767	7.91251	39.1477	11 s
Img8( PNG)	14.4354	8.59381	38.7889	23 s
Img12( PNG)	13.3464	19.8721	35.1484	32 s
Img16(PNG)	19.3452	13.7524	36.747	35 s
Img15(BMP)	22.6005	18.4733	35.4654	3.5 s
Img17(BMP)	18.357	59.2412	30.4046	3.5 s
Img14(BMP)	34.5174	11.1099	37.6737	4 s
Img7(BMP)	15.8563	54.5525	30.7627	2 s
Img9(PNG)	11.2833	32.5299	33.008	4 s

Table 3.1

## (b) Sound

**CR: Compression Ratio**

**MSE: Mean Square Error**

**PSNR: Peak Signal to Noise Ratio**

Audio	CR	MSE	PSNR	Run Time
Hath(wav)	3.38068	0.0043955	95.27	1.5 s
Hobak (wav)	3.33849	0.004059	95.9624	1.5 s
Husam(wav)	3.465	0.0102	87.94	2 s
Music1(wav)	3.22999	0.1256	66.15	2 s
MmrDiab(wav)	3.254	0.2699	59.505	1 s

**Table 3.2**

## 3-6 Conclusion and Future Work

The results in the current research were implemented through the application of a compression programs on the image files (png, jpg, bmp) and digital audio (wav) for the purpose of compression and reduce the size of the treasury to the least possible storage and as original image files and digital audio. Also the compression of these files is of great importance in the field Analysis, processing and transmission of images and sound as it reduces the volume of the sound and image without loss or with a relatively unimportant loss of the original data and the accuracy of the image and sound compression. In our work , three quantities ( MSE , PSNR , CR ) were applied to measure the compression methods ( DCT , Haar) with different samples . the results of these measure are that we obtained are good. There are some works can be developed as a future work through developing a compressor for all types of files without losing completely by adding other measurements in order to determine the error rate better, as well as the use of other algorithms and compare the results.

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