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A REVIEW OF WATERMARKING IN IMAGE PROCESSING

Priya Darshini Mehra[1], Dr. Kapil Kumar Kaswan[2]

[1]Research Scholar, Department of CSA, Chaudhary Devi lal University,Sirsa(India)
[2]Assistant Professor, Department of CSA, Chaudhary Devi lal University,Sirsa(India)

ABSTRACT:
The research work is about watermarking in image processing. The increasing amount of research on watermarking over the past decade has been largely driven by its important applications in digital copyrights management and protection. One of the first applications for watermarking was broadcast monitoring. It is often crucially important that we are able to track when a specific video is being broadcast by a TV station. This is important to advertising agencies that want to ensure that their commercials are getting the air time they paid for. Watermarking can be used for this purpose. The research work provides the study the existing researches in the field of watermarking in image processing. It also analyzes the loopholes of existing researches related to watermarking in image processing. This research would explain the watermarking technology more fundamentally. Finally the images with watermarks embedded have been tested and then the features and quality of embedded watermarks are analyzed. The surviving abilities of watermarks are verified and the description of the testing process and results are given.

1. INTRODUCTION

Today's generation is witness of developments of digital media. A very simplest example of digital media is a photo captured by phone camera. The use of Digital media is common in present era. Other example of Digital media is text, audio, video etc.

In recent years, the proliferation of digital media has established the need for the development of tools for the efficient access and retrieval of visual information. At the same time, watermarking has received significant attention due to its applications on the protection of intellectual property rights (IPR). However, many other applications can be conceived which involve information hiding. In this paper, we propose the employment of watermarking as a means to content-based indexing and retrieval of images from data bases.

History of encrypting and hiding information is very long. There are well-known examples from ancient Greece, Egypt, and middle Ages. There are three the most important branches of encrypted communication known as cryptography, steganography, and watermarking. The word "cryptography" is derived from the Greek 'kryptos' which means 'hidden', and 'graphia', which means 'writing'. The dictionary defines cryptography as hidden writing. The Ancient Egyptians, Greeks and Romans developed their own systems to encrypt messages using special ciphers for instance by rearranging the order of letters in a message or substituting letters with other letters, signs, or numbers. There is the well-known example brilliantly described by Conan Doyle in The Dancing Men story from The Adventures of Sherlock Holmes. This example shows one of the wide-spread methods of encrypting and decrypting messages. The modern word Cryptography means the art and science of encrypting and decrypting information.

Watermarking applications

The increasing amount of research on watermarking over the past decade has been largely driven by its important applications in digital copyrights management and protection. One of the first applications for watermarking was broadcast monitoring. It is often crucially important that we are able to track when a specific video is being broadcast by a TV station. This is important to advertising agencies that want to ensure that their commercials are getting the air time they paid for. Watermarking can be used for this purpose. Information used to identify individual videos could be embedded in the videos themselves using watermarking, making broadcast monitoring easier. Another very important

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application is owner identification. Being able to identify the owner of a specific digital work of art, such as a video or image can be quite difficult. Nevertheless, it is a very important task, especially in cases related to copyright infringement. So, instead of including copyright notices with every image or song, we could use watermarking to embed the copyright in the image or the song itself. Transaction tracking is another interesting application of watermarking. In this case the watermark embedded in a digital work can be used to record one or more transactions taking place in the history of a copy of this work. For example, watermarking could be used to record the recipient of every legal copy of a movie by embedding a different watermark in each copy. If the movie is then leaked to the Internet, the movie producers could identify which recipient of the movie was the source of the leak.

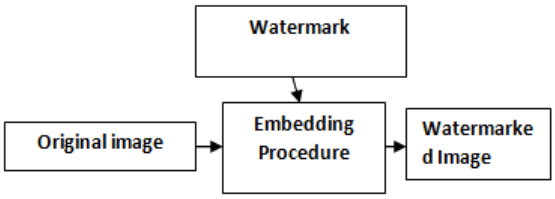

Fig.1.1 Functioning of Digital Watermarking

2.IMAGE COMPRESSION

Image compression is a type of data compression applied to digital images, to reduce their cost for storage or transmission. Algorithms may take advantage of visual perception & statistical properties of image data to provide superior results compared with generic compression methods. Image compression is minimizing size in bytes of a graphics file without degrading quality of image to an unacceptable level. Reduction in file size allows more images to be stored in a given amount of disk or memory space. It also reduces time required for images to be sent over Internet or downloaded from Web pages.

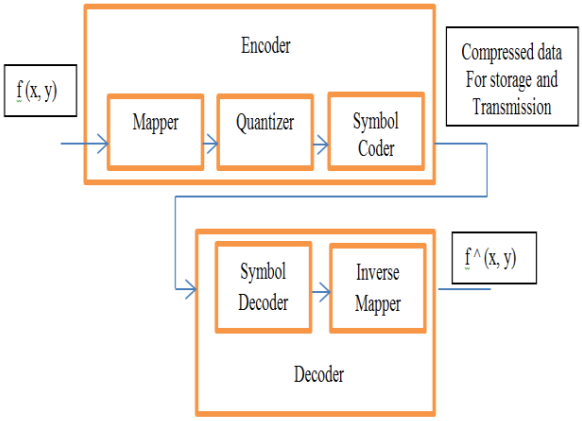

Figure 1.2: Functional Block Diagram of General Image Compression Systems

Loosy & Lossless Image Compression

Image compression may be lossy or lossless. Lossless compression is preferred for archival purposes & often for medical imaging, technical drawings, clip art, or comics. Lossy compression methods, especially when used at low bit rates, introduce compression artifacts. Lossy methods are especially suitable for natural images such as photographs in applications where minor loss of fidelity is acceptable to achieve a substantial reduction in bit rate. Lossy compression that produces negligible differences may be called visually lossless.

3. LITERATURE REVIEW

There are several researches in the field of image processing with watermarking .Some have been listed below:

In 2015, Zihao Xiao et.al[1] wrote a robust and encrypted digital image watermarking method against print-scan.

The growth of network multimedia systems has expanded the demand for image copyright protection. Digital watermark is one approach which is often used for image copyright protection. However, there are limitations of robustness and confidentiality in the common digital watermarking algorithms to resist print-scan attacks. In this paper, a new method combining zero watermarking, blind watermarking and Arnold scrambling is proposed.

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In 2017, Mahsa Boreiry et.al [2] wrote Classification of watermarking methods based on watermarking approaches.

Video watermarking is the approach of adding insensible data to video content in order to protect the owner's right. One of the main important issues in watermarking operation is the watermarking robustness.

In 2012, Maria Chroni et.al [3] presented an embedding graph-based model for software watermarking.

In a software watermarking environment, several graph theoretic watermark methods encode the watermark values as graph structures and embed them in application programs. In this paper we first present an efficient codec system for encoding a watermark number w as a reducible permutation graph F[π*] through the use of the self-inverting permutation π* which encodes the number w and, then, we propose a method for embedding the watermark graph F[π*] into a program P.

In 2017, Lizhong Zhang et.al [4] wrote Relational databases watermarking for textual and numerical data.

Digital Watermarking may be used to protect databases copyright. A new method for proving the ownership of relational databases is presented. Such approach is applied for protecting both textual and numerical data. This is done by embedding special mark and watermark bits into textual attributes and numerical attributes respectively. Carriage return character and linefeed character, representing 1 and 0 of watermarking bits respectively, are inserted into textual data.

In 2014, Ziquan Hu et.al [5] presented Game theory based false negative probability of embedded watermark under unintentional and steganalysis attacks.

Steganalysis attack is to statistically estimate the embedded watermark in the watermarked multimedia, and the estimated watermark may be destroyed by the attacker. The existing methods of false negative probability, however, do not consider the influence of steganalysis attack.

In 2011, Xianzhen Jin et.al [6] wrote A digital watermarking algorithm based on wavelet transform and singular value segmentation of the watermark image.

Digital watermarking is a topic that has recently gained increasing attention all over the world; we divide singular values of watermark image into two parts.

In 1998, G. Voyatzis et.al [7] presented Digital watermarking: An overview.

In this paper we describe a general framework for image copyright protection through digital watermarking. In particular we present the main features of an efficient watermarking scheme, discuss robustness issues and describe the three main stages of a watermarking algorithm namely watermark generation, embedding and detection.

In 2014, PratikChavada et.al [8] wrote Region of Interest Based Image Compression.

In medical images region of interest should not be distorted after compression. In case of conventional compression schemes equal loss of information would occur for whole image, as they are compressed with equal CR.But in ROI based compression schemes, visual quality of important area (ROI) would be quite better due to less information loss of ROI as compared to back ground.

In 2015, Ali Tariq Bhatti et.al [9] presented Implementation of Lossless Huffman Coding: Image compression using K-Means algorithm & comparison vs. Random numbers & Message.

Huffman coding analysis from provided results with help of MATLAB implementation using random numbers, message display lies in between for 26 English alphabets, & image compression via K-Means technique based on performance metrics that more compression ratio of Huffman coding.

In 2015, MalwinderKaur et.al [10] presented A Literature Survey On Lossless Image Compression.

The lossless compression is that allows original data to be perfectly reconstructed from compressed data. Lossless compression programs do two things in sequence: first step generates a statistical model for input data, & second step uses this model to map input data to bit sequences in such a way that probable. The main objective of image compression is to decrease redundancy of image data which helps in increasing capacity of storage & efficient transmission.

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In 2015, R. Sumalatha et.al [11] wrote Hierarchical Lossless Image Compression for Telemedicine Applications.

The AMWT filter coefficients were derived from adaptive lifting scheme. In adaptive lifting scheme predictor was modified based on two previous values for calculating current pixel. The proposed predictor reduces computational complexity. Experimental results were obtained by applying proposed method to an 8-bit ultrasound image.

In 2016, Er. Kiran Bala et.al [12] presented Advance digital image compression using fast wavelet transforms comparative analysis with DWT.

In this paper they propose "Image Compression Using Fast Wavelet Transforms Comparative Analysis with DWT". FWT based image compression has been performed to get desired results of proposed work. Image Compression is performed in MATLAB software using wavelet toolbox.

In 2016, Rajandeep K. et.al [13] wrote A Review of Image Compression Techniques" .

An image compression method eradicates redundant and/or unrelated information, & resourcefully encodes leftovers. Practically, it is frequently essential to toss away both non redundant information & relevant information to attain essential compression. In any case, ploy is discovering methods that permit important information to be resourcefully extracted & represented.

In 2017, Anurag et.al [14] presented JPEG Compression Using MATLAB.

Creating, editing, & generating images in a very regular system today is a major priority. The original image data generated by camera sensor is very large to store, so efficiency is not high. Mobile or bandwidth- limited systems become particularly cumbersome, where object is a conservative bandwidth cost, such as World Wide Web.

In 2017, Dr. Vijaya Kumar C N et.al [15] wrote Performance Analysis of Image Compression Using Discrete Wavelet Transform.

The main objective of source coding is to represent symbols or messages generated from an information source in a suitable form so that size of data is reduced. In image compression they use JPEG where huge number of zero is generated in medium & high frequency region of transformed image using combination of Discrete Cosine Transform & quantization. This is required to reduce run length coding of an image.

In 2017, Akhilesh Kumar Singh et.al [16] wrote A Survey on Image Compression Methods.

This paper presents various techniques of image compression. These are still a tough task for researchers & academicians. There are mainly two types of image compression techniques exist. Comparing performance of compression technique is difficult unless identical data sets & performance measures are used. Some of these techniques are obtained good for certain applications like security technologies.

In 2017, Sudha R. et.al [17] presented Survey paper on image compression techniques.

This paper attempts to give a best approach for selecting one of popular image compression algorithms based on (a) Wavelet, (b) JPEG/DCT, (c) VQ, & (d) Fractal approaches. We review & discuss advantages & disadvantages of these algorithms for compressing greyscale images & collared images. Here they are trying to find best performance approach amongst several compression algorithms.

In 2017, Bharathi Gururaj et.al [18] wrote Insights on Error-Resilient Image Transmission Schemes on Wireless Network.

They have reviewed significant research contribution published in last 5 years associated with wireless image transmission, channel coding mechanism, & investigated scale of effectiveness in techniques based on advantages & limitations. We also extracted a significant research gap, which requires immediate attention.

4.TOOLS AND TECHNOLOGY

In this dissertation perform task MATLAB is taken as simulation tool. MATLAB is known as language of technical computing. This is considered as a high-stage language with interactive atmosphere. MATLAB allows us to achieve computationally missions quicker as compared to other programming languages like PASCAL, C, COBOL, C++ & FORTRAN.

Matrix is known as rectangular numbers array in MATLAB environment. Its Meaning is attached to 1x1 matrices. The MATLAB has various mechanisms to store numeric & non-numeric data. It is best to consider whole thing as a matrix in

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beginning. Operations in MATLAB have been designed to be natural. Programming languages other than MATLAB perform task with numbers one on a time but MATLAB offers to run with complete matrices very rapidly & easily.

CHARACTERISTICS OF MATLAB

MTLAB is easiest & most productive software for engineers & scientists. There are several characteristics of MATLAB that are as follows:-

1. It is a High level language in order to perform technical computing.
2. It is having development environment to manage code, data & files.
3. MATLAB allows analysis of parameter in case of various routing schemes in case of wireless sensor netperform task.
4. This has interactive gears for various purposes such as iterative exploration, design & to solve problem.
5. MATLAB consist of Fourier analysis, filtering, optimization, Mathematical functions for linear algebra, statistics, & numerical integration.
6. Several wireless sensor netperform task researches have used MATLAB for simulation.
7. The two dimensional & three dimensional graphics functions have been used to visualize data.
8. MATLAB also provided tool to perform automated testing using automation tools such as ML Unit.
9. MATLAB is a gear to build custom, graphical & user interfaces.
10. There are many functions to integrate MATLAB algorithm that have outer applications with programming languages like PASCAL, C, COBOL, C++ & Fortran.

When MATLAB is started, desktop appears its default layout.

ARRAY CREATION IN MATLAB

MATLAB is contraction for matrix laboratory. In array creation in MATLAB, usually programming languages perform task with numerical value one at a time. But MATLAB is intended to activate on complete matrices & arrays primarily.
Every MATLAB commands are considered as multi-dimensional arrays. It does not matter that type of data. Matrix is known as 2-D array that is often used for linear algebra.

THE ARRAY CREATION PROCESS

In order to make an array with five elements in a single row user separates elements with also comma or space.

```
cc = [7 8 9 5 4]
returns
cc =  7   8   9   5   4
```

This type of array is a row vector.

In order to define matrix that has multiple rows user is to divide rows with semi-colons.

```
t = [1 3 2; 5 4 6; 9 8 7]
t =
   1   3   2
   5   4   6
   9   8   7
```

FUNCTIONS IN MATLAB

MATLAB usually provides huge number of functions that are used to perform calculative tasks. These Functions are perform tasking same as subroutines or mechanisms in programming languages other than MATLAB.
Let user perform taskspace consists of variables x & y, such as

```
x = [3 8 9];
y = [5 4 7];
```

In order invoke a function user has to enclose its input arguments in parentheses:

```
max(x);
```

And if there is presence of input arguments user has to separate them with commas:

```
max(x,y);
```

Following statement returns output from function after assigning it to variable:

```
maxx = max(x);
```

.
If there are lot of output arguments than user has to enclose them in square brackets:
[maxx,loc] = max(x);
User has to enclose character string inputs in single quotes:
disp('Welcome');
In order to invoke function that is not requiring inputs & does not return outputs, user has to type following function name:
clc //clc function is used in order to clear Command Window.

5.CONCLUSION

Watermarking is a very active research field with a lot of applications. Although it is a relatively new field, it has produced important algorithms for hiding messages into digital signals. These can be described by many different models. Two broad categories for these models were described in this essay. These are communication-based models and geometric models. Communication-based models can be further divided into those which use side-information and those that don't. One example system was used to illustrate non-side-information models, and two example systems were used to illustrate side-information models. Each of these systems has its advantages and disadvantages, and each one trades some important watermarking property for another. The choice of which to use relies on the underlying application's requirements.

Of course the examples provided in this essay are only a small sample of the many different approaches to watermarking. Examples of other approaches that have not been mentioned include those which operate in the frequency domain and take advantage of DCT coefficient and wavelet coefficients.

6.FURTUE SCOPE

The research work would be beneficial to provide the study the existing researches in the field of watermarking in image processing. It would analyze the loopholes of existing researches related to watermarking in image processing. The research work would offer the research work related to watermarking in image processing. This research would explain the watermarking technology more fundamentally. Finally the images with watermarks embedded have been tested and then the features and quality of embedded watermarks are analyzed. The surviving abilities of watermarks are verified and the description of the testing process and results are given.

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