

# DIGITAL IMAGE WATERMARKING

## Abstract

Nowadays worldwide research activities and the industrial interest in digital watermarking methods are growing tremendously. **Digital multimedia data provides a robust and easy editing and modification of data.** The data can be delivered over computer networks with little to no errors and often without interference. Unfortunately, digital media distribution raises a concern for digital content owners. **Digital data can be copied without any loss in quality and content.** This poses a big problem for the protection of intellectual property rights of copyright owners. Watermarking is a solution to the problem. It can be defined as embedding digital data, such as information about the owner, recipient, and access level, without being detectable in the host multimedia data. Our aim in the project is to work on the aspects of digital image processing using Discrete Cosine Transform of an image in frequency domain.

Through this project, we aim to work on Digital image Watermarking domain and to devise some robust means to make the watermark withstand a number of attacks like JPEG compression, cropping etc. We analyzed the performance of RGB color channels for DCT-based watermarking scheme using Middle-band co-efficient exchange algorithm. We also developed an algorithm which resists cropping attack in which some portion of an image is cut down to distort the watermark. As this is a very strong and effective attack, it has been a big challenge to prevent exploitation of digital data through this attack in the digital world. We proposed an algorithm to prevent digital data from this attack. We checked robustness of our algorithm against various attacks like JPEG compression, Noise attack, Histogram equalization attack, Flip attack, zoom attack and cropping attack.

## GENERAL INTRODUCTION

### 1.1 INTRODUCTION

The advent of the Internet and the wide availability of computers and printers make digital data exchange and transmission a simple task. However, making digital data accessible to others through networks also creates opportunities for malicious parties to make salable copies of copyrighted content without permission of the content owner.

#### 1.1.1 Digital watermarking

Digital watermarking is likely to be a potential solution to this problem. Watermarking is an increasingly important technology for protecting intellectual property or ensuring integrity of many forms of digital data. Watermarking means that a digital signature (called a watermark) is added to the protected data – e.g. image - and this signature proves ownership or certifies authenticity of the artifact. Imperceptible watermarks have the advantage that attackers may not even know their presence that makes repudiation very hard. . The significance of watermarking has been rapidly increasing, driven by the dominance of digital media in technology and commerce.

### 1.1.2 Image watermarking techniques

Image watermarking techniques proposed so far can be divided into two groups according to the type of feature set the watermark is embedded in: spatial domain techniques (where watermarks are embedded in intensity values) and transform domain techniques (where watermarks are inserted in transform coefficients).

### 1.1.3 Spatial domain

The simplest way to embed a watermark in the spatial domain is to select a pseudo random set of pixels and to modify the Least Significant Bits (LSB) of their intensity values. In long m-sequences are added to the LSB of the image's pixel intensities, and detection is performed by computing the spatial cross-correlation. Such an approach is very sensitive to noise and common signal processing and cannot be used in practical applications. The drawbacks of spatial domain methods are that in general they are not robust to common geometric distortions and have a low resistance to JPEG compression; moreover, since the watermark casting algorithm can embed only few bits in the image to respect the requirement of unobtrusiveness, they seem to offer a low bit capacity.

### 1.1.4 Transform domain

In transform domain watermarking techniques, a digital image is processed by means of a specific transform. This process can be applied to the whole image as a single block or to smaller blocks, most commonly of size 8x8 or 16x16. In wavelet based methods, the space of embedding consists of the bands in which the image is decomposed. The advantage of using DCT domain includes the fact that frequency transform is widely used in image and video compression and DCT coefficients affected by compression are well known. Also the watermarking schemes based on DCT and DWT are robust against those attacks, which does not have large impact on perceptual quality like JPEG compression.

## 1.2 **PROBLEM STATEMENT**

The motivation for taking up "Image Watermarking" as topic for this project was to make images on web prone to illegal duplication of images without the consent of owner. Watermarking was proposed to resolve this so that a watermark is hidden in the image as a token of ownership. But the intelligent attacker performed various attacks on the image to destroy the watermark without harming the image much. This motivated us to think on the lines to propose a robust algorithm which resists various attacks like JPEG Compression, Addition of Noise and Cropping attack. On further researching, we decided to work on DCT-based watermarking schemes. We found that there was a scope of improvement in these schemes. But before that we needed to bring certain facts about the image's response to various attacks after doing minor changes in the image. These will be discussed in detail in later chapters.

The goal of this project is to analyze the performance of color channel for DCT-based watermarking scheme and to propose a robust algorithm which resists various attacks like JPEG Compression, Addition of Noise and Cropping attack.

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