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A survey of DCT based watermarking schemes

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Abstract
In current scenario, the uses of smart phone are increasing exponentially due to the increasing use of social media platforms such as Facebook, Instagram, and YouTube etc. Many users use social media apps to share his/her personal information in the form of images and videos. To protect this personal information, there is a need of secure communication system. This work presents a novel encryption algorithm based on discrete cosine transform (DCT). DCT is one of the popular techniques used in watermarking schemes. With this research, researchers can get a survey of latest watermarking schemes based on DCT that will help various researchers working in this field.
Keywords: - Watermarking scheme, DCT, Discrete cosine transform.

1. Introduction

We live in an era where the Internet has such a profound effect on our lives that we are completely reliant on it. The internet has turned the entire world into a global village, and the transfer and distribution of digital data such as text, videos, photographs, and audio has increased dramatically in recent years. Multimedia data, on the other hand, is more vulnerable to security threats as a result of modern access technology, as data can be changed or redistributed without authorization. Copyright breaches, piracy, hacking, unapproved production and delivery, information theft, and a variety of other statistical and differential attacks are all possible security threats.
Digital watermarking has proven to be one of the most effective methods for protecting intellectual property and authenticating content. Digital watermarking is a technique of hiding information in host media including video, photographs, etc., in a way that it is unnoticeable to human visual system (HVS) (HVS). It protects the information concealed in images/videos and serves as a useful tool for dealing with various multimedia-related IPR issues. An institute logo, a doctor's signature, a case history, or someone's personal logo may all be used as a digital watermark. The robustness, payload, imperceptibility, and security of a watermarking technique are all essential factors to consider.
The rest of the report is divided into three sections: section 2 provides a brief summary of DCT-related watermarking systems, and section 3 wraps up the whole work.

2. Related Work

Since it is too simple to tamper with any image, digital image authentication is a major concern for the digital revolution. The authenticity of digital images has become a pressing issue for researchers in recent decades. Several appropriate watermarking techniques have been developed to alleviate this problem based on the desired applications. However, developing a watermarking system that is both stable and safe is difficult. This paper [1] describes typical watermarking system frameworks and lists some common criteria for developing watermarking techniques for a variety of applications.
For healthcare applications, a multiple watermarking algorithm based on discrete wavelet transforms (DWT), discrete cosine transform (DCT), and singular value decomposition (SVD) is proposed in this paper [2]. The proposed approach uses three watermarks for identity authentication: a medical Lump image watermark, a doctor signature/identification code, and the patient's diagnostic details as text watermarks. Back Propagation Neural Network (BPNN) is applied to the extracted image watermark to minimize noise effects on the watermarked image in order to increase the robustness efficiency of the image watermark.

In the field of signal processing, image watermarking technology is critical. In this paper [3], the concepts of image watermarking and DCT/IDCT were introduced. A new digital watermarking encryption algorithm was published, with the watermarking information based on the image's size. The embedding and extraction of the watermark were performed on two images using MATLAB to verify the watermarking algorithm, and the results show that the adaptive algorithm is successful.

This work [4] presents a novel watermarking scheme based on the Chinese Remainder Theorem (CRT) that works in the Discrete Cosine Transform (DCT) domain. We looked at a Singular Value Decomposition (SVD)-based watermarking scheme first, then a CRT-based watermarking scheme that works in the spatial domain, and their flaws were pointed out. The proposed CRT-based scheme is more resistant to various types of attacks, especially JPEG compression, and it also improves the watermarking scheme's security function.

The challenges of integrity authentication, proof of authenticity, tamper detection, and guarantee of copyright rights for digital images propagated online are addressed in this paper [5]. The issue here primarily concerns the security of sensitive online textual images that may be targeted for counterfeiting or intentional/unintentional modifications, resulting in the dissemination of a fake copy. When compared to their more general digital picture/image equivalents, sensitive text images usually pose more difficulties and restrictions to embedding/extraction techniques. With several digital security schemes addressing the issue of less-sensitive material with a diverse range of colors and textures, this paper proposes a novel watermarking method for sensitive text images in order to validate content originality and integrity verification while adhering to certain established image form constraints. With several digital security schemes addressing the issue of less-sensitive material with a diverse range of colors and textures, this paper [6] proposes a novel watermarking method for sensitive text images in order to validate content originality and integrity verification while adhering to certain established image form constraints.

With the rapid advancement of computer science, issues such as digital product piracy and copyright disputes are becoming more serious; thus, finding solutions to these issues is an urgent activity. The authors create a digital watermarking algorithm based on a fractal encoding method and the discrete cosine transform in this analysis (DCT). To boost the standard DCT process, the proposed method [7] incorporates fractal encoding and DCT for double encryptions. As the first encryption, the image is encoded using fractal encoding, and the encoded parameters are then used in the DCT process as the second encryption.

This paper [8] uses differential evolution (DE) and kernel extreme learning machine (KELM) to present a semi-blind discrete cosine transform (DCT) domain watermarking technique for gray-scale images. The integer discrete cosine transform, non-linear chaotic map, and dynamic stochastic resonance are used in this paper [9] to propose a robust watermarking technique (DSR). The host image is first converted to an integer DCT domain, with the coefficients partitioned into non-overlapping blocks. The selected blocks are then used to build a circulant matrix. A non-linear chaotic map is used to pick blocks. By computing the singular values, this circulant matrix is used to embed the watermark. The watermark is extracted by first creating the dynamic stochastic resonance (DSR) phenomenon and then casting a verification step.

A novel color image watermarking approach based on Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT) is proposed in this paper [10]. The RGB cover image is divided into red, green, and blue components using this process. Each color component is subjected to DCT and DWT. The Arnold transform is used to scramble the grayscale watermark picture. The scrambled watermark image is subjected to DCT. Transformed watermark image is then divided into equal smaller bits. Each watermark part's DCT coefficients are embedded in four DWT bands of the cover image's color components.

A versatile multi-watermarking algorithm suitable for medical images is proposed to overcome the contradiction between current watermarking methods—which are incompatible with the watermark's ability to withstand geometric attacks—and robustness. To perform multi-watermark embedding and extraction, the visual feature vector of the medical image was first obtained using the dual-tree complex wavelet transform and discrete cosine transform (DTCWT-DCT). The multi-watermark was then preprocessed with henon map chaotic encryption technology to improve the security of watermark data, and then combined with the zero watermark principle to make the watermark resistant to both traditional and geometric attacks. The proposed algorithm [11] extracts watermark information effectively and implements zero watermarking and blind extraction, according to experimental results.

It is preferable to use image-dependent keys in the watermark generation process to improve the security of blind watermarking schemes for image authentication. In this paper [12], we propose a new watermarking method for image authentication that uses the image hash as a key to generate the watermark. The local image characteristics are used to produce a robust image hash that is invariant to legitimate modifications but vulnerable to illegitimate modifications. It is possible to distinguish between legitimate and illegitimate image modifications thanks to the relationship between the watermark and the image hash. For watermark embedding, quantized index modulation of DCT coefficients is used.

This paper [13] describes a chaotic encryption-based blind digital image watermarking technique that works with grayscale and color images. Before embedding the watermark in the host image, a discrete cosine transform (DCT) is used. Prior to DCT implementation, the host image is divided into 8X8 non-overlapping blocks, and the watermark bit is embedded by changing the difference between DCT coefficients of adjacent blocks. To add double-layer authentication to the watermark, Arnold transform is used in addition to chaotic encryption. The proposed algorithm has been evaluated and analyzed in three separate variants.

A robust and high-capacity digital image watermarking scheme based on discrete cosine transform is proposed in this paper [14]. The original image is segmented into mxn image blocks, which are then decomposed using the discrete cosine

transform. After that, by adaptive quantization of the selected coefficients, the twelve representative DCT coefficients are chosen for watermark embedding. The proposed method outperforms the current watermarking algorithm in terms of embedding 4096 bits of information in images with dimensions of 512 by 512 pixels and is resistant to attacks such as JPEG compression and Gaussian lowpass filter.

3. Conclusion

This work gives a brief overview of DCT based cryptographic schemes which helps various researchers to use DCT in his/her research work in solve various security aspects related to user's personal information over the unsecured public communication network. Also, this work gives a proper direction to various researchers to use DCT schemes in latest research.

Conflict of Interest

In this manuscript the authors declare that there is no conflict of interest.

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