ISSN: 2277-9655
Impact Factor: 1.852

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

A Survey on Improving Robustness of Image Watermarking By Using Gradient

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Abstract

Digital images can be captured easily with digital cameras, scanners and can be easily uploaded on the internet. Images can be appeared widely in the internet and can be copied from the internet. JPEG is one of the most popular image formats and can achieve high compression with high image quality. Information can be hidden into an image where the hidden information can be used or extracted for any particular purpose. Digital watermarking is a process to hide information in an image. Watermarks are visible but most of the watermarks are invisible. There are different types of invisible watermarks which can be used in different application such as fragile watermarks and robust watermarks. Fragile watermarks are designed and can be broken by simple image processing operations. We focus on geometrically robust watermarking and semi fragile water marking for digital images.

Keywords: Digital watermarking, watermarks

Introduction

Peoples are showing interest on hiding information like event, particular occasion, or any secret message in an image such that it could be kept safely and also for secret communication. Novel sample-based methods are proposed to hide some information/data bits in the JPEG compressed domain.

The steps of image security consist the updating of original data to insert the watermark and toprovide the security key such as authentication or copyright codes. The embedding method must leave the original data perceptually unchanged. The major technical problem is to develop a highly robust digital watermarking technique, which discourages copyright infringement by making the process of watermarking removal tedious and costly.

An algorithm of watermarking consists of the watermark structure, an embedding algorithm, and an extraction, or detection algorithm .In multimedia applications, embedded watermarks should be invisible, robust, and have a high capacity. Invisibility refers to the degree of distortion introduced by the watermark. The literature survey explains secretes is the resistance of an inserting watermark against risky attacks such as noise. Capacity is the amount of data that can be represented by an embedded watermark .The most applicable and accurate method is invisible robust watermarking and that is used in this paper. Watermarking represents an efficient technology for ensuring data integrity and data-origin authenticity. Watermarking is the process of embedding data into multimedia element can primarily for copyright protection. Because of its growing popularity, the DWT is commonly used in the proposed watermarking scheme increase, area increases so power consumption.

General Watermarking Procedure

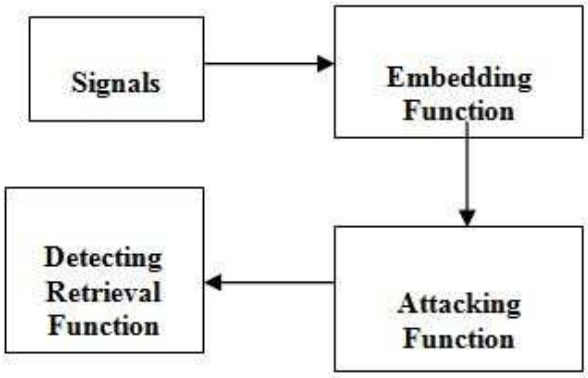

Fig 1: General Watermarking Procedure

Digital image watermarking is one of the proposed solutions for copyright protection of multimedia data. This technique is better than Digital Signatures and other methods because it does not increase overhead. In this paper plan to present a new image watermarking technique that can embed more number of watermark bits in the cover image without affecting the imperceptibility and increase the security of watermarks .Digital watermarking is the process of

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embedding information into a digital signal in a way that is difficult to remove. The signal may be audio, pictures or video. In this paper image is the host signal and embedding the secret data and the extract the same.

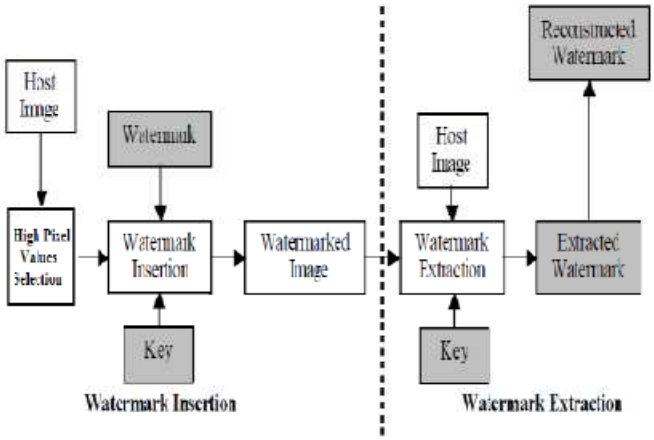

Fig 2: General Diagram of the Watermarking Proposed Scheme

Embedding and Extraction Stage

Embedding Stage

Watermarking is not a fully mature technology lot of research is going on this field, especially to increase security and capacity of watermark data. Most of researchers try to increase the watermark capacity by compromising image quality, because there is a trade off among data rate, security and imperceptibility. But with our scheme we will be able to embed more number of watermark bits without affecting the imperceptibility of the cover image.

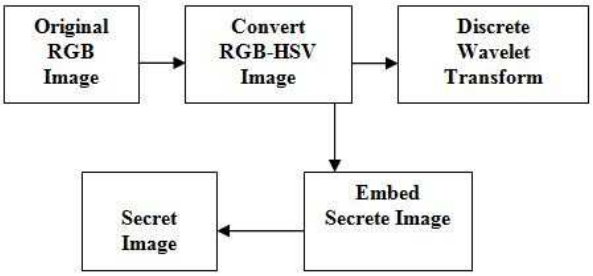

Fig 3: Watermarked Image

One of the most important features that make the recognition of images possible by humans is color. Color is a property that depends on the reflection of light to the eye and the processing of that information in the brain. The color is used every day to tell the difference between objects, places, and the time of day. Usually colors are defined in three dimensional color spaces usually colors are defined in three dimensional color spaces. These could be RGB (Red, Green, and Blue), HSV (Hue, Saturation, and Value) or HSB (Hue, Saturation, and Brightness). The last two are dependent on the human perception of hue, saturation, and brightness. Color represents the distribution of colors within the entire image. This distribution includes the amounts of each color, but not the locations of colors. In numerical analysis and functional analysis, a DWT is any wavelet transform for which the wavelets are discretely sampled. As with other wavelet transforms, a key advantage it has over Fourier transforms is temporal resolution: it captures both frequency and location information (location in time). The discrete wavelet transform has a huge number of applications in science, engineering, and mathematics and computer science. Most notably, it is used for signal coding, to represent a discrete signal in a more redundant form, often as a preconditioning for compression. The DWT of a signal x is calculated by passing it through a series of filters. First the samples are passed through a low pass filter with impulse response g resulting in a convolution of the two:

$$y[n] = (x * g)[n] = \sum_{k=-\infty}^{\infty} x[k]g[n-k]$$

The signal is also decomposed simultaneously using a high-pass filter. The outputs are giving the detail coefficients (from the high-pass filter) and approximation coefficients (from the low-pass). The invisible watermarking techniques used for enhancing the network security. Fundamental role of watermarking is the reliable embedding and detection of information. Digital watermark should be statistically invisible to prevent obstruction of the original image .The watermark should be robust to filtering ,additive noise, compression and other forms of image manipulation.

Extracting stage

In a digital watermarking process, all time in order to detect the owner's signature from the watermarking image, it is not convenient to carry the original image. Moreover, for those applications that require different watermarks for different copies, it is preferred to utilize some kind of watermark-independent algorithm for extraction processes i.e. dewater marking. It's robustness against many attacks including rotation, low pass filtering, salt n paper noise addition and compression.

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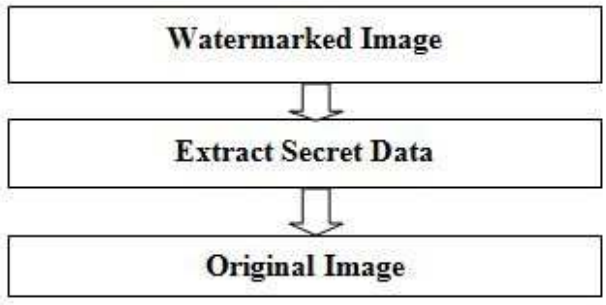

Fig 4: Extracted Image

Proposed Watermarking Method

Multiscale Gradient Direction Quantization

Gradient direction watermarking (GDWM) is based on direction of gradient vectors and in that process used the uniform quantization. In this method, the watermark bits are embedded by quantizing the angles of significant gradient vectors at multiple wavelet scales. GDWM has the following advantages:

1) Invisibility increased invisibility because watermark is inserted in particularly significant gradient vector position,

2) Robustness to amplitude scaling attacks because many attacks are occurred and your data is distributed

From one place to another place so in proposed system watermark is embedded in the angles of the gradient vectors, and,

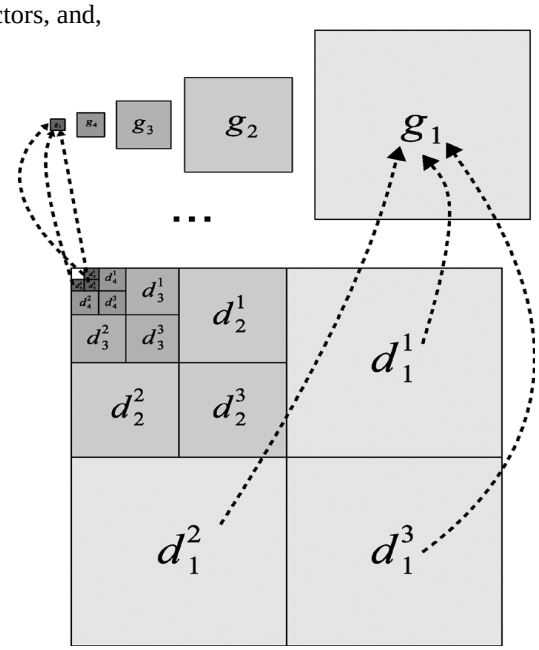

Figure 5: Illustration of five-level gradient field, obtained from five-level wavelet decomposition.

3) Increased watermarking capacity as the process , it uses image decomposition using three level wavelet decomposition. The gradient vector at a pixel is declared in terms of the discrete wavelet transform (DWT) coefficients. To quantize the gradient direction, the DWT coefficients are varied based on the derived relationship between the changes in the coefficients and the change in the gradient direction. It is shown in the experimental results that the proposed GDWM performs well as compared to other watermarking methods and is robust to a wide range of attacks, e.g., JPEG compression, Gaussian filtering, amplitude scaling, median filtering, sharpening, Gaussian noise, salt & pepper noise, and scaling.

To achieve high fidelity-robustness trade-off, HVS models could be employed in watermark embedding. Towards this aim, the *just noticeable difference* (JND) can be obtained for each transform-domain coefficient. [1]

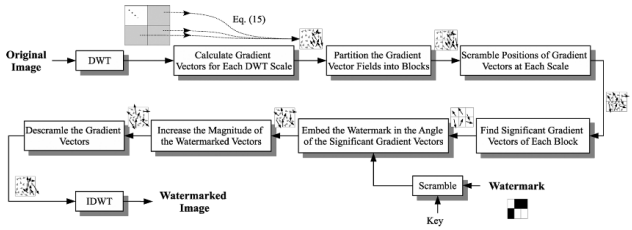

Fig 6: Block Diagram of Proposed Watermark decoding method

Conclusion

The most important property of any watermarking technique is its robustness to various attacks and capability to preserve the data hidden. As mentioned above the multiscale gradient direction quantization is the most robust method that can be employed to any secured watermarking method but has more complexity and requires a lot of computation.

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Impact Factor: 1.852

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