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REVIEW ARTICLE

REVIEW PAPER ON QR CODE WATERMARKING ALGORIHTM BASED ON WAVELET TRANSFORM

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ABSTRACT

In this paper we study how QR code can be embedding and extract using watermarking algorithm by different spatial and transform domain. Basics of QR code and watermarking technique its application in different areas. We will discuss the various factors used in watermarking, properties and application area where water making technique need to be used. Also a survey on the some new work is done in QR code and image watermarking field

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INTRODUCTION

To display multimedia contents on the internet become necessary. Website such as YouTube, Face book, Torrents, pirate bay are necessary for the authentication and protection. In the digital watermarking embedding of various information in digital content to protect from the illegal copying. Types of digital watermarking are robust, fragile, semi fragile, visible and invisible. Watermarking tries to hide a message related to the actual content of the digital signal, but in steganography the digital signal has no relation to the message, and it is merely used as a cover to hide its existence

DIGITTAL WATERMARK TECHNIQUE

A watermarking algorithm embeds watermark in different kind of data like, text, audio, video etc. The embedding process is done by use of a private key which decided the locations within the multimedia object (image) where the watermark would be embedded.

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Depends upon the working domain digital watermarking divided into two types

- Spatial Domain Watermarking Techniques
- Frequency Domain Watermarking Techniques. .

Spatial Domain Techniques

In the spatial domain watermarking depends on image pixel embedding is done. Spatial domain is made by colour separation. One of the type of spatial domain is Least Significant Bit (LSB)Watermarking is embeds watermarks in the LSB of the pixels.

Frequency Domain Techniques

In frequency domain watermarking embedding of image is done after transform As compared to spatial domain frequency domain are widely used. Frequency domain techniques are Discrete Cosine Transform (DCT), Discrete Fourier Transform (DFT), Discrete Wavelet Transform (DWT). In the discrete cosine transform data is represents in frequency space rather than amplitude space DCT watermarking classified into the

Global DCT watermarking and Block based DCT watermarking

PROPERTIES OF DIGITAL WATERMARKING

Fidelity: Fidelity of watermarking system as a perceptual similarities between unwatermarked and watermark work. Watermark work will be degraded in the transmission process prior to its being perceived by a person.

Robustness: Robustness depends on the information capacity of the watermark, the watermark strength visibility, and the detection statistics (threshold).Robustness is also influenced by the choice of images (size, content, color depth) A digital watermark is called robust if it resists a designated class of transformations. Robust watermarks may be used in copy protection applications to carry copy and no access control information

Capacity: The length of the embedded message determines two different main classes of digital watermarking. The message is conceptually zero-bit long and the system is designed in order to detect the presence or the absence of the watermark in the marked object. This kind of watermarking scheme is usually referred to as zero-bit or presence watermarking schemes. Sometimes, this type of watermarking scheme is called 1-bit watermark, because a 1 denotes the presence (and a 0 the absence) of a watermark

Aplication of Watermaring

Copyright protection: 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.

Broadcast Monitoring: Cross-verifying whether the content that was supposed to be broadcasted (on TV or Radio) has really been broadcasted or not. We able to track when a specific video is being broadcast by a TV station. Information used to identify individual videos could be embedded in the videos themselves using watermarking, making broadcast monitoring easier

Metadata: Metadata allows content creators to store all sorts of useful tracking information associated with content. For example, metadata can be used to supplement video fingerprints by storing vital information about users (such as who created the content and who has modified it), a history of use, which operating systems a video has been played on and by what version of which player technology, information about which networks content has traveled on and more.

Transaction tracking: 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.

QR CODE

A QR code is a type of matrix barcode. More recently, the system has become popular outside of the industry due to its fast readability and comparatively large storage capacity. The QR code is a matrix consisting of an array of nominally square modules arranged in an overall square pattern, including a unique pattern located at three corners of the symbol and intended to assist in easy location of its position, size and inclination.

The decoding procedure starts with the reorganization of black and white module then Decode format information. Then restoring of data and RS code words follows the Error detection and then decode the Data codeword .A QR Code enables to store several of information that is hundred times than the capacity of traditional barcode stores information(numeric and alphabetic characters, kanji,

kana, hiragana, symbols, binary, and control codes.) QR Code can store maximum 7,089 characters in one symbol.

Image Watermarking in Frequency Domain

The most commonly used transforms are the Discrete Cosine Transform (DCT), Discrete Fourier Transform (DFT), Discrete Wavelet Transform (DWT). This kind of watermarking is simple and with low computing complexity, because no frequency transform is needed. However, there must be tradeoffs between invisibility and robustness, and it is hard to resist common image processing and noise. Frequency-domain watermarking embeds the watermark into the transformed image. It is complicated but has the merits which the former approach lacks.

Dct Domain Watermarking

DCT like a Fourier Transform, it represents data in terms of frequency space rather than an amplitude space. DCT based watermarking techniques are robust compared to spatial domain techniques. Such algorithms are robust against simple image processing operations like low pass filtering, brightness and contrast adjustment, blurring etc. DCT domain watermarking can be classified into Global DCT watermarking and Block based DCT watermarking The DCT allows an image to be broken up into different frequency bands namely the high, middle and low frequency bands thus making it easier to choose the band in which the watermark is to be inserted.

There are 6 types of QR CODE [1]

MODEL 1 & MODEL 2 QR CODE	MICRO QR CODE	ICQ CODE	SQRC	LOGO Q
				
Model 1 is the original QR Code. The largest version of this code is 14 (73 x 73 modules), which is capable of storing up to 1,167 numerals. Model 2 is an improvement on Model 1 with the largest version being 40 (177 x 177 modules), which is capable of storing up to 7,089 numerals. Today, the term QR Code usually refers to this type.	Only one orientation detecting pattern is required for this code, making it possible to print it in a smaller space than before. This code can be viable even if the width of its margin is 2 module-worth (QR Code requires a margin of 4 module-worth at least around it). The largest version of this code is M4 (17 x 17 modules), which can store up to 35 numerals.	Code that can be generated with either square modules or rectangular ones. Can be printed as a turned-over code, black-and-white inversion code or dot pattern code (direct part marking). The maximum version can theoretically be 61 (422 x 422 modules), which can store about 40,000 numerals	QR Code that has a reading restricting function. Can be used to store private information or manage a company's internal information) Its appearance is no different from the regular QR Code.	QR Code that can incorporate high-levels of design features such as illustrations, letters and logos Since proprietary logic is used in generating this type of code, its readability is not compromised.

Fig. QR CODE

Image Watermarking Survey

Year	Author	Title	Methodology	Performance
2013	Radhika v. Totla, K.S.Bapat	Comparative analysis of watermarking in digital images using dct and dwt.	DCT&DWT based algorithm for watermarking in digital images	DWT is more robust against attacks such as cropping and resizing as compare to DCT.
2013	Pravin M. Pithiya,H.L.Desai	Dct based digital image watermarking, dewatermarkig & authentication		
IEEE 2000	W. N. Cheung	Digital image watermarking spatial and transform domains	Used differential PCM to detect edge region of image.	
ISSN August 2013	Divya A and Priya H. K	A wavelet transform based watermarking algorithm for protecting copyrights of digital images	Biorthogonal Wavelet Transform, Correlation	Achieve a good balance between robust and invisibility
2013	Jithin V M, K K Gupta	Robust invisible qr code image watermarking in dwt domain	QR Codes, It can be scanned by using the QR code scanner easily	More Robust Than Previous Techniques

Dft Domain Watermarking

At present, the research of Image watermarking techniques require a relatively higher robust of watermark, an algorithm with pseudo-random noise to construct the watermark and use test to find the watermark in detected. When the image be detected extracted test sequence has a strong relevance with the original watermark. Some time the Fourier transform is use to transform the signal from time domain to frequency domain or signal from frequency domain to time domain. This transformation is reversible and that maintaining the same energy. In the transmission of information for reduce the retransmission and anti-aggressive Arnold transform is used for improve the security of watermarking. For testing and analysis, we use a gray test image and use two parameter Peak signal to ratio (PSNR) and Normalized correlation (NC). Both PSNR and NC are usual standards of quantitative evaluation to the digital product which has embedded watermark.

$$PSNR = 10\log_{10} XY \max p2_{x,y} / \sum (p_{x,y} - \acute{p}_{x,y})^2$$

$$NC = \sum p_{x,y} \acute{p}_{x,y} / \sum p\,2_{x,y}$$

Dwt Domain Watermarking

Wavelet transform used in audio and video compression, removal of noise in audio, and the simulation of wireless

antenna distribution. Wavelets have their energy concentrated in time and are well suited for the analysis of transient, time-varying signals. Wavelets have their energy concentrated in time and are well suited for the analysis of transient, time-varying signals. Wavelets have their energy concentrated in time and are well suited for the analysis of transient, time-varying signals.

Conclusion

We classified watermarking algorithms based on the transform domain in which the watermark is embedded. Also, study the watermarking properties, applications and techniques used. Recent developments in the digital watermarking of images in which the watermarking technique is invisible and designed to exploit some aspects of the human visual system. DWT is more robust against attacks such as cropping and resizing as compare to DCT. Magnitude of DWT coefficients is high in the lowest bands (LL) at each level of decomposition and is least for other bands (HH, LH, HL). Wavelet transformed image is a multi-resolution description of image. Hence an image is shown at different resolution levels and can be continuously processed from low resolution to high resolution. DFT and DCT are full frame transform, and hence any change in the transform coefficients affects the entire image except if DCT is implemented using a block based approach. However DWT has spatial locality property, which means if signal or any watermark is embedded it will affect the image locally. Hence a wavelet transform provides both frequency and spatial information for an image.

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