Digital Image Watermarking In Spatial Domain

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Abstract: **This paper presents a process able to mark digital pictures with invisible and detectable secret information called the watermarking. This process can be basic of complete cop- right protection system. The process first step consists in producing a secret image. The first part of the secret resides in basic information that forms a binary image. The picture is then frequency modulated. The second part of the secret is precisely the frequencies of the carrier both secret depends on the identity of the copyrights owner and on the original picture contents. The obtained picture is called stamp. The second step consisting of modulating the amplitude of the stamp according to a masking criterion stemming from model of human perception. That to theoretical criterion is supposed not to match. This is followed by the adaptation of the level of the stamp at that place. The so formed watermark is then added to the to ensure its protection. That watermarking method allows the detection of watermarked pictures in a stream of digital images, only with the knowledge of picture owner's secret.**

Keywords: spatial domain, digital watermarking requirement.

1. Introduction:

To hide multimedia information, watermarking is a relative new technique. Its application is broad, including data au-thentication, ownership protection, side information convey-ance, broadcast monitoring etc. Basically digital watermarking is that technique in which we embed the signal or any propri-etary information i.e. watermark, into the digital media like image, audio, video.Afterthat the embedded signal is detected and extracted out to reveal the real identity of digital media. The very basic idea of digital watermarking system. This technique has many applications in the field of certification, distribution, anticounterfiet of any type of digital media. For the purpose of ownership protection, robustness is one of the important factors of concern. To solve the problem of content authentication; fragile water-mark is used so that the modification in the digital media will be reflected in hidden watermark. Captioning watermark is a type of watermark in which less redundancy & more in-formation can be employed, as there are multiple water-marks. Different sorts of watermarks does the different tasks, so there should be a particular order of hiding. As Mintzer and Braudaway noted, ownership watermarks should be embedded first, then captioning watermarks and at the last fragile watermark should be done. The watermark technique can be divided into two sections, visible watermarking and invisible watermarking. The main advantage of the visible watermark is that the watermark can be seen by eyes without extracting but its shortcoming is that watermark would destroy the presentation of media. That is why it is not so much appropriate for today's modern digital application. In contrast, the invisible watermark is extracted by particular method but it may reserve the original presentation of cover.

2. Digital Watermarking

A **digital watermark** is a kind of marker covertly embedded in a noise-tolerant signal such as audio, video or image data. It is typically used to identify ownership of the copyright of such signal. "Watermarking" is the process of hiding digital information in a carrier signal; the hidden information should, but does not need to, contain a relation to the carrier signal. Digital watermarks may be used to verify the authenticity or integrity of the carrier signal or to show the identity of its owners. It is prominently used for tracing copyright infringements and for banknote authentication.

Fig 1.1 Example of a watermark overlay on an image.

Like traditional physical watermarks, digital watermarks are often only perceptible under certain conditions, i.e. after using some algorithm. If a digital watermark distorts the carrier signal in a way that it becomes easily perceivable, it may be considered less effective depending on its purpose.

Traditional watermarks may be applied to visible media (like images or video), whereas in digital watermarking, the signal may be audio, pictures, video, texts or 3D models. A signal may carry several different watermarks at the same time. Unlike metadata that is added to the carrier signal, a digital watermark does not change the size of the carrier signal.

The needed properties of a digital watermark depend on the use case in which it is applied. For marking media files with copyright information, a digital watermark has to be rather robust against modifications that can be applied to the carrier signal. Instead, if integrity has to be ensured, a fragile watermark would be applied.

Both Steganography and digital watermarking employ Steganography techniques to embed data covertly in noisy signals. While Steganography aims for imperceptibility to human senses, digital watermarking tries to control the robustness as top priority.

Since a digital copy of data is the same as the original, digital watermarking is a passive protection tool. It just marks data, but does not degrade it or control access to the data.

One application of digital watermarking is *source tracking*. A watermark is embedded into a digital signal at each point of distribution. If a copy of the work is found later, then the watermark may be retrieved from the copy and the source of the distribution is known. This technique reportedly has been used to detect the source of illegally copied movies.

3. Requirement of Digital Watermarking

Watermarking for copyright protection applications has the following requirements Imperceptibility (Visibility) The watermark should not be visible in the image under typical viewing conditions and should not affect the quality of the host image. 2. Robustness The watermark can still be detected after the image has undergone linear or nonlinear image processing operations intentionally or unintentionally like compression, cropping, rotation and noise. So the watermarks should be robust against variety of such attacks. 3. Capacity or Data Payload The watermarking technique must be capable of allowing multiple watermarks to be inserted in an image, with each watermark still being independently verifiable and can be successfully detected during extraction. 4. security The security of watermarking techniques can be interpreted in the same way as the security of encryption techniques. Hence a watermarking technique is truly secure if knowing the exact algorithm for embedding and extracting the watermark does not help an unauthorized party to detect the presence of the watermark or remove it without knowing the secret key.

4. Spatial Domain

The *spatial domain* is the normal image space, in which a change in position in I directly projects to a change in position in S. Distances in I (in pixels) correspond to real distances (*e.g.* in meters) in S.This concept is used most often when discussing the frequency with which image values change, that is, over how many pixels does a cycle of periodically repeating intensity variations occur. One would refer to the number of pixels over which a pattern repeats (its periodicity) in the spatial domain.In most cases, the Fourier Transform will be used to convert images from the spatial domain into the frequency domain

A related term used in this context is *spatial frequency*, which refers to the (inverse of the) periodicity with which the image intensity values change. Image features with high spatial frequency (such as edges) are those that change greatly in intensity over short image distances.

Another term used in this context is *spatial derivative*, which refers to how much the image

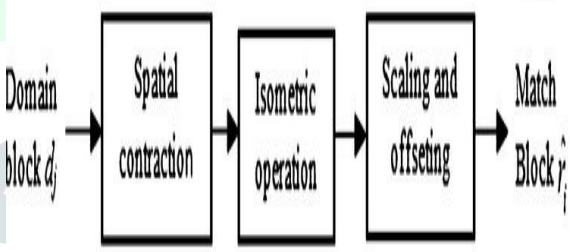

Fig 2.1 Spatial Domain Processing

intensity values change per change in image position. In spatial domain, we deal with images as it is. The value of the pixels of the image change with respect to scene. Whereas in frequency domain, we deal with the rate at which the pixel values are changing in spatial domain

5. Spatial Domain Filtering:

Filtering is a technique for modifying or enhancing an image. Spatial domain operation or filtering (the processed value for the current pixel processed value for the current pixel depends on both itself and surrounding pixels). Hence Filtering is a neighborhood operation, in which the value of any given pixel in the output image is determined by applying some algorithm to the values of the pixels

in the neighborhood of the corresponding input pixel. A pixel's neighborhood is some set of pixels, defined by their locations relative to that pixel.

In this lecture we will talk about spatial domain operations. Mask or filters will be defined. The general process of convolution and correlation will be introduced via an example. Also smoothing linear filters such as box and weighted average filters will be introduced.

6. Image Enhancemnt

Image Enhancement improves the perception of information in images for human viewers. The deteriorated image due to optics, electronics or environment may be enhanced to restore certain features of an image. The image maybe corrupted by different types of noise such as additive noise, Gaussian noise, impulse noise and Poisson noise etc. To remove these types of noises there are various filters are available. The basic operations performed with noisy image is smoothing and sharpening just as low pass filtering and high pass filtering. Smoothing or blurring of noisy images is analogous to the low pass filtering while sharpening of images represent high pass filtering. The term frequency in images has very interesting definition. It is just representing the changes or transition in pixel intensities. Low intensity transition from pixel to pixel shows low frequency however high frequency indicates high intensity transition from pixel to pixel. The term cutoff frequency in image filter represented by the pixel distance from center pixel of the image, usually it is denoted by DO

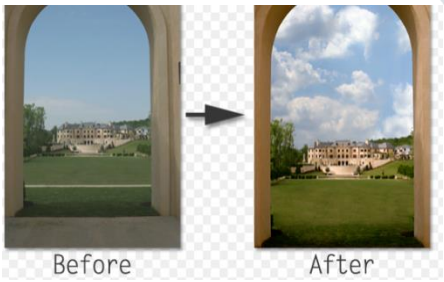

Fig 3.1 Image Enhancement

6. Results

By this paper we come to know about Digital Image Watermarking, visible and invisible Watermarking.A visible watermark on a image is very similar to a corporations logo on its letterhead. It is basically a semi transparent identifier that is used to show the ownership of the image.Originally used in photography market as a way of identifying the copyright owner of digital photos , digital watermarking is a means of embedding data into digital and analog content in order to identify its owner .The watermark becomes a permanent part of the content, even as it is distributed to others.An invisible watermarking is a type of Steganography that aims at concealing information in a medium to prove additional In this paper we surveyed the various aspects for digital watermarking techniques and its applications. A brief and comparative analysis of watermarking techniques is also presented which can help in the new researches in also presented which can help in the new researches in related areas. We also classified the watermarking algorithms based on spatial domain and transform domain. Watermarking, which belong to the information hiding field, has seen a lot of work begin conducted in different branches in this field. We classify the techniques based on different domains in which data is embedded. Here we limit the survey to images only..If its used to support copyright, its first priority is robustness against destruction and spoofing.

Fig 4.1: original image

Fig 4.2: Mark image

Fig 4.3: Watermarked image

9. CONCLUSION

In this paper we surveyed the various aspects for digital watermarking techniques and its applications. A brief and comparative analysis of watermarking techniques is also presented which can help in the new researches in also presented which can help in the new researches in related areas. We also classified the watermarking algorithms based on spatial domain and transform domain. Watermarking, which belong to the information hiding field, has seen a lot of work begin conducted in different branches in this field. We classify the techniques based on different domains in which data is embedded. Here we limit the survey to images only.

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