A NOVEL IMAGE WATERMARKING METHOD USING DISCRETE WAVELET TRANSFORM

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Abstract
These days internet has turned into an ideal medium for downloading multimedia content. Digital media can be replicated effortlessly bringing about security issues. The advanced content can be ensured against duplicating, piracy and any unauthorized access by digital watermarking. Digital watermarking is a basic procedure to include copyright see, secret messages or check messages to advanced image signals, sound, video, or archives which is utilized for distinguishing the first maker and owner of advanced content. In this paper discrete wavelet transform technique is utilized for implanting and extraction of watermark in unique image by utilizing alpha blending. The outcomes demonstrate that the DWT system is strong against different basic image processing operations.

Index Terms: Digital watermarking, Alpha Blending, Discrete Wavelet transform.

1. Introduction

Digital media can be put away proficiently and can be controlled effortlessly utilizing computers, bringing about different security issues. The issue of securing the copyright of advanced media can be tackled by digital watermark. Advanced watermarking is an idea of concealing ownership information into the sight and sound information, which can be separated later on to demonstrate the validated owner of the media. Watermarking guarantees validating possession, securing concealed data, forestalls unauthorized duplicating and circulation of images over the internet and guarantees that an advanced image has not been modified. There are essentially two strategies for watermarking: spatial space and frequency area. Spatial space watermarking marginally alters the pixels of arbitrarily chose subsets of image pixels relying on the image perceptual investigation. Frequency area chooses and transforms a few frequencies from their unique esteems as indicated by specific tenets. The frequency space strategies are more famous than spatial area procedures since it delivers more hearty and vague watermarking. In light of the extraction method watermarking calculations are comprehensively sorted into two: Blind and Non-daze watermarking. The previous does not require unique image for extraction though the later requires unique image for extraction process. In this paper non-daze watermarking is utilized which requires unique image for extraction. The reason for this paper is to study and execute Discrete Wavelet Transform (DWT) area image watermarking framework for ongoing image.

2. General Model of Digital Watermarking

A summed up watermarking model comprises of two procedures: watermark inserting and recognition as appeared in Fig. 1 and Fig. 2.

In the inserting procedure, the watermark might be encoded into the cover image utilizing a particular key. This key is utilized to encode the watermark as an extra assurance level. The yield of the installing procedure, the watermarked image, is then transmitted to the beneficiary.

In the discovery procedure additionally called extraction process the watermark is separated from the assaulted flag. Amid the transmission if the flag is unmodified then the watermark is as yet present and can be removed.

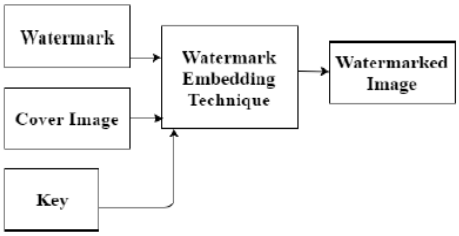

Fig -1: Watermark Embedding

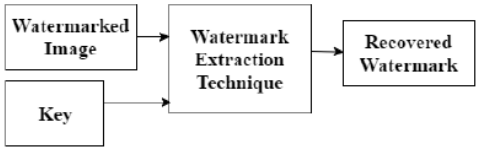

Fig -2: Watermark Detection

3. Discrete Wavelet Transform

Discrete Wavelet transform (DWT) is a numerical instrument for various leveled decay of an image. The transform depends on decaying a flag into wavelets or little waves, having shifting frequency and restricted term. The properties of wavelet break down a unique flag into wavelet transform coefficients which contains the position data. The first flag can be remade totally by performing Inverse Wavelet Transformation on these coefficients.

DWT breaks down an image into sub images or sub groups, three points of interest and one estimate. The groups are LL, LH, HL and HH. Fig. 3 demonstrates the sub group in DWT. LL contains low frequencies both in level and vertical heading. HH contains high frequencies both in level and vertical heading. HL contains high frequencies flat way and low frequencies vertical way. LH contains low frequencies even way and high frequencies vertical way. The low frequency part involves the coarse data of the flag while high frequency part includes the data identified with the edge segments. The LL band is the most noteworthy band as it contains the majority of the image vitality and speaks to the approximations of the image. Watermarks can be implanted in the high frequency detail groups (LH, HL and HH) as these areas are less delicate to human vision. Inserting into these groups builds the heartiness of the watermark without having extra effect on the nature of the image. At each level of decay, first DWT is performed in the vertical course, trailed by the DWT in the flat heading. The main level of disintegration yields four sub-groups: LL1, LH1, HL1, and HH1. The LL sub band of the past level is utilized as the contribution for each progressive level of decay. This LL sub-band is additionally decayed into four multi determination sub-bands to obtain next coarser wavelet coefficients. This procedure is rehashed a few times in light of the application for which it is utilized.

DWT has incredible Spatio-frequency restriction property that has been broadly used to distinguish the image regions where an aggravation can be all the more effectively covered up. Additionally this procedure does not require the first image for watermark recognition. In this manner it is utilized as a part of different applications related with flag preparing like pressure of sound and video, expulsion of clamor. Digital image watermarking comprises of two procedures initially implanting the watermark with the data and second extraction.

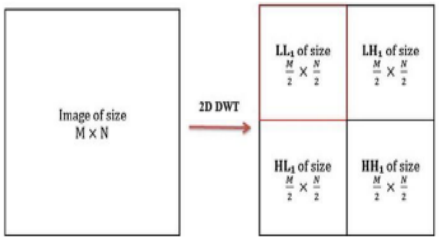

Fig -3: Sub-bands formed after 1-level DWT

3.1 Watermark Embedding In this procedure 2D DWT is performed on the cover image that decays the image into four sub-bands: low frequency estimation, high frequency askew, low frequency level and low frequency vertical sub-bands. So also 2D DWT is performed on the watermark image that must be inserted into the cover image. Here we have utilized Haar wavelet. The procedure utilized for embeddings watermark is alpha blending. The deteriorated segments of cover image and watermark are additionally increased by a specific scaling factor and are included. Amid the inserting procedure the extent of the watermark ought to be littler than the cover image however the edge size of both the images ought to be made equivalent. The watermark implanted in this paper is detectable or unmistakable in nature, so we installed it in the low frequency estimation segment of the cover image.

Alpha Blending Technique

As per the alpha blending method the watermark image is acquired by:

WMI= k*(LL1) +q*(WM1)

Where WMI=Watermarked image, LL1=low frequency estimate of the first image, WM1=Watermark and k, q = Scaling factors for the first image and watermark individually.

At long last converse discrete wavelet transform is performed on the watermarked image coefficient to produce the last secure watermarked image.

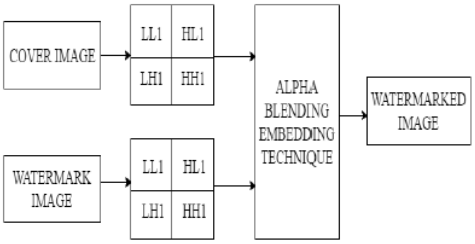

Fig -4: Watermark Embedding Process

3.2 Watermark Extraction In this procedure the means connected in the implanting procedure are connected in the invert way. To begin with discrete wavelet transform is connected to both cover image and the watermarked image. After this the watermark is recuperated from the watermarked image by utilizing alpha blending procedure.

Alpha Blending Technique

The alpha blending recipe utilized for watermark extraction is given by:

RW= (WMI - k*LL1)

Where RW=Recovered watermark, LL1=Low frequency guess of the first image, WMI=Watermarked image.

At last opposite discrete wavelet transform is performed on the watermark image coefficient to create the last watermark removed image.

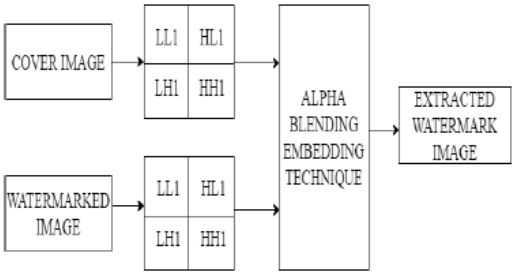

Fig -5: Watermark Extraction Process

4. Experimental Results

In this paper we have utilized pepper image as the cover image and the organic products image as the watermark which are appeared in Fig. 6 (an) and Fig. 6 (b) separately. Both the images are of equivalent size of 512×512. The alpha blending procedure utilized here includes the low frequency content of the two images thus the two images of equivalent size are taken.

Fig -6(a): Cover image

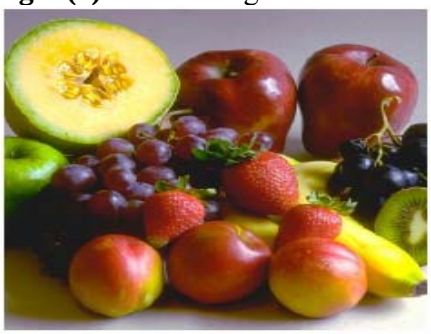

Fig -6(b): Watermark image to be embedded

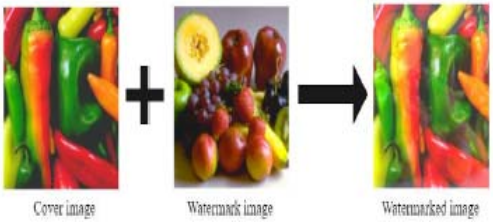

Fig -7: Watermark embedding process 1-level DWT

Fig. 7 indicates watermark inserting process. Fig. 8 demonstrates the watermarked image. Watermark inserting is finished by differing. the estimation of k from 0.1 to 0.9 keeping q consistent at 0.1. Best outcomes are acquired when k is 0.5. With the diminishing estimation of k underneath 0.4 watermarks image gets brighter and totally destroys the cover image.

Fig -8: Watermarked image

Fig. 9 demonstrates the watermark extraction process. Fig. 10 demonstrates the extracted image. Recuperation of watermark image is finished by fluctuating estimation of k from 0.1 to 0.9. With the diminishing estimation of k underneath 0.2 recouped watermarks ends up darker and totally imperceptible.

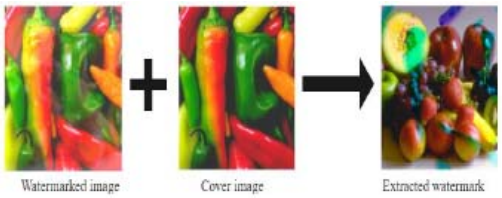

Fig -9: Watermark extraction process 1-level DWT

Fig -10: Extracted Watermarked image

5. Conclusions

In this paper a digital image watermarking technique in view of discrete wavelet transform utilizing alpha blending procedure is actualized. This technique implants obvious watermark into the cover image. The cover image is required in the extraction procedure. The nature of recuperated watermark image and watermarked image is relies upon the scaling factors k and q. Results acquired demonstrate that this method is vigorous to different image preparing activities

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