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Digital Image Watermarking For Bank Security Using Arm Processor

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Abstract—The growth of image processingused in embedded system has boosted the increase of security in various sectors to a greater extent, we developed a digital watermarking technique for security purpose using discrete wavelet transform (DWT) and Discrete Cosine Transform (DCT).Watermarking technique is highly secure if knowing the exact algorithms for embedding and extracting. Watermark does not help an unauthorized party to detect the presence of the watermark information in it.

IndexTerms—-Digital watermarking, Discrete Wavelet Transform,(DWT) , Discrete Cosine Transform(DCT)

Introduction

As shown in figure the watermark $W_i$is inserted into image $f_i$will produce watermark imagef_{wi}. The complementary function is done in the decoder. It will extract and validates the presence of W_i in watermarked input f_{wi}or unmarked inputf_j . The decoder is not needed ifW_i is visible. The decoder may or may not require a copy of $f_i$and/or W_i to do its job if it is invisible .In the private or restricted key system f_j and/or $W_i$are used and not used in public or unrestricted key system. $W_{\varphi}$is used to denote absence of mark .to determine the presence of in an image ,the decoder correlates extracted watermark with and compare result to predefined threshold which set the degree of similarity that is acceptable for all match.

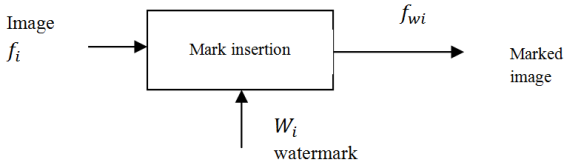


Fig.1:-Watermark Embedding

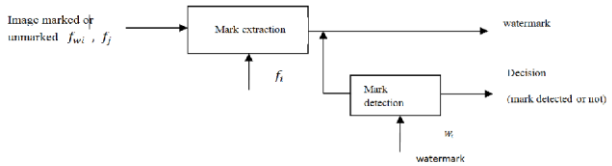


Fig.2.-Watermark extracting

In this paper, a digital image watermarking algorithm is described which is based on two algorithms, DCT and DWT.

As shown in the following block diagram the images are taken from camera or save in the PC .This image is watermarked in MATLAB. In watermarking the name of employee and random sequence is invisible watermarked on image .Also this sequence in send to ARM 11 processor .This image is sent to USB port. The watermarked image is taken into employee's/user's pen drive.

This pen drive is then connected to the USB connector of the ARM processor. Then user will enter his password which is assign to him. If password is incorrect, alarm will be ON. If correct, ARM processor will decodes this image using same algorithm. ARM processor will compare the sequence in the image and sequence generated by random sequence generator. Here for simplicity serial communication is not shownIfthese sequences are matched, the stepper motor will rotate and door will open. The text message will sent to the number saved in ARM 11 processor. If the sequence in the image and sequence generated by random sequence generator are not equal the alarm will be ON.and LCD display is used to display the message on it.

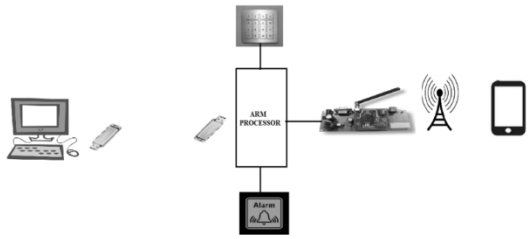


Fig.3.-System block diagram

I. DWT

Wavelet transform is based on small wavelets of varying frequency and limited duration. In two dimensional transform, two-dimensional scaling function and three two-dimensional wavelets are required. Two dimensional scaling function is φ(x, y) ,three two-dimensional wavelet function are ψ^H(x, y),ψ^V (x, y),ψ^D (x, y)

φ(x, y)= φ(x)φ(y)

The product produces separable scaling function and separable, "directionally sensitive" wavelets

ψ^H(x, y)=ψ (x) φ(y)

ψ^V (x, y)= φ (x)ψ (y)

ψ^D (x, y)=ψ(x) ψ(y)

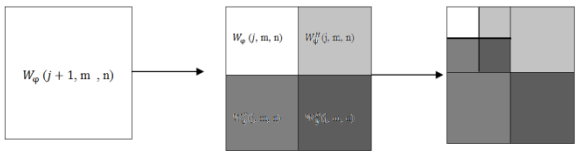


Fig.4:-Discrete wavelet transform

These wavelet measures the intensity variation along different directions.ψ^Hmeasures variation along column,ψ^V measures variation along row and ψ^D measures variation along diagonals.

Scaled function is defined as

$\varphi_{j,m,n}(x, y)=2^{\frac{j}{2}}\varphi(2^j x - m, 2^j y - n)$

Let us define translated basic function

$\psi^i_{j,m,n}(x, y)=2^{\frac{j}{2}}\psi^i(2^j x - m, 2^j y - n)$

i=directional wavelet={H,V,D}

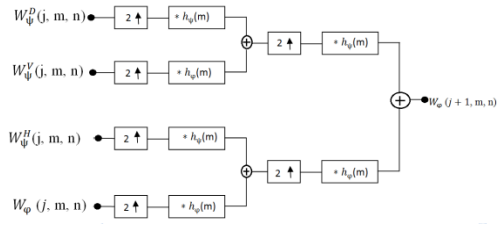


Fig.5:-Watermark embedding using wavelet transform

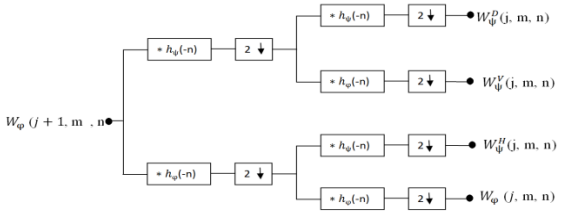


Fig.6:-Watermark extracting using wavelet transform

The discrete wavelet transform of an image of size M×N is then

$W_\varphi(j_0, m, n)=\frac{1}{\sqrt{MN}}\sum_{x=0}^{M-1}\sum_{y=0}^{N-1} f(x,y)\,\varphi_{j,m,n}(x, y)$

$W_\psi^i(j, m, n)=\frac{1}{\sqrt{MN}}\sum_{x=0}^{M-1}\sum_{y=0}^{N-1} f(x,y)\,\psi^i_{j,m,n}(x, y)$,

i= {H,V,D}

Inverse DWT

$f(x, y)=\frac{1}{\sqrt{MN}}\sum_m\sum_n W_\varphi(j_0, m, n)\varphi_{j,m,n}(x, y)+$

$\frac{1}{\sqrt{MN}}\sum_{i=H,V,D}\sum_{j=j_0}\sum_m\sum_n W_\psi^i(j, m, n)\,\psi^i_{j,m,n}(x, y)$

DWT is a transformation technique is used to denote an image in a new time and frequency scale by decomposing the input image into low frequency, middle and high frequency bands. The value of low frequency band is the averaging value of the filter whereas the high frequency coefficients are wavelet coefficients or detail values. The DWT can be used to decompose image as a multistage transform. In the first stage, an image is decomposed into four sub bands LL1, HL1, LH1, and HH1, where HL1, LH1, and HH1 represent the finest scale wavelet coefficients, while LL1 stands for the coarse level coefficients, i.e., the approximation image. Fig. shows the one level wavelet decomposition of an image.

II. DCT

Discrete cosine transform is basically obtain from real part (it carries the cosine term) of the discrete Fourier transform. It is used to transforms the time domain or space domain of real input into its elementary frequency components. The DCT allows an image to be broken up into different frequency bands, making it much easier to embed watermarking information into middle frequency bands of an image. The middle frequencies are selected such that they have minimized they avoid the most visual important parts of image (low frequencies) without over exposing themselves to removal through compression and noise attack (high frequencies).The important properties of watermark are robustness and imperceptibility in transform domain.

With the character of discrete Fourier transform (DFT), discrete cosine transform(DCT) turn over the image edge to make the image transformed into the form of even function. It's one of the most common linear transformations in digital signal process technology. Two dimensional discrete cosine transform (2D-DCT) is defined as

$$F(jk)=a(j)a(k)\sum_{m=0}^{N-1}\sum_{n=0}^{N-1} f(mn)\cos\left[\frac{(2m+1)j\pi}{2N}\right]\cos\left[\frac{(2n+1)k\pi}{2N}\right]$$

The corresponding inverse transformation (Whether 2D-IDCT) is defined as

$$f(mn)=\sum_{m=0}^{N-1}\sum_{n=0}^{N-1} a(j)a(k)F(jk)\cos\left[\frac{(2m+1)j\pi}{2N}\right]\cos\left[\frac{(2n+1)k\pi}{2N}\right]$$

The 2D-DCT can not only concentrate the main information of original image into the smallest low-frequency coefficient, but also it can cause the image blocking effect being the smallest, which can realize the good compromise between the information centralizing and the computing complication. So it obtains the wide spreading
application in the compression coding.

Implementation

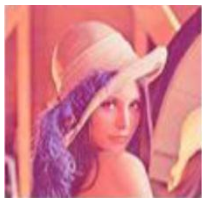
In this project, watermark insertion and extraction algorithms are implemented using MATLAB software. Using MATLAB commands different operations like DWT, DCT,

and IDCT are performed on host image and watermark. One can see the results by simulating programs.

III. ATTACKS

Working on attacks is to increase highly robust watermarking schemes and define better benchmarks. In this work, watermarking program which is writing in MATLABlanguage is used to test the attacks on the image watermarking. Figure illustrates the attacks diagram on watermarked images in both spatial and frequency

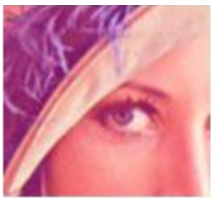
Noise



JPEG 20% compression

Rotate

Convolution



Crop

IV. RESULT

Fig:-Cover image

Fig:-Watermarked Image

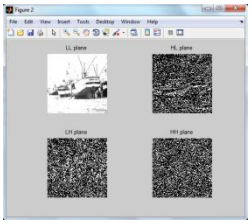


Fig:-Image decomposition

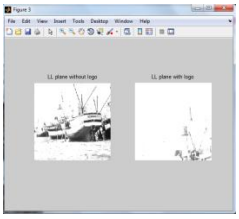


Fig:-LL plane with and without logo

Fig:-Watermarked embedded Image

V. CONCLUSION

In this we introduced a digital image watermarking algorithm based on DWT and DCT algorithm. Digital image watermarking is one vital area of research. We have proposed various security techniques for to protect the password in the form of digital information in bank security. It is used in security features, security tools and security parameter. We presented a system on digital watermarking techniques which has no effect such as cropping attacks, rotation attacks, noise attacks and filter attacks. Digital watermarking can be utilized for authentication of data, copyright protection and in communication process. It also provides a reliable performance on different original image and watermarked image in all the experiments. The Experimental results show that the quality of the watermarked image is better. Furthermore, the extracted watermark can be easily identified by the system.

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