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Hiding Copyright Mark in Images using Watermarking Technique

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Abstract: ***In field of watermarking, as the development in computer network is increasing day by day and multimedia technology, digital information such as image, video, audio or text are to be stored, transmitted and distributed through internet without any loss or damage of data. This work represents the Hybrid DWT-SVD technique with the entropy concept. The idea behind the proposed technique is based on fusing multiple watermark images using wavelet fusion algorithm. Original image is initially divided into blocks. Then blocks of high entropy are selected for embedding fused watermark in original image. That fused watermark is to be embedded in high entropy areas of image using Hybrid DWT-SVD Technique. The performance of proposed technique is evaluated and comparative analysis is done between Hybrid DWT-SVD and Hybrid DWT-SVD with entropy concept. The experimental results verify and prove that Hybrid DWT-SVD technique with entropy concept is an efficient algorithm for fusing multiple watermarks. Proposed technique is more robust than previous existing techniques. The results prove that proposed watermarking technique improves both capacity of embedded information and robustness without affecting the perceptual quality of original images as well as fused watermarks. Indeed, extraction of fused watermarks is also possible.***

Keywords: Digital Watermarking, Digital hiding, DWT (Discrete Wavelet Transformation), SVD (Singular Value Decomposition), Entropy based Watermarking.

I. INTRODUCTION

Digital Image processing is a technique which contains image data to be scanned and calculated. The image processing have digital image processing, indexing of images, scanning the digital edition of image processing, service evaluation of the image using the latest technology. Digital media technology has a wide range of Internet as well as wireless applications. However, the distribution and use of multimedia data is faster and easier with success of the Internet. A digital image is a image of a 2-D representation, as the resolution of the image is fixed. It can be vector type or can be the frame type. A digital watermark is a type of brand that can be integrated into the signal is noise tolerant as audio, video, image, etc. Basically, the process of watermarking is to hide information in digital carrier signal, but it does not contain relationship with the carrier signals. There are three basic types of specifications in the watermarking system that is imperceptible, robustness and capacity. The watermarking technique consists of three steps which are embedding, attack and extraction process. Embedding is an algorithm which accepts the host and does integration of data, and produces a signal which is watermarked. Then, the digital signal includes transmitted watermark to any other person or stored. Attack is that condition when unauthorized person attempting to make changes. Extraction is an algorithm which can be applied to the signal which is attacked to attempt to extracting the original watermark from it. If that signal has been altered in process of transmission unmodified, then the watermark will be still present and that could be extracted further in process. Research in this field of digital watermarking has growing up to gain momentum in previous time. Many other methods have been proposed in previous years in different-2 media types like audio, image, video and text. In that work, a hybrid watermarking for digital image's algorithm with the concept of

entropy increased the imperceptibility and robustness of watermarked image as well as original image. This algorithm made usage of two most efficient mathematical transforms: SVD and DWT with the concept of Entropy. These two techniques are merged to gain attractive features like DWT in spatial frequency localization or keep compact in capture in case of features which are semi-global and in case of SVD, the information data in field of images from components in SVD. Entropy term is used to measure the unpredictability in content of information.

II. METHODOLOGY

The steps of methodology are following:

1. Calculate Entropy of entire image.
2. Select high entropy areas of that image by using thresholding value.
3. Fusion of Primary and Secondary watermark by Wavelet Fusion method.
4. Watermark embedding in high entropy areas of image.
5. Use hybrid DWT-SVD technique on selected pixels of image.
6. Comparison of results with existing techniques.

1. Step: Calculate Entropy of entire Image

- Initially image is acquired.
- In Pre-processing, RGB image need to be converted in grey scale whereas grey-scale image is taken as such.
- That image is divided in blocks of 8*8.
- Then entropy is calculated of every block of image by following formula.

$$E=\sum P \text{ Log } 2(P)$$

2. Step: Select high entropy areas of that image by using thresholding value.

- The Threshold value is set as the mean of entropy value of entire image.
- Then only those blocks are selected whose values are more than threshold value. These blocks are considered as high entropy blocks.
- The blocks lower than threshold values are neglected .we have to embed watermark only in high entropy blocks.

3. Step: Fusion of Primary and Secondary watermark by Wavelet Fusion method.

- Two watermarks are acquired where one is primary watermark and other is considered as secondary watermark.
- Both the watermarks are fused in one another by using wavelet fusion method.

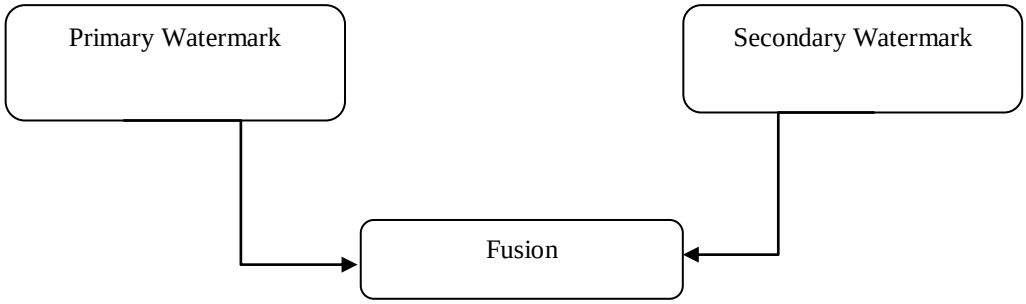


Figure 1 Wavelet Fusion

4. Step: Watermark embedding in high entropy areas of image.

- Fused watermark is to be embedded in high entropy blocks of an image.
- Watermark does not affect the low entropy blocks of an image.
- Multiple watermarks are fused by wavelet fusion method.

5. Step: use Hybrid DWT-SVD on selected pixels.

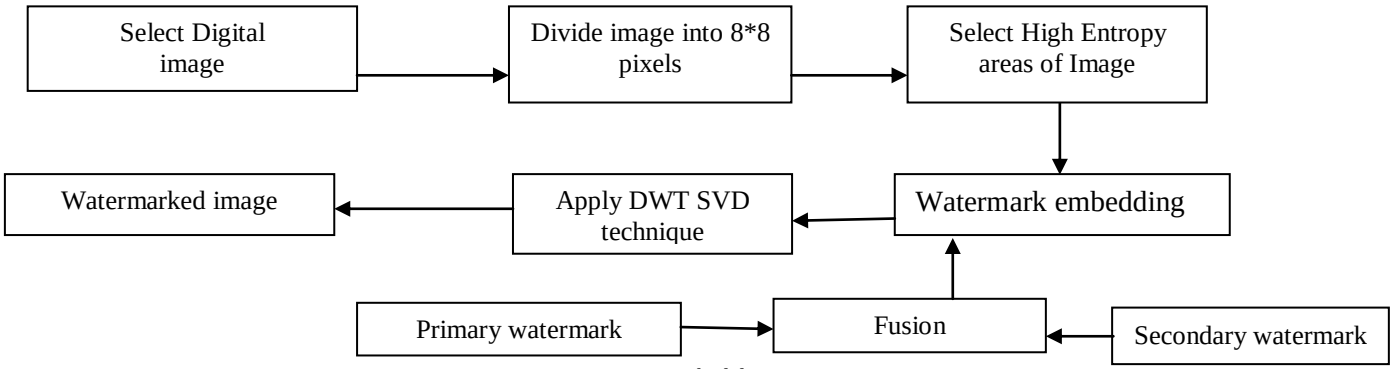


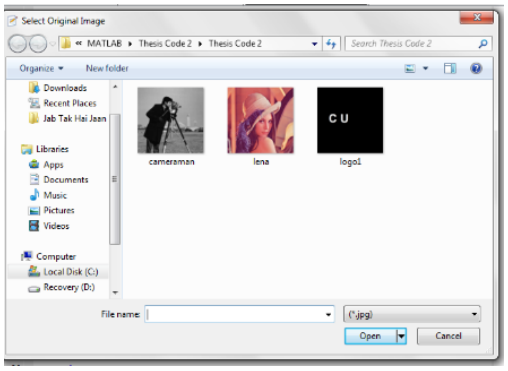
Figure2 Methodology

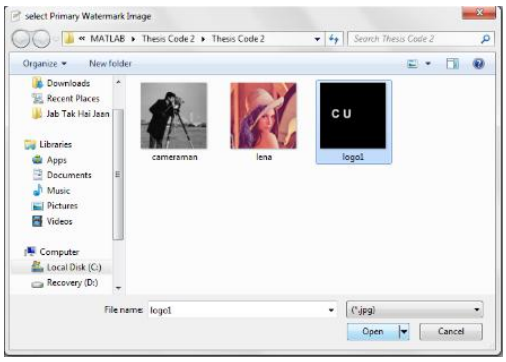
6. Step: Comparison of results with existing techniques.

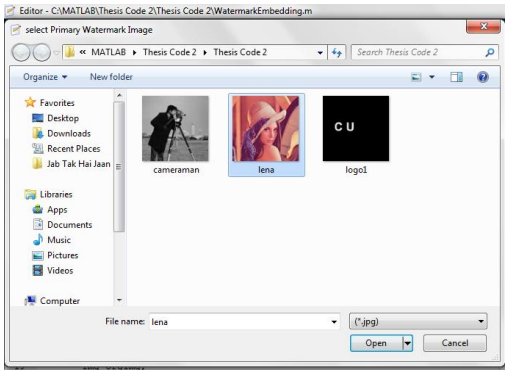
- Comparison of PSNR and MSE values between proposed technique and existing techniques are shown in tables.
- Comparison between BER (Bit Error Rate) is measured and compared with existing techniques.

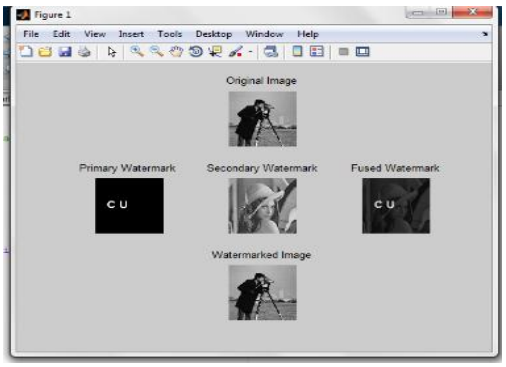
III. RESULTS

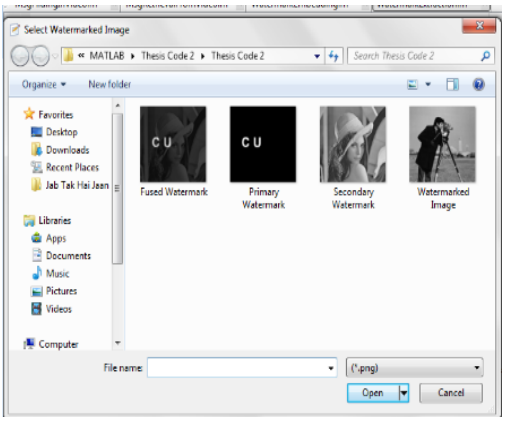
Many methods have been used to embed watermark in original image. As I have used only high entropy areas of image for embedding. As shown following, initially original image is selected and then primary and secondary watermark has been selected and then that fused watermark is embedded in original image. After that extraction process is done. Then resulted values are compared with previous techniques as shown in figures.

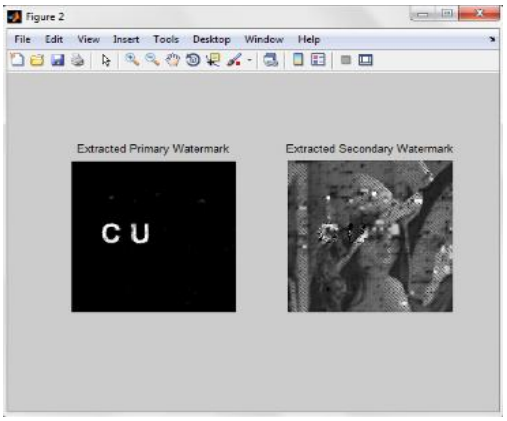


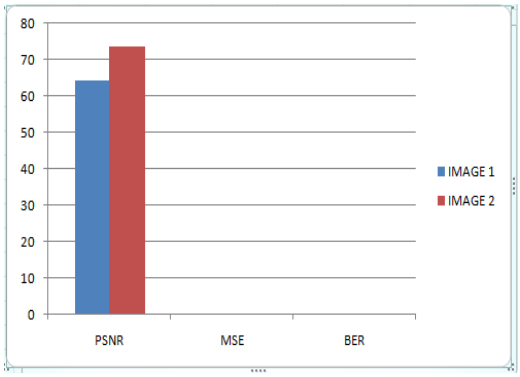












Techniques	PSNR	MSE	BER
Hybrid DWT-SVD	64.31	0.0325	0.0138
Proposed Technique	73.70	0.0028	0.0136

Table 1 Comparison of Proposed Technique with Hybrid DWT-SVD technique on cameraman image

Images	PSNR	MSE	BER
	73.70	0.0028	0.0316
	85.13	0.00	0.01
	70.81	0.01	0.01

Table 2 Comparison of Proposed Technique with Hybrid DWT-SVD technique on different image

IV. Conclusion

Research in this field of digital watermarking has growing up to gain momentum in previous time. Many other methods have been proposed in previous years in different-2 media types like audio, image, video and text. In that work, a hybrid watermarking for digital image's algorithm with the concept of entropy increased the imperceptibility and robustness of watermarked image as well as original image. This algorithm made usage of two most efficient mathematical transforms: SVD and DWT with the concept of Entropy. These two techniques are merged to gain attractive features like DWT in spatial frequency localization or keep compact in capture in case of features which are semi-global and in case of SVD, the information data in field of images from components in SVD. Results in tables proved the complexity and effectiveness of this method as regards with watermarking requirements like robustness and imperceptibility. A hybrid image watermarking technique with the concept of entropy is proposed and evaluated using several test images as shown in table 4.2. In the proposed technique, two watermark images whereas one is taken as primary watermark and other is secondary watermark are first fused then the fused watermark is embedded using the hybrid DWT –SVD watermarking algorithm with entropy concept means embedding of fused watermark is not performed on entire image. Only high entropy blocks are selected for embedding fused watermark and after that fused watermark has extracted. The final results proved that proposed algorithm achieves higher degree of capacity and robustness than traditional image watermarking algorithms with improved image perceptual quality. Also, the proposed technique using the hybrid DWT-SVD watermarking algorithm is suitable for the extraction of the fused watermarks. So, the proposed technique in image watermarking is used in different applications. The proposed technique also shows that the wavelet fusion can be used to embed multiple images in the watermarking system.

V. Future Scope

In this work, all criteria have been performed on image only. In this work, hybrid DWT-SVD technique is used to embed fused watermark images whereas one is primary watermark and other is secondary watermark with the concept of entropy in which entire image has not been used, only few blocks which contains high entropy has been used for the purpose to embedding the fused watermark. In future, this hybrid DWT-SVD with concept of entropy can be even used in videos also. This technique has performed on 2-D images yet, so it can be used in 3-D Images also.

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