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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.

$$E = \sum P \log_2(P)$$

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.

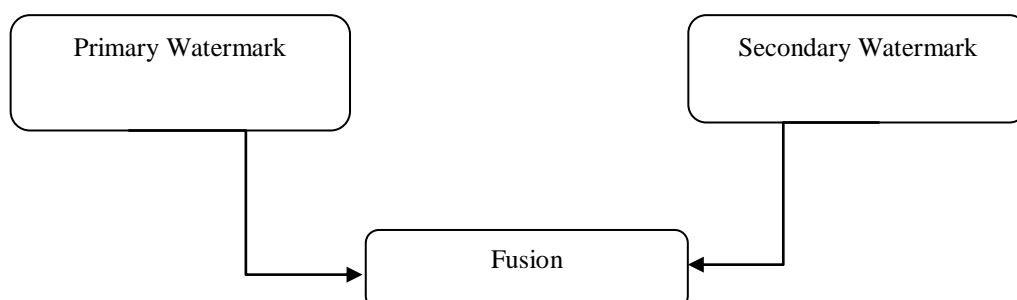


Figure 1 Wavelet Fusion

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.

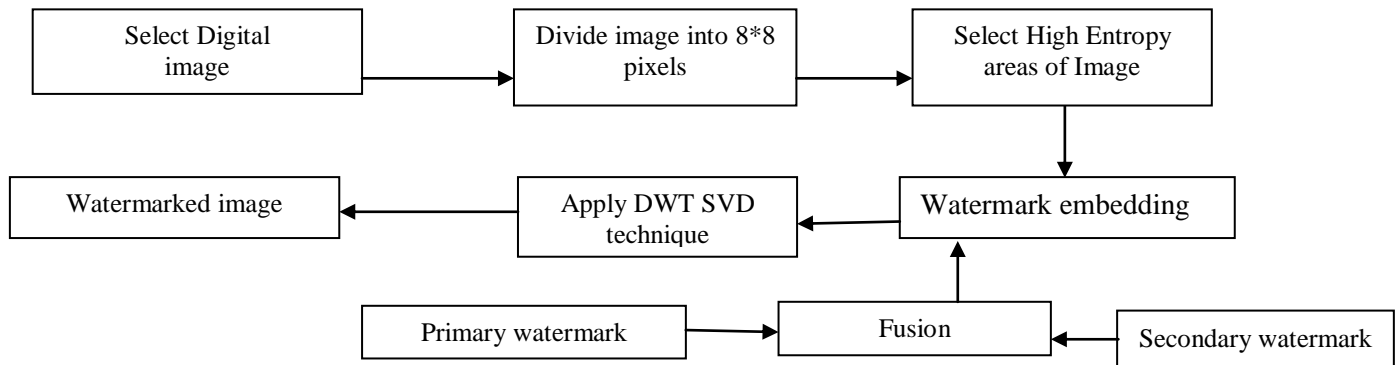
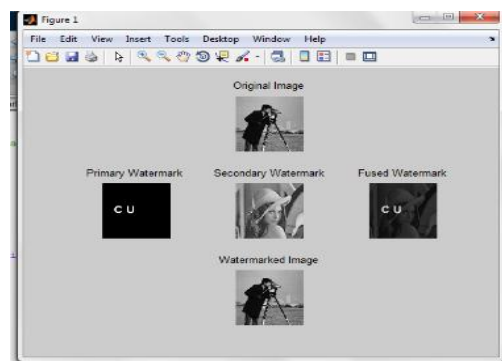
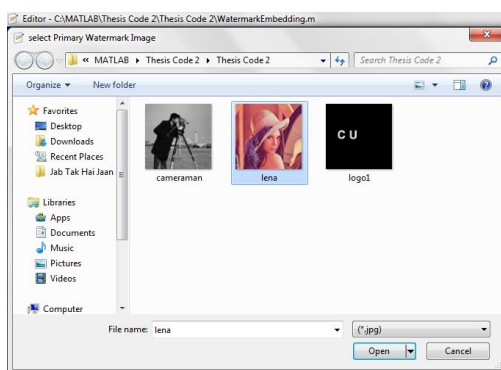
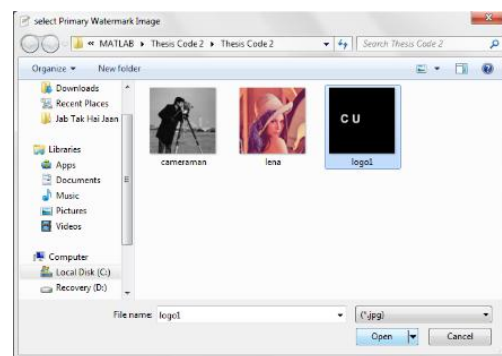
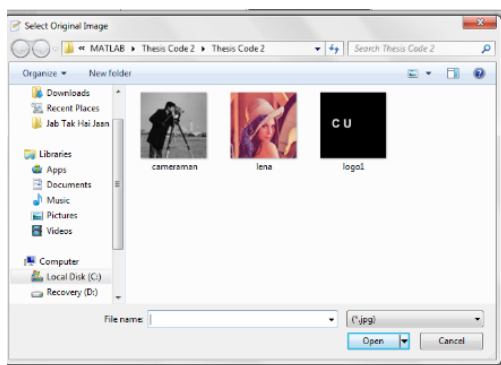


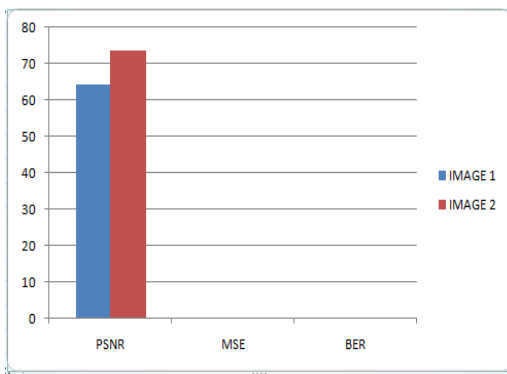
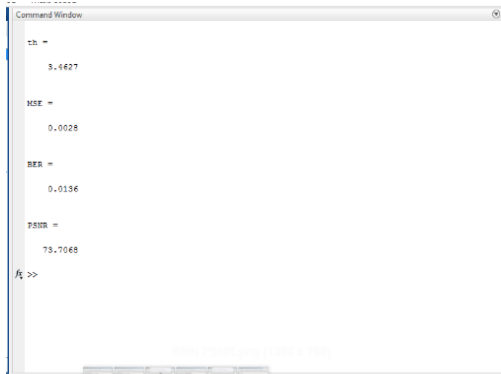
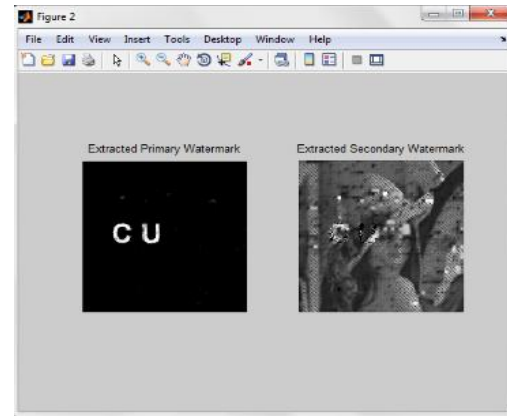
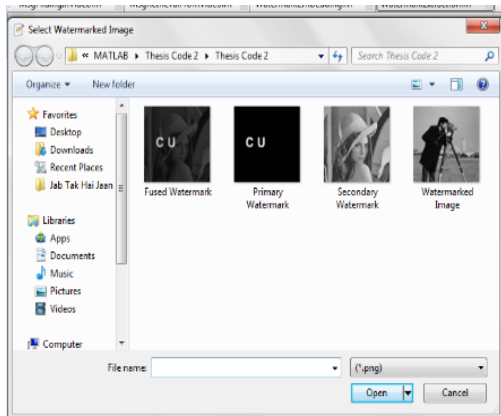
Figure2 Methodology

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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References

1. A Mansouri et. al, "SVD-based digital image watermarking using complex wavelet transform" Springer Verlag, Volume 34, Issue 3, pp 393-406, June 2009
2. Ali Al-Haj et al. "Non-Invertible Copyright Protection of Digital Images Using DWT and SVD" IEEE Transactions on Image Processing, Volume 1, pp-448-453, October 2007
3. A.B. Watson, "DCT quantization matrices visually optimized for individual images", in SPIE Proceedings, 1993, pp. 202–216.
4. Afrin Zahra Husaini, and M. Nizamuddin, "Challenges and Approach for a Robust Image Watermarking Algorithm," International Journal of Electronics Engineering, , pp. 229-233, June 2010
5. C.F.Wu et al. "Digital watermarks using zerotree of DCT,"IEEE Transactions Consumer Electronics, Volume 46, No.1 , pp. 87-94, February 2000.
6. Devleeschouwer et al. "Human visual system features enabling watermarking" IEEE International conference on Multimedia, Volume 2, pp-489-492, January 2002
7. Ezz El-Din Hemdan et al. "Hybrid Digital Image Watermarking Technique for Data Hiding" IEEE 30th national radio science conference 2013, pp-220-227, April 2013
8. Emir Ganic et al. " Robust DWT-SVD Domain Image Watermarking: Embedding Data in All Frequencies" IEEE Transactions on Image Processing, Volume 6, No.8, September 2004

9. Franklin V et al. "Entropy based Robust watermarking Scheme using Hadamard Transformation technique" IEEE International Journal of Computer Applications (0975 – 8887) Volume 12, No.9, December 2010
10. Fardin A. et al., "A new robust blind DWT- SVD based digital image watermarking," IEEE International Conference on Emerging Trends in Electrical and Computer Technology (ICETECT), pp-1-5,May 2011
11. G. Langelaar et al. "Watermarking Digital Image and Video Data: A State-of- Art Overview," IEEE Signal Processing Magazine, Volume 17, Issue 5, pp. 20-46, September 2000.
12. Juan R. Hernandez et al. "DCT-Domain Watermarking Techniques for Still Images Detector Performance Analysis and a New Structure" IEEE Transactions on Image Processing, Volume 9, No. 1, January 2000
13. Jahan R et al. "Efficient and Secure Digital Image Watermarking Scheme using DWT-SVD and Optimized Genetic Algorithm based Chaotic Encryption" International Journal of Science, Engineering and Technology Research (IJSETR) Volume 2, Issue 10, October 2013
14. Kai Wang et. al "Hierarchical Watermarking of Semi-regular Meshes Based on Wavelet Transform" IEEE Transactions on Information Forensics and Security, Volume 3, no. 4, December 2008
15. Kaur R et. al. "Semi-Blind Image Watermarking Using High Frequency Band Based on DWT-SVD" IEEE Sixth International Conference on Image Processing, pp-19-24, December 2013
16. Liu, K.C. "Wavelet-based watermarking for color images through visual masking", ELSEVIER International Journal of Electronics and Communications, Volume 64, Issue 2,February 2010
17. Mohammad Rahmati "A robust watermarking scheme based on wavelet transform and block SVD" IEEE International Conference on Signal Processing and Its Application, pp-1-4, February 2007.
18. Mitchell D. Swanson, et al. "Transparent Robust Image Watermarking" IEEE International Conference on Image Processing ,Volume 3, pp-211-214 May 2009
19. Moulin P, et al. "A Framework for Evaluating the Data-Hiding Capacity of Image Sources" IEEE Transactions on Image Processing, Volume 2,September 2002
20. M.-S. Hsieh et al. "Hidden digital watermarks using multi- resolution wavelet transform" IEEE Transactions Industrial Electronics, Volume 48, No.5, pp.875-882, Oct.2001.
21. Premaratne P. et al. "A Novel Watermark embedding and detection scheme for image in DFT domain", Image Processing and Its Applications, Seventh International Conference, Volume 2, pp.780-783,1999.
22. Pierre Moulin et al. "A Framework for Evaluating the Data-Hiding Capacity of Image Sources" IEEE Transactions on Image Processing, Volume 11, No.9, September 2010
23. R.G. Van et al. "A Digital Watermark", Proceedings of IEEE International Conference on Image Processing, Volume 2,pp-86-90 November 2010.
24. Raymond B. et al."Perceptual Watermarks for Digital Images and Video"Proceedings of the IEEE, Volume 87, No. 7, August 2002
25. R.A. Ghazy et al. "Performance Evaluation of Block Based Image Watermarking," Progress In Electromagnetics Research , Volume 8, 147-159, June 2008.
26. S Kamble et al. "DWT-based Multiple Watermarking for Privacy and Security of Digital Images in E-commerce," IEEE International Conference on Multimedia, Signal Processing and Communication Technologies, pp-224-227,December 2011.
27. S Voloshynovskiy et al. "Multibit Digital Water marking robust against Local Non linear geometrical Distortions" IEEE International Conference on System Sciences, October 2001.
28. Shijun Xiang et al."Invariant Image Watermarking Based on Statistical Features in the Low- Frequency Domain" IEEE transactions on circuits and systems for video technology, Volume 18, No. 6, June 2008
29. V Santhi et al, "A Hybrid Block Based Watermarking Algorithm using DWT-DCT-SVD Techniques for Color Images" International Conference on Image Processing, pp. 1-7, December 2008
30. V Santhi et.al "DWT-SVD Combined Full Band Robust Watermarking Technique for Color Images in YUV Color Space" International Journal of Computer Theory and Engineering, Volume 1, No. 4, October 2009
31. V Singh, "Digital watermarking: A tutorial," Cyber Journals, Multidisciplinary Journals in Science and Technology, Journal of Selected Areas in Telecommunications (JSAT), January Edition, 2011.
32. V.Potdar et al. "A Survey of Digital Image Watermarking Techniques", IEEE International Conference on Industrial Informatics, Volume 10, pp. 709-716, August 2005
33. Ying Yang et al. "A Contrast-Sensitive Reversible visible Image Watermarking Technique" IEEE transactions on circuits and systems for video technology. Volume 19,No.5, May 2009
34. Yaxun Zhou et al. "A Robust Digital Image Multi-watermarking Scheme in the DWT Domain," IEEE International Conference on Techniques and Informatics (ICSAI 2012),pp-1851-1854, May 2012
35. Zhou Y et al. "A Novel Image Zero Watermarking Scheme Based on DWT-SVD" International Journal of Multimedia, Volume. 7, No. 4, August 2012
36. Zhang Y et al. "A Universal Entropy Masking Model in Digital Watermarking System" IEEE 9th International Conference on Fuzzy Systems and Knowledge Discovery, (FSKD), pp-2875-2878,May 2012

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