Location Identification For Optimizing Fidelity And Robustness Using Swarm Intelligence

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Abstract *- Digital Watermarking has important characteristics of Robustness and Fidelity. It is a crucial decision to find locations where watermark bits need to be inserted in order to optimize these desirable characteristics. PSO can be helpful in arriving at the decision of finding locations where the watermark bits can be inserted. The usage of this methodology has generated optimistic results in favor of using this method for the sake of watermark embedding and extraction.*

Keywords — *Robustness, fidelity, Watermarking, PSO, Swarm Intelligence*

I. INTRODUCTION

In this paper, we have introduced a technique which can make use of PSO to find suitable locations in the cover image, where watermark bits may be inserted to encode the watermark and later to extract the inserted watermark bits without much deterioration. Attempt has been used to define a suitable objective function of PSO to facilitate this operation. the results obtained are optimistic and talk in favor of using PSO for the purpose of watermark insertion and extraction

II. APPROACH USED FOR DIGITAL WATER MARKING

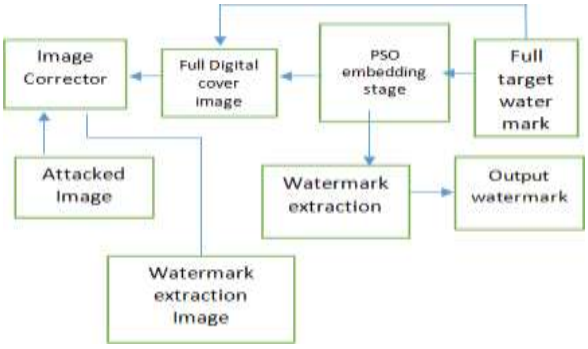
The general approach for the insertion and extraction of watermark bits may be describe as follows.

Encoding watermark bits into the cover image.

1. Objective function of PSO is being used to find locations to insert the watermark bits.
2. Now the PSNR of the image is calculated and recorded.
3. Take the locations identified byPSO.
4. Insert the watermark bits into the identified locations byPSO.

Extraction of watermark bits on the cover image.

1. Take the locations identified byPSO.
2. Get the modified pixelvalues.
3. Separate out the original pixels and the inserted watermark bits.
4. Join the watermark bits to reconstitute the watermark.



III. EXPERIMENT CONDUCTED AND RESULTS OBTAINED

In the experiment conducted a gray scale image of this dimension 117*114 pixel was chosen as a cover image. Now the watermark bits were inserted into pixel intensity values of the cover image as per location decided by PSO. After this various image attacks were made and watermark was again extracted from the identified location and the bits were assembled to the build the watermark. The normalized correlation are obtained was done with the original watermark to find the robustness of watermark under the various image attacks. The results were tabulated and given in the paper.

Trade-off between Robustness and fidelity (PSO with hiding watermark bits within fractional part of cover image)

It is clear that even after stronger insertion of watermark bits, the fidelity remains almost unaltered. This tells in terms of drastic reduction of inverse tradeoff between Robustness and Fidelity. This is one important result which advocates in favor of using PSO during Digital Watermarking.

Table 1 Detail of Fidelity and correlation

Sr. No.	Fidelity-PSNR(dB) (watermarked Image)(un-attacked)	Normalized Correlation (Extracted Watermark) (Unattacked)	Trade Off
1	41.65	0.855	NO
2	41.65	0.861	
3	41.65	0.863	
4	41.65	0.811	
5	41.65	0.890	
6	41.65	0.964	
7	41.65	0.997	

Table 2 Result and conclusion of PSNR watermarked

Cover Image	Watermark Image	PSNR(dB) of watermarked Image and NC of watermark extracted (no attack situation)PSNR,NC	Size of water mark inserted	Attack	PSNR(dB)of extracted watermark and NC after attack
		41.65 , 0.997	117*114 pixels with 256 grey values	Blurred (0.5%) 3*3 averaging filter	41.66,0.955 41.62 ,0.950
				Cropped (30%)	41.33,0.943
				Contrast and Enhanced (40%) 3*3 contrast enhancement filter	40.58,0.942 41.64,0.955
				Compressed CR = 10.75 QF= 50%	41.64,0.955
				Gaussian Noise(25%) with variance =0.1	41.62,0.962 40.80,0.927
				Sharpened (30%) 3*3 lapacing filter	41.64,0.955 41.60,0.962
				Rotated(15 degree)	41.62,0.961
				Scaled (50%)(1-1/2-1) 1-3-1	41.64,0.952 41.60,0.959

IV. CONCLUSION

The fidelity and robustness are shown to exhibit inverse trade off which is quite natural. But the tradeoff is not very seriously affecting the desirable characteristics. The payload of the watermark used in this technique if 117*114 pixel with 256 gray values which is equivalent to 117*114*8 bits. The results obtained clearly indicative of the success of this technique for the purpose of Digital Watermarking.

V. REFERENCES

[1] R.Schyndel, A.Tirkel and C.Osborne, "A Digital Watermark" in Proc. IEEE International conference on Image Processing, 1994, vol.2,pp.86-92.

[2] Xia-Mu Niuand Sheng-He Sun, "Multiresolution Digital Watermarking for Still Image" in Proc. IEEE Neural Networks for Signal Processing, 2000,vol.2,

[3] Ping Dong, Jovan G.Brankov, Nilolas Palastsanos, YongyiYang, FranckDavoine,"SignalCompression Digital Watermarking Robust Geometric

[4] Fredric M.Hamand Ivica Kostanic, "Principles of Neurocomputing for Science & Engineering", Mc.GrawHill, Singapore, 2001, pp.136-140.

[5] Yu,P.T., Tsai H.H., and Lin J.S., "Digital Watermarking based on Neural Networks for Color Images , Signal processing, vol.81,pp.663-671.

[6] J.R.Hernandez, F.Perez Gonzalez and J.M.Rodriguez, "Data Hiding for Copyright Protection of Still Images", National conference in image processing,Faislabad,2001.

[7] Hwang M.S., Chang C.C. and Hwang K.F.,"Digital Watermarking of Images using Neural Networks",Journal of electronic imaging, 2000, vol.9,pp.548-555.

[8] CharrierM.,Cruz,D.S. and Larsson M., "JPEG 2000 , the Next Millennium Compression Standard for Still Images" in Proc. IEEE InternationalConference.

[9] Distortions", IEEE Transaction on image processing, December 2005,vol.14(12).

[10] Charkari N.M. and Chahooki M.A.Z., "A Robust High Capacity WatermarkingBased on DCT and Spread Spectrum" in IEEE International Symposium of Signal Processing and Information Technology, 2007,pp.194-197.