

University of Trento

Engineering Faculty

Telecommunication Engineering Master Degree

FINAL THESIS

GA-BASED ROBUSTNESS EVALUATION METHOD FOR DIGITAL IMAGE WATERMARKING

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Academic year 2006-2007



Application field

Multimedia content security



- Copyright protection
- Authenticity of the document
- Copy protection
- Traitor tracing

Proposed approach: DIGITAL WATERMARKING

(the art of hiding a message (*watermark*) within a host (*cover*) signal)



Purpose of the thesis

Benchmarking tool to automatically evaluate robustness of Digital Watermarking techniques



- AIM : given a set of attacks, remove the watermark while granting the perceptual quality of the image as high as possible, here measured in terms of *Weighted Peak Signal to Noise Ratio*
- → Stochastic search of the most suitable parameterization of attacks through the use of Genetic Algorithms.



Innovation & Results

- Combination of attacks
- Dynamic parameterization of attacks
- Definition of a new metric to evaluate robustness in term of perceptual quality
- •Use of optimization algorithms (Genetic Algorithm) in a watermarking benchmark





Lena image watermarked with q = 47dB (left) and unmarked with M(q) = 37.37 dB (right).

Performances plots for Q = 40 dB and Q = 35 dB under the combination of JPEG2000 compression, addition of WGN and resize attack.



Applications

- <u>Developers</u> : improvement of the algorithm under development, by identifying method's weaknesses and failings.
- <u>Users</u> : fair comparison of existing techniques in order to choose the most suitable for the intended application.

elezione immagine ——					
barni_lena_1.5.tif		Carica			
Immaj	gine barni_lena_1.5.tif a	cquisita!		Visualizza im	magine
elezione attacchi					
	-Range Power [dB]-			- Standard Deviation	
Rumore awgn Compressione jpeg	Lower Bound 0		💿 Filtro gaussiano	Lower Bound	0.1
	Upper Bound	36		Upper Bound	1.9
	Range OF			Resizing Factor	
	Lower Bound 30 Upper Bound 100			Lower Bound	0.1
			 Resize 		0.1
				upper bound 1	
Run Tool					
- Setting GA			Set Soglia		
Dimensione Popolazione		3	15		
CrossOverFraction		0.7			
M detien Drehebilt		0.7			Run AG
Watation Probabilit		0.1			
Generations		1			
		GArun t	erminatol		
— Output Ottimizzazio	ne				
		Marchio r	imosso!!		
WPSNR = 27.8727 dB Av		Awgn	Power = 34dB	QF = 64	
Vienalizza Immanina Sanza Marchin				Resizing factor = 0.5	

 A user-friendly interface has been developed



Thank you!

For further information: http://mmlab.disi.unitn.it

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