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Video Watermarking Technique with High Robustness and Embedding Capacity

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Abstract**—** This work investigates a technique of watermarking for secured communication. Now a day's authorized access of multimedia data has been increasing rapidly and it demands higher security. A new modified LSB watermarking embedding technique is presents in this regards. The main objective of this technique is to provide highest robustness against different types of attacks like rotation, cropping, noise and filtering. Simulation result of proposed work has been shown to claim the better robustness.

Keywords**—** Watermarked, PSNR, MSE, DWT, IDWT, RGB

I. INTRODUCTION

Digital watermarking has become a very important in various applications. Several watermarking techniques have been proposed to protect the copyright information. There are three indispensable, yet contrasting requirements for a watermarking scheme: robustness, invisibility and capacity [1].

The visual quality of host media (often known as imperceptibility) and robustness are widely considered as the two main properties vital for a good digital watermarking system. They are complimentary to each other and hence challenging to attain the right balance between them. This paper proposes a new approach to achieve high robustness in watermarking while not affecting the perceived visual quality of the host media by exploiting the concepts of visual attention [2].

The security of any digital information is very important in today's world. The basic idea is to embed auxiliary information into multimedia data, such as image, audio, video and text. Most typically, watermarking is used to protect the copyright of products. In this case, the hidden information is generally related to owner, creator, authorized user, and status of the multimedia, and when necessary, it is extracted to identify or verify the copyright owner [3].

When the embedded watermark is visible on the watermarked image, approaches is known as visible watermarking. Watermarks may be applied to images or frames only. These types of watermarks cannot be removed easily from watermarked frame or image. Statistical analysis provides protection to them [5]. Visible watermarking has the disadvantage of image quality degradation.

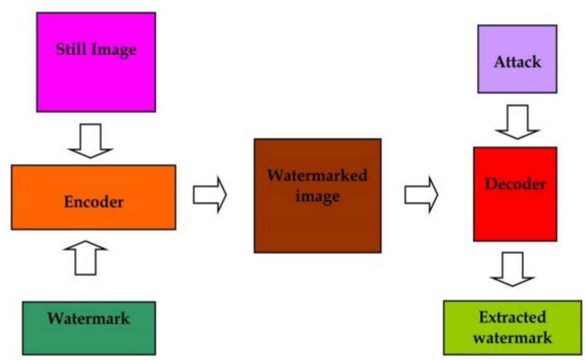

Figure 1: Block diagram of the watermarking process

II. RELATED WORK

Xinshan Zhu et.al [3]: "Normalized Correlation-Based Quantization Modulation for Robust Watermarking" A novel quantization watermarking method is presented in this paper, which is developed following the established feature modulation watermarking model. The performance of the NC-based quantization modulation (NCQM) is analytically investigated, in terms of the embedding distortion and the decoding error probability in the presence of volumetric scaling and additive noise attacks. Proposed algorithm gives better result in presence of different types of attacks.

Anirban Sengupta et.al [4]: "Exploring Low Cost Optimal Watermark for Reusable IP Cores During High Level Synthesis " This paper presents a novel multi-variable signature encoding for embedding a watermark it is difficult to realize the signature without complete encoding knowledge of the four variables. Comparison with other indicated that our algorithm gives better result with lower embedding cost, lower runtime, and less storage hardware.

Tianrui Zong et.al [5]: In this paper author used Rank-Based Watermarking with using High Embedding Capacity and Robustness in which 2dct technique is used and watermark bits are inserted into a block by modifying the set of DCT. In the watermark extraction process, the received image are obtained from the secret key. Afterward, the watermark bits are extracted by checking the ranks of the detection matrices.

III. METHODOLOGY

A video and watermark is considered and video is divided into number of frames and separated into R, G, and B components. 2D-DWT operation is performed on each R, G & B component to identify approximation & details coefficients. Then watermarking embedding LSB algorithm is applied on combine approximation coefficient to obtain watermarked video frames. To recover the watermark from watermarked frame, watermark extraction algorithm is used. Embedding & extraction algorithm of watermarking makes easy to obtain watermark.

To check the Robustness of proposed algorithm, watermarked frame is passed through different types of attacks like filtering, rotation, cropping, and noise. But in the presence of these entire attacks watermark is easily extracted with high PSNR value.

IV. RESULTS AND DISCUSSION

The experiment is performed on test video. The watermark robustness is tested under median filter, salt & pepper (S&P) noise, cropping & rotation. From the PSNR graph obtained using the proposed detector & the other conventional algorithm (i.e. existing algorithm) when the watermarked images are contaminated by rotation attack undergone by rotation varying from -10^o, -20^o, 10^o and 20^o by noise attack with noise variance varying from 10% to 90%, by cropping attack & undergone by filtering attack with mask size of 3X3, 5X5, 7X7 & 9X9 respectively.

Similarly figure shows the MSE curves obtained using the proposed detector and the other conventional algorithm (i.e. existing algorithm) when the watermarked images are contaminated by different attack. Proposed algorithm is robust to other existing algorithm against all attacks.

Table 1. Comparison of Average PSNR & MSE of extracted watermark in case of rotation attack

S.No.	***Rotation Attack***				
	Video Frames	***Existing Method***		***Proposed Method***	
		PSNR	**MSE**	**PSNR**	**MSE**
1.	Frame 10	46.34	1.38	52.89	0.23
2.	Frame 30	47.34	1.02	51.35	0.47
3.	Frame 50	45.34	1.93	52.11	0.26
4.	Frame 70	46.57	1.55	52.12	0.31
5.	Frame 90	46.64	1.58	51.35	0.47
6.	Frame 100	47.34	1.02	52.19	0.37

Table 2. Comparison of Average PSNR & MSE of extracted watermark in case of noise attack

S.No.	***Noise Attack***				
	Video Frames	***Existing Method***		***Proposed Method***	
		PSNR	**MSE**	**PSNR**	**MSE**
1.	Frame 10	36.34	14.8	45.24	1.98
2.	Frame 30	32.45	27.6	49.67	1.09
3.	Frame 50	32.67	31.8	45.24	1.58
4.	Frame 70	30.67	29..5	45.54	1.57
5.	Frame 90	29.88	31.2	45.14	1.88
6.	Frame 100	35.67	19.3	49.67	1.09

Table 3. Comparison of Average PSNR & MSE of extracted watermark in case of cropping attack

S.No.	***Cropping Attack***				
	Video Frames	***Existing Method***		***Proposed Method***	
		PSNR	**MSE**	**PSNR**	**MSE**
1.	Frame 10	45.23	1.88	52.58	0.25
2.	Frame 30	44.84	2.23	51.84	0.48
3.	Frame 50	44.37	2.73	50.58	0.55
4.	Frame 70	44.24	2.17	52.77	0.31
5.	Frame 90	45.23	1.88	51.13	0.49
6.	Frame 100	44.84	2.23	51.45	0.27

Table 4. Comparison of Average PSNR & MSE of extracted watermark in case of cropping attack

S.No.	Filtering Attack				
	Video Frames	*Existing Method*		*Proposed Method*	
		PSNR	MSE	PSNR	MSE
1.	Frame 10	46.34	1.45	53.41	0.29
2.	Frame 30	44.31	2.81	50.28	0.72
3.	Frame 50	44.59	2.66	50.23	4.23
4.	Frame 70	44.32	2.13	53.41	0.29
5.	Frame 90	46.34	1.45	50.28	0.72
6.	Frame 100	44.31	2.81	50.23	4.23

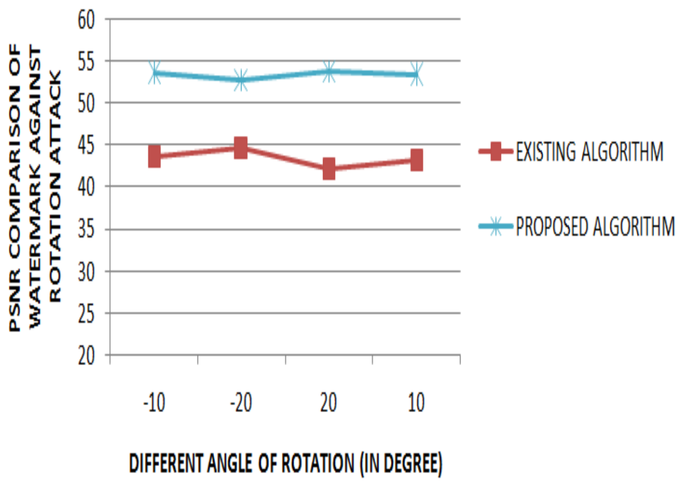

Figure 2: Comparison of PSNR of watermarked v/s different angle in case of rotation angle of test video

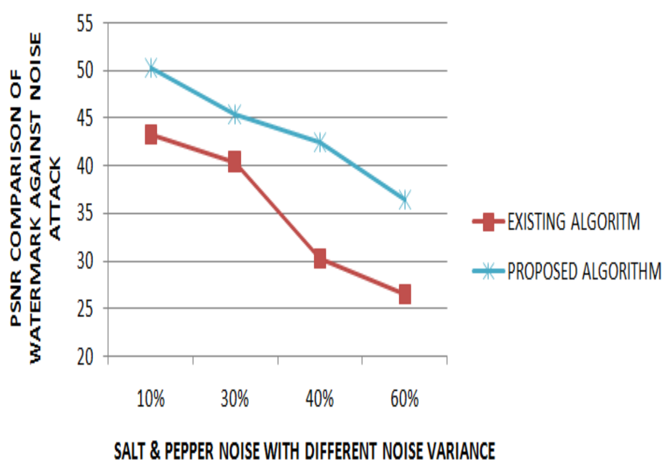

Figure 3: Comparison of PSNR of watermark v/s different noise variance in case of noise attack of test video

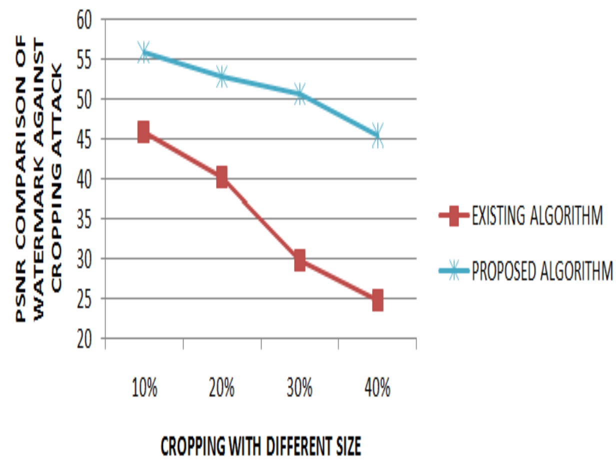

Figure 4: Comparison of PSNR of watermark v/s different size of crop in case of cropping attack of test video

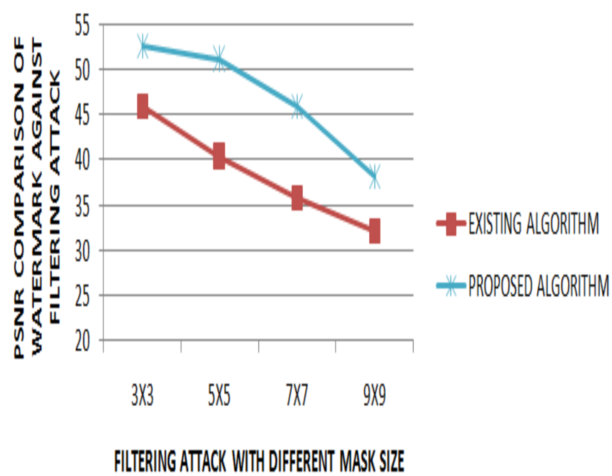

Figure 5: Comparison of PSNR of watermark v/s different mask size in case of filtering attack of test video

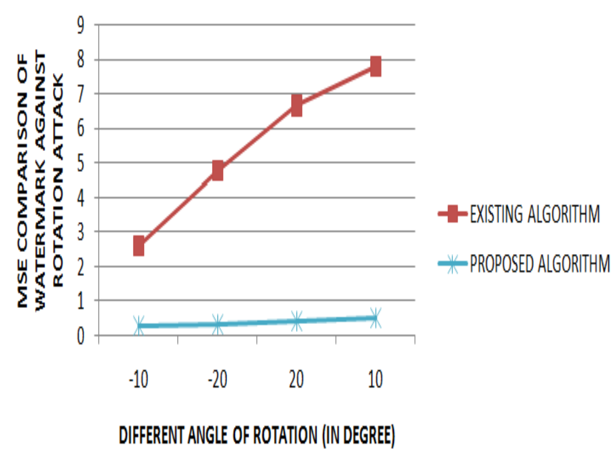

Figure 6: Comparison of MSE of watermark v/s different noise variance in case of rotation attack of test video A

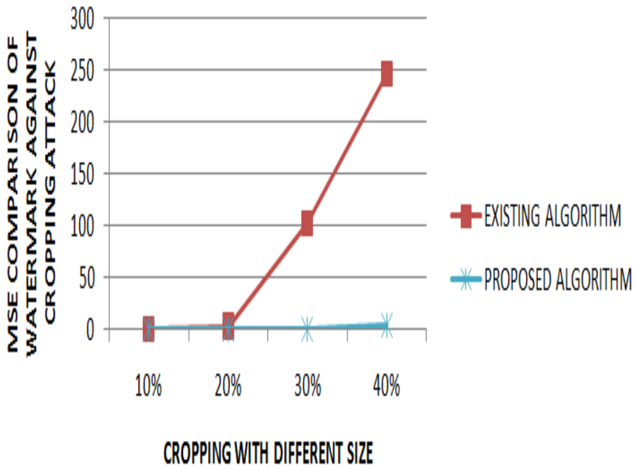

Figure 7: Comparison of MSE of watermark v/s different crop size in case of cropping attack of test video

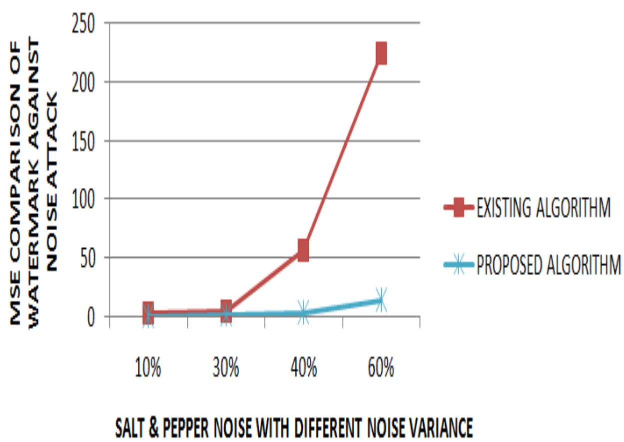

Figure 8: Comparison of MSE of watermark v/s different noise variance in case of noise attack of test video

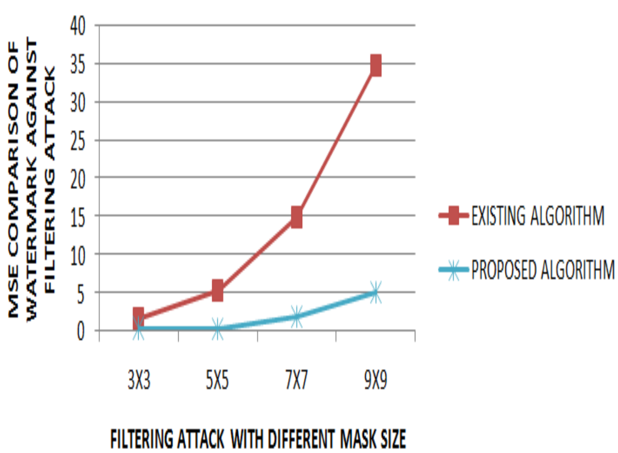

Figure 9: Comparison of MSE of watermark v/s different mask size in case of filter attack of test video

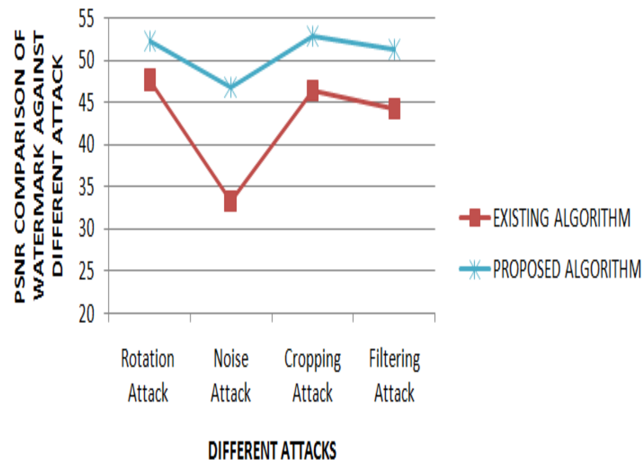

Figure 10: Comparison of PSNR of watermark v/s different Attacks of test video

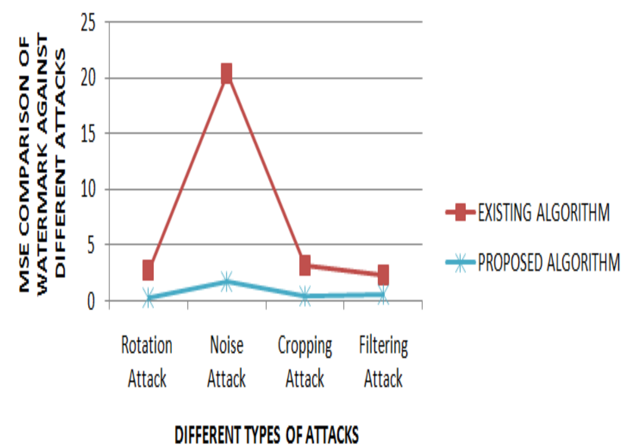

Figure 11: Comparison of MSE of watermark v/s different noise variance attacks of test video B

V. CONCLUSION AND FUTURE SCOPE

In this paper, a new method DLSB Based watermarking algorithm has been proposed. To investigate the robustness of proposed algorithm, different video frames with different intentional and unintentional attacks were employed. PSNR values are estimated for all the video frames. Comparing these PSNR values with that obtained by earlier conventional approaches, it can be concluded that the fidelity of the watermarked video is improved with the proposed method. It has been also shown that the performance of proposed algorithm is highly robust against common attacks such as salt & pepper noise, median filtering, cropping & rotation. But form the results it is clear that if noise & filtering attacks are present and value of noise variance increases along the size of window, quality of extracted watermark is degraded. Results exhibit the robustness and superiority of algorithm over existing once.

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