Mitigation of Geometrical Attack in Digital Image Watermarking using Different Transform Based Functions

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Abstract: ***The illegal act of digital multimedia data loss the value of information and integrity. The loss of information and integrity born the process of piracy of digital data. The piracy of digital data loss the brand value of documents and products. For the prevention of piracy used the digital watermarking technique. The digital watermarking techniques provide copyright protection and increase the value of brands — Watermarking techniques used in various fields such as image, video, audio, and text. The process of watermarking techniques proceeds in two manners spatial domain and frequency domain. The processing of frequency based watermarking techniques is roughest and fast processing of watermarking. Now in the current scenario, various transform function is used for the embedding process of watermarking techniques. In this approach present the studied of digital watermarking techniques based-on different transform function such as DCT, DWT, FFT, and many more transform function. The transform function based watermarking techniques faced a problem of geometrical attack. The Geometrical attack deforms the watermark and gets information. The prevention of watermarking techniques against the Geometrical attacks is a big challenge for the researcher in the field of digital watermarking.***

Keywords: - Digital Watermarking, Transform Function, Geometrical Attacks, PSNR, Strength

I. INTRODUCTION

The protection of copyright act of digital multimedia data used the process of watermarking. Now a day, the transformation of technology and application needs the process of digital watermarking techniques[1]. The umbrella of watermarking techniques covers all filed of computer vision in the process of copyright protection. The embedding process of watermarking deals in two different modes, such as spatial modes and frequency modes. The spatial patterns of watermarking techniques work on the biases of pixel-based operation. The pixel-based watermarking techniques easily cracked and theft. The pixel-based watermarking algorithm works on LSB and MSB bit of digital data[5-7]. The visual content of watermark also faced a problem of quality in the scenario of this algorithm. In frequency based watermarking techniques have some advantage such as fast processing algorithm, more robust and quality-based watermark.

The process of spectrum-based watermarking techniques used a transform-based function. The transform-based function resolves the multiple points of data in the process of watermarking. The umbrella of transform function gives a variety of algorithms such as DCT, DWT, IWT, FFT, and many more solid state-based transform functions. Also, the combination of transform based function increases the strength of watermarking techniques. The uses of transform function provide the process of features based watermarking techniques. The feature-based watermarking techniques used the method of feature optimization [3-4]. The process of feature optimization reduces the correlation coefficient value of the feature and increase the security strength of watermarking techniques. Always, Robust watermarking methods give lack response from the conflict problem b/w the needed robustness and the appropriate imperceptibility. Watermark applying is taken out by modifying some of the temporary values either in spatial or transform-domain. A countable improvement is necessary to get greater robustness versus attacks, which is a move towards reducing the quality of the watermarked host. Most of the robust watermarking approaches applied the watermark in the transform domain since it provides more robustness than those in the spatial area [12]. After that, the location of the improved coefficients and the embedding strength's quality is affected. The sustainability and applicability of watermark algorithm depend on the penetration of security attacks of watermarking techniques. For the validation of the watermarking algorithm used various types of geometrical attacks. The Geometrical attacks consist of transformation attack, rotation attack, share attack, cropping attack, and many more attack[2, 14]. These attacks major the security of watermark image and data. Afterward, the remaining section of this manuscript assembled and described below. Figure 1 shows the process of watermarking.

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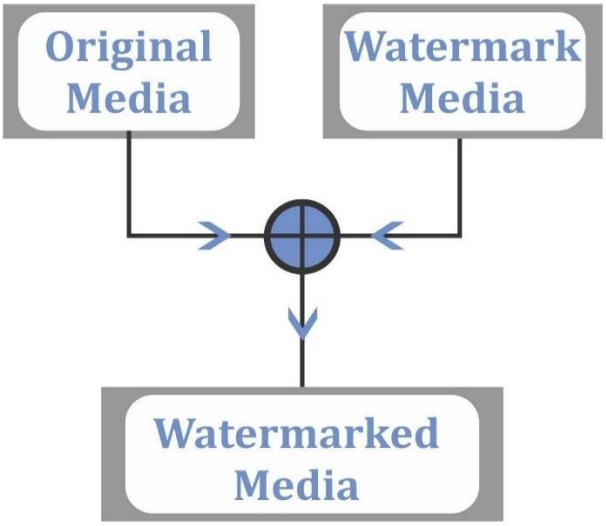

Figure 1: block diagram of watermarking in image processing [2].

Section II presents the review of current work in image watermarking in tabular form. In part III show the comparative methods based on numerical values of validation. In section, IV describes the process of geometrical attacks in the watermarking process and finally conclude the conclusion and future work of watermarking.

II. RELATED WORK

In the current scenario, the Strength of watermarking techniques is big issue. For the enhancement of the Strength of watermarking techniques used various algorithms based on transform based function and pixel-based operation in the process of watermarking. Some methods and approach of watermarking describe here in form of table.

Et al.	Author	Description	Issues and challenges
[1]	Xu Li, Xingming Sun and Quansheng Liu	• Installation on basic level and scenario using discussedapproach • Time-Shift Sampling Method	• The overflow problem concerns only the pixel values 0 and 255.
[2]	Chau-Jern Cheng	• Cropping Attack • Sudoko • Using the Sudoku on an Image • Watermark image embedded using the LSB approach • Crop Attacking Watermarked Image	• A significant issue for hologram storage and delivery is self-contained-ness.
[3]	AfrojaAkter	• Image scrambling • Singular value decomposition	• Pasting, updating, and distributing the intellectual features in an unauthenticated manner.
[4]	Sun Jianguo	• SVD • Arnold Transform • RDWT • DCT	• Traditional approach depended on space or frequency domain using higher meshed structure.
[5]	Xinguo Zou, Na Li and Nawei Ji	• Segmentation based on SDF • Watermark embedding • Watermark extraction • Experimental results against various attacks	• Regular attacks, like gaussian noise-adding, cropping, salt and pepper noise-adding, Wiener filtering
[6]	B. J. Saha	• Basis images • Matrix product • Orthogonal transform of the basis images • Decomposition of the binary matrix having unit brightness • Basis dwt images • A steganographic scheme	• Real time Attack not possible.
[7]	Jung-San Lee and Bo Li	• DWT • SVD	• A process of embedding approach must be robust enough to resist dangerous attacks that are; an illegal customer must be permitted to get a usable icon.

[8]	MrigankaGogoi	• Encoding algorithms • Decoding algorithms	• Arising for security • Digital information privacy
[9]	Md. Asikuzzaman	• Statistical optics • Fringe analysis • Interference microscopy.	• The main two issues of the DWTin it's the ridiculous decimated form, which is lack of invariance.
[10]	B. Sridhar and Dr. C. Arun	• QR code structure • Function Pattern Region • Encoding • QR decoding • Approaches to QR code embedding	• The embedded watermark signal can also be easily removed or destroyed.
[11]	S.Thayammal and D.Selvathi	• Discrete wavelet Transform • Singular value decomposition • Proposed Watermarking Schemes	• Band restriction problems
[12]	Anurag Mishra, Amita Goel, Rampal Singh, Girija Chetty and Lavneet Singh	• Image Hash Construction • Forged area of image • Forgery localization • Robustness to JPEG compression • Robustness to brightness/contrast adjustments • Robustness to other content preserving modifications • Sensitivity to tampering •	• Taking more time (training time, embedding time, extraction time)
[13]	SaeidFazli	• Singular Value Decomposition (SVD) • Discrete Wavelet Transform (DWT) • Video Watermarking Technique	• Not secure enough to secure the given attacks: pixel-based and geometrical, known/chosen-plaintext and statistical.
[14]	Wang Xiang-Yang, Liu Yu-Nan, Li Shuo Yang Hong-Ying and Niu Pan-Pan	• Bees optimization algorithm • Watermark embedding and extraction	• The hidden information is not noticeable
[15]	Arun	• Spares matrix • Principle of CS • Template Matching Procedure	• Problems of several threats and protects the digital data from being compromised or altered.
[16]	T.Naga Jyothi and K.HariBabu	• Embedding Process • Extraction Process	• The same watermark is embedded into 4 types of sub-bands and that is so tuff to terminate.
[17]	Kayvan. Ghaderi, Fardin. Akhlaghian and Parham. Moradi	• Domain overview • Genetic Algorithm • Modification on genetic algorithm/ Proposed Algorithm	• Copyrighted digital data problem in the digital industry
[18]	Q*ingbo Kang*	• Problem identification: Rounding error problem	• Need to upgrade the watermark's capability versus the attacks while influencing as less as possible the original image.
[19]	Chandan Singh Rawat and SukadevMeher	• Digital WatermarkingTechnology • Broadcast Monitoring • Ownership Assertion • Transaction Tracking • Content Authentication	• The problem is blocks become visible when the image is decreased to higher compression ratios.
[20]	M*d. Asikuzzaman*	• Watermarking threats • Models of watermarking • algorithms • Comparative Analysis	• Camcorder stole is mostly found issues that digital media are facing and is one of the most significant origins of video duplicity.

[21]	Saman Iftikhar, M. Kamran and Zahid Anwar	• Robust methods • Spectral methods • Fragile methods • Distortion evaluation • Robustness measurement	• Watermark information calculation is formulated as a no problem to meet the constraints of the data owner.
[22]	LamriLaouamer, Abdelhamid Benhocine, Laurent Nana and Anca Pascu	• Proposed Watermarking • SVD	• Images recovering right and authentication in Motion JPEG video stream forward by WIFI attached robots.
[23]	L*ingling* A*n*	• Discrete Wavelet Transform • Watermark Preparation • Block Mapping Address • Watermark production • Watermark Embedding • Watermark Extraction	• Get the watermarks using backup by creatively modeling the extraction working as a partition issue.
[24]	A.E.A.E. H*ossaini*	• Transform domain method • DWT transform • Extraction algorithms • Embedding algorithm • Attack free case	• The problem of illegal distribution of multimedia
[25]	Sidham Abhilash and S M Shamseerdaula	• Tampering attacks • Tampering protection stage • Tampering detection stage • Spatial detection • Temporal detection • Thresholds analysis	• The problem of run time complexity
[26]	P. Shanthi	• Basic of watermarking • Properties of watermarking • Classification of embedding • Challenges of watermark	• The problem of geometric and non-geometric attacks.
[27]	G. Agila and N.R. Ananthanarayanan	• Preliminary of DCT and Spread Spectrum Way • Cross correlation coefficient	• Theft original data using manipulation of data with the help of shifting MSB
[28]	R.C. S*ingh*	• Watermark creation • Watermark embedding • Ownership verification • Errors in estimated feature • PSNR of image	• The issue is to integrate the safety of data into the digital data' content in the inseparable form in this time its usable lifespan.
[29]	Satendrakumar, Ashwini Kumar Saini and Papendra Kumar	• Photoreceptor voltage response sampling • light's light • Intensityon flight speed and temporal resolution • The light intensity with position control effect • Photoreceptor voltage response modulation • Materials and Methods • Photoreceptor voltage response modulation	• The problem of easy editing and duplication of images

[30]	Baisa L. Gunjal and Suresh N. Mali	• Approach: Brain-like SNNstructure$NeuCube$ • Unsupervised Learning in the 3D SNNc • ERP Components Analysis • $Supervised\ Learning$ and Classification with the Use of Evolving $SNN\ Classifier$	• The process is too lengthy and time-consuming
[31]	Pooran Singh Negi and Demetrio Labate	• Digital video watermarking • Recent Developments in CodingStructure Technique • Watermarking techniques for MPEG • Watermarking techniques for the H.264 • Watermarking for the HEVC • Conclusion and future research directions	• Problems of video denoising and video enhancement.
[32]	Abdullah AL- Shraideh, Suliman Bni Ahmad and AudehBni Ahmad	• Proposed Watermarking Method • Experimental Setting and Results	• The problem of fraud digital work these days
[33]	Pooja Chandrakar, Minu Choudhary and Chandrakant Badgaiyan	• Requirements of audio watermarking • Golden ratio • Proposed watermarking algorithm	• The problem of Audio quality deteriorates
[34]	Osama Hosam and Nadhir Ben Halima	• Intra Prediction in HEVC • The Intra Prediction Mode chosen in 4x4 Luminnance Block • Information Hiding Algorithm • Data Embedding Procedure • Data Detection Procedure	• The problem of copyright protection
[35]	ShachiNatu	• Robust $3D-watermarking$ • Fragile $3D-watermarking$	• The problem of evaluation against various image processing attacks.
[36]	Peyman Rahmati, Thomas Tran and Andy Adler	• Different techniques of digital watermarking • DCT • DWT • SVD • Plot for comparison between SVD and DWT • Attack	• Problem of security
[37]	LamriLaouamer and Omar Tayan	• Model of digital watermarking • Audio watermarking • Chaotic scrambling • Tests against attacks	• The problem of security text data and image data.
[38]	Chia-Chen Lin, Chin-Chen Chang and Yi-Hui Chen	• Defenses Against Memory Corruption Attacks • Subverting Information Hiding • Novel Memory Probing Method • Adversary Model • Randomization Techniques • Security by Information Hiding • Unveiling hidden memory • Subverting hidden code layouts • Conquering (re-)randomization • Proof-of-concept implementations	• How to restore a watermarked image to satisfactory condition after it is compressed by JPEG with a certain level of quality factor.

[39]	Samiksha Singlaand Harpreet Tiwana	• The Proposed Watermarking Scheme • Combine DCT,DWT AND SVD	• F1-measure of 96.90 has been recorded against the maximum of 96.37 in the existing models, whereas the 94% overall accuracy has been recorded against the 93% obtained from the other descriptors.
[40]	H. L*akshman*	• DWT • Stream Cipher • Proposed Algorithm	• The problem of image interpolation is nearly attached to image modeling.
[41]	Y*an Zhao*	• Mathematical preliminaries • Essentially non-oscillatory point-value decomposition • Proposed multiple watermarking scheme	• The problem of large size address than simply discussion whether a picture is a duplicated. • Hash's sensitivity to small part tampering while adjusting the short hash length and good robustness versus simple image processing.
[42]	P. Muthukumar, P. Balasubramaniam and K. Ratnavelu	• Experimental Results • Sensitivity Analysis • Statistical Analysis • Differential analysis • Encryption Speed	• Problem fully based on the discrete logarithm problem (DLP) and an inverse problem (IP).
[43]	S. S. Sujatha and M. Mohamed Sathik	• Segmentation • Watermark Embedding and Detection	• The problem of image authorization
[44]	Muhammad Arsalan, Sana Ambreen Malik and Asifullah Khan	• Digital Watermarking Concept • Digital Audio Watermarking Approach • Digital Watermarking Requirements • Classification. • Watermarking Techniques • Genetic Algorithm • Attacks	• GA is a direct random search technique, inspired by biological evolution, for solving optimization problems
[45]	Shun Zhang, Tiegang Gao and Lin Gao	• Domain of watermarking • Proposed Watermarking Scheme • Watermarking Process Using second order transform function •	• The difficulty of encryption and information hiding
[46]	Yu-Cheng Fan and Yu-Yao Hsu	• Berkeley Wavelet Transform • The Proposed System • The Simulation Parameters Settings	• Change traditional problem is embedding the duplicate watermark at LSB of wavelet coefficients just detects simple replaced in the picture.
[47]	Baoru Han, Lisha Cai and Wenfeng Li	• YCbCr color space • Arnold transform • Singular value decomposition • Human visual model • Relationship between JND and SVD • Why YCBCR	• Malicious attacks, tampering, illegal possession and other serious security problems attendant
[48]	T.Sridevi and S Sameena Fatima	• Text Steganography • Video Steganography • Image Steganography • Network or Protocol Steganography	• Problem to be considered in the watermarking are imperceptible, robustness, blindness and capacity.
[49]	Hieu V. Dang and Witold Kinsner	• Watermarking using the Hilbert • JPEG and JPEG 2000 Compression	• The problem as it has very lower time convergence and lower prediction accuracy

[50]	Sachin Goyal,Roopam Gupta	• Transformation • Gentetic Algorithim • Roulette-Wheel • Embedding Algorithm • Extraction Algorithm	• Need a powerful tool for watermarking

III. COMPARATIVE ANALYSIS OF WATERMARKING METHODS

The analysis of watermarking algorithms used two essential parameters, such as PSNR and NC. The study of all methods based on these two factors. The process of analysis presents in the form of a table.

CITATION	TECHNIQUE	PSNR	NUMBER OF CORRELATION
[2]	LSB	39.93	1
[3]	SVD	42.38	1
[4]	RDWTDCT-SVD	56.37	0.9932
[7]	DWT-SVD	59	1
[8]	WT	38.08	1
[11]	DWT	28.65	0.9726
[13]	DWT	75.93	1
[15]	Sparse	41.05	0.995
[16]	DWT-DCT	52.74	0.985
[18]	Hybrid DWT-SVD	70.48	1
[22]	SVD	99	1
[23]	DWT	37.57	1
[24]	HDWT-DCT	36.42	1
[25]	QIM	45.53	0.902
[27]	Spread spectrum	49.54	0.83
[31]	Int-DST	44.65	1
[32]	Spatial domain image	30	0.87
[34]	Information Hiding	44.65	1
[36]	SVD	44.50	0.9
[39]	DCT-DWT-SVD	47.309	0.999
[40]	DWT	66.98	0.9126
[42]	DCT-DWT	73.21	1
[43]	Robustness	43.3	1
[45]	DWT	31	1
[46]	Robustness	40.66	1

IV. GEOMETRICAL ATTACKS OF WATERMARKING

Geometrical attacks are the process of temporal relation of watermarking techniques. The Geometrical attacks replace the geometric structure of the watermark image and insert operation of rotation, translation, scaling, and cropping. The geometrical attacks replace the nature of watermark; the process of attacks detection is complicated after the attack — level of Geometrical attacks performed on two levels of local level and global level. The working of geometrical attacks deforms the quality of watermark and decrease the strength of security[13-14].

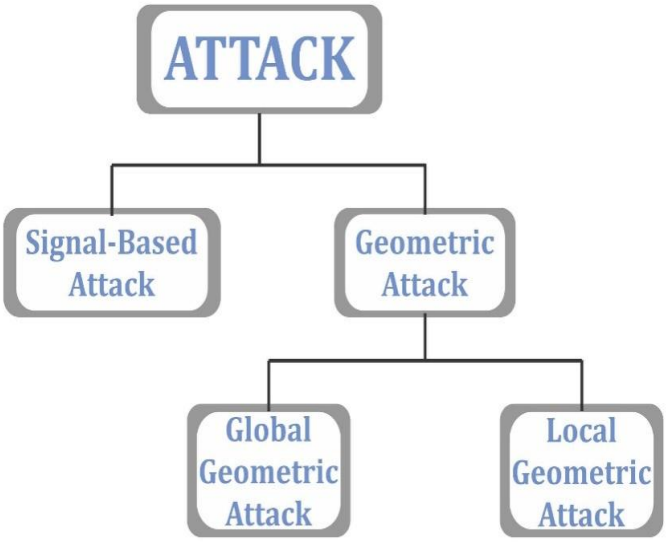

Figure 2: shows that the classification of attacks in watermarking techniques [2].

Table 1 describes the types of geometrical attacks and impact of attacks in watermarking [13-14].

Type of Attack	Description of Attack
Cropping	Cut image from a particular area and gets some information about the watermark.
Rotation	Apply different geometrical angle for rotation in both directions.
Image Flipping	Flip the content of image vertical and horizontal
Row-Column Blanking	Remove some row-column data in the watermark image
Scaling	Disorder the value of aspect of watermark image.
Warping	Deform the dimension of the watermark image.
Translation	Change the order of image.
Local exchange of pixels	Swapping of the pixel of the image in the local region.

V. CONCLUSION & FUTURE WORK

The digital watermarking protects the violation of copyright and intellectual property of rights. The strength and security of digital watermarking depend on the process of algorithm selection and minimum distortion of the image. Distortion of the image invites the geometrical attacks in watermarking techniques. The Geometrical attacks are non-predictive attacks on the side of detection. In the review process finds that the transform function depended watermarking techniques is higher robust than other approaches such as pixel-based techniques. The evaluation of PSNR and NC values also indicates that the transform-based function is the better option of watermarking. For the improves of watermarking techniques used feature based watermarking techniques. The feature-based watermarking methods give the opportunity of optimization of features and improve the strength of watermark. The process of optimization invites swarm-based optimization techniques for the better embedding and minimization of distortion during the process of watermarking in future used swarm-based feature optimization algorithm for the working of watermarking.

REFERENCES

1. Hiroshi Unno, RonnapornYamkum, ChutharatBunporn and KazutakeUehira “A New Displaying Technology for Information Hiding Using Temporally Brightness Modulated Pattern”, IEEE, 2017, Pp 596-601.
2. Mohammad Shahab Goli and Alireza Naghsh “Introducing a New Method Robust Against Crop Attack in Digital Image Watermarking Using Two-Step Sudoku”, IPRIA, 2017, Pp 237-242.
3. Tao Wang “Digital Image Watermarking using Dual-scrambling and Singular Value Decomposition”, IEEE, 2017, Pp 724-727.
4. [4] Sachin Gaur and Vinay Kumar Srivastava “A Hybrid RDWT-DCT and SVD Based Digital Image Watermarking Scheme Using Arnold Transform”, SPIN, 2017, Pp 399-404.
5. Seung-Min Mun, Han-Ul Jang, Do-Gon Kim, Sunghee Choi and Heung-Kyu Lee “A Robust 3d Mesh Watermarking Scheme Against Cropping”, IEEE, 2015, Pp 1-6.
6. Valery Gorbachev, Elena Kaynarova, Anton Makarov and Elena Yakovleva “Digital Image Watermarking Using DWT Basis Matrices”, Proceeding of the 21st Conference of Fruct Association, 2017, Pp 127-133.
7. Md. Atiqur Rahman and M.M. Fazle Rabbi “DWT-SVD based New Watermarking Idea in RGB Color Space”, International Journal of Signal Processing, Image Processing and Pattern Recognition, 2015, Pp 193-198.
8. [8] A. K. Verma, C. Patvardhan and C. Vasantha Lakshmi “Robust Adaptive Watermarking Based on Image Contents Using Wavelet Technique”, I.J. Image, Graphics and Signal Processing, 2015, Pp 48-55.
9. [9] Azeem Ahmad, Vishesh Dubey, Gyanendra Singh, Veena Singh and Dalip Singh Mehta “Quantitative phase imaging of biological cells using spatially low and temporally high coherent light source”, Optical Society of America, 2016, Pp 1554-1557.
10. [10] Sachingoyal,Roopamgupta “optimization of fidelity with adaptive genetic watermarking algorithm using roulette-wheel” 2010 IEEE computer society pp 591-596
11. [11] Asha Rani, Amandeep K. Bhullar, Deepak Dangwal and Sanjeev Kumar “A Zero-Watermarking Scheme using

Discrete Wavelet Transform", ICECCS, 2015, Pp 603-609.
12. [12] Lima S Sebastian, Abraham Varghese and Manesh T "Image Authentication by Content Preserving Robust Image Hashing Using Local and Global Features", Procedia Computer Science, 2015, Pp 1554 – 1560.
13. [13] SaeidFazli and Masoumeh Moeini "A robust image watermarking method based on DWT, DCT, and SVD using a new technique for correction of main geometric attacks", Elsevier, 2015, Pp 1-9.
14. [14] Wang Xiang-Yang, Liu Yu-Nan, Li Shuo Yang Hong-ying and NiuPan-pan "Robust Image Watermarking Approach using Polar Harmonic Transforms based Geometric Correction", National Natural Science Foundation of China, 2016, Pp 1-27.
15. [15] Rohit Thanki and KomalBorisagar "Sparse Watermarking Technique for Improving Security of Biometric System", Procedia Computer Science, 2015, Pp 251 – 258.
16. [16] Abhilasha Sharma, Amit Kumar Singh and S P Ghrera "Secure Hybrid Robust Watermarking Technique for Medical Images", Procedia Computer Science, 2015, Pp 778 – 784.
17. [17] PratikshaSethi and V. Kapoor "A Proposed Novel Architecture for Information Hiding in Image Steganography by using Genetic Algorithm and Cryptography", Procedia Computer Science, 2016, Pp 61 – 66.
18. [18] Abhishek Tiwari and Kamlesh Kumar Gupta "An Effective Approach of Digital Image Watermarking for Copyright Protection", International Journal of Big Data Security Intelligence, 2015, Pp 7-20.
19. [19] Aaqib Rashid "Digital Watermarking Applications and Techniques: A Brief Review", International Journal of Computer Applications Technology and Research, 2016, Pp 147-150.
20. [20] Sumedh P. Ingale and Dr.C.A.Dhote "A Survey of Digital Watermarking Techniques", International Journal Of Engineering And Computer Science, 2015, Pp 10270-10275.
21. [21] NassimaMedimegh, Samir Belaid and NaoufelWerghi "A Survey of the 3D Triangular Mesh Watermarking Techniques", International Journal of Multimedia, 2015, Pp 1-8.
22. [22] Rohit Thanki and KomalBorisagar "Multibiometric Template Security Using CS Theory – SVD Based Fragile Watermarking Technique", WSEAS Transactions on Information Science and Applications, 2015, Pp 1-10.
23. SukalyanSom, SarbaniPalit, Kashinath Dey, Dipabali Sarkar, Jayeeta Sarkar and Kheyali Sarkar "A DWT-based Digital Watermarking Scheme for Image Tamper Detection, Localization, and Restoration", Springer, 2015, Pp 17-37.
24. [24] Nadhir Ben Halima, Mohammad Ayoub Khan and Rajiv Kumar "A Novel Approach of Digital Image Watermarking using HDWT-DCT", IEEE, 2015, Pp 1-6.
25. [25] Ronaldo Rigoni, Pedro Garcia Freitas and Mylène C.Q. Farias "Detecting tampering in audio-visual content using QIM watermarking", Information Sciences, 2016, Pp 127–143.
26. [26] Ruchika Patel and Parth Bhatt "A Review Paper on Digital Watermarking and its Techniques", International Journal of Computer Applications, 2015, Pp 10-13.
27. [27] Nilesh Kumar Dubey and Shishir Kumar "An Effective Approach of Distortion-Resistant Video Watermarking for Piracy Deterrence", International Journal of Security and Its Applications, 2015, Pp 283-294.
28. [28] Zhan-He Ou and Ling-Hwei Chen "A robust watermarking method for stereo-pair images based on unmatched block bitmap", Springer, 2015, Pp 1-22.
29. [29] Therese Reber, Antti Vähäkainu, Emily Baird, Matti Weckström, Eric Warrant and Marie Dacke "Effect of light intensity on flight control and temporal properties of photoreceptors in bumblebees", The Company of Biologists Ltd, 2015, Pp 1-22.
30. [30] ZohrehGholamiDoborjeh, Maryam G. Doborjeh and Nikola Kasabov "Attentional Bias Pattern Recognition in Spiking Neural Networks from Spatio-Temporal EEG Data", Springer, 2017, Pp 1-15.
31. [31] M.F.L. Abdullah, Ali A. Elrowayati, Azizah Abd Manaf and Zakaria S. Zubi "Recent Methods and Techniques In Video Watermarking And Their Applicability To The Next Generation Video Codec", Journal of Theoretical and Applied Information Technology, 2015, Pp 93-103.
32. [32] KharitthaThongkor, PipatSupasirisun and ThumrongratAmornraksa "Digital Image Watermarking based on Regularized Filter", International Conference on Machine Vision Applications, 2015, Pp 18-22.
33. [33] Neethu V and R.Kalaivani "Efficient and Robust Audio Watermarking for Content Authentication and Copyright Protection", International Conference on Circuit, Power and Computing Technologies, 2016, Pp 1-6.
34. [34] Jia-Ji Wang, Rang-Ding Wang, Da-Wen Xu and Wei Li "An Information Hiding Algorithm for HEVC Based on Angle Differences of Intra Prediction Mode", IEEE, 2015, Pp 213-221.
35. [35] Hidangmayum Saxena Devi and KhumanthemManglem Singh "A Brief Survey on 3D Watermarking Techniques", Journal of Basic and Applied Engineering Research, 2015, Pp 1644-1648.
36. [36] JaiveerTewatia and Shivani Singh "Implementation of Digital Image Watermarking using SVD", Advanced Research in Electrical and Electronic Engineering, 2015, Pp 58-62.
37. [37] Jeebananda Panda, Indu Kumari and Nitish Goel "Digital Watermarking of Audio in Time Domain Multiple Bit Plane based on Chaotic Scrambling", IJIRCCE, 2015, Pp 1843-1850.
38. [38] Robert Gawlik, Benjamin Kollenda, Philipp Koppe, BehradGarmany and Thorsten Holz "Enabling Client-Side Crash-Resistance to Overcome Diversification and Information Hiding", Internet Society, 2016, Pp 1-15.
39. [39] SouadBekkouch and Kamel Mohamed Faraoun "Robust and Reversible Image Watermarking Scheme Using Combined DCT-DWT-SVD Transforms", J. Inf. Process. Syst., 2015, Pp 406-420.
40. [40] Abhilasha Sharma, Mayank Dave, Amit Kumar Singh and S P Ghrera "Encryption Based Medical Image Watermarking against Signal Processing Attacks", Proceedings of 2015 International Conference on Future Computational Technologies, 2015, Pp 78-84.
41. [41] Gaurav Bhatnagar and Q. M. Jonathan Wu "A new robust and efficient multiple watermarking scheme", Springer, 2015, Pp 8421-8444.
42. [42] M.A. Mohamed, H.M. Abdel-Atty, A.M Aboutaleb and M.G. Abdel-Fattah, A.S. "Hybrid Watermarking Scheme for Copyright Protection using Chaotic Maps Cryptography", International Journal of Computer Applications, 2015, Pp 13-26.
43. [43] LamiaaBasyoni, H. I. Saleh and M. B. Abdelhalim "Enhanced Watermarking Scheme for 3D Mesh Models", International Conference on Information Technology, 2015, Pp 612-619.
44. [44] Siddarth Gupta and VageshPorwal "Recent Digital Watermarking Approaches, Protecting Multimedia Data Ownership", ACSIJ Advances in Computer Science, 2015, Pp 21-30.
45. [45] Shadi. Saneie and Alireza. Naghsh "Introducing a new method of Robust Digital Image Watermarking against Cropping and Salt & Pepper Noise using Sudoku", Majlesi Journal of Multimedia Processing, 2015, Pp 9-15.
46. [46] Iman M.G. Alwan and EnasMuzaffer Jamel "Digital Image Watermarking Using Arnold Scrambling and Berkeley Wavelet Transform", Al-Khwarizmi Engineering Journal, 2016, Pp 124- 133.
47. [47] Aniket Roy, Arpan Kumar Maiti and Kuntal Ghosh "A perception-based color image adaptive watermarking scheme in YCbCr space", SPIN, 2015, Pp 1-7.
48. [48] Ashwini S. Jadhav "Review on Steganography-An Art of Hiding Data", Journal of Android and IOS Applications and Testing, 2016, Pp 1-7.
49. [49] Rashmi Agarwal, R. Krishnan, M. S. Santhanam, K. Srinivas and K. Venugopalan "Digital watermarking: An approach based on Hilbert transform", IEEE, 2014, Pp 1-17.
50. [50] Sachin Goyal,Roopam gupta " optimization of fidelity with adaptive genetic watermarking algorithm using roulette-wheel" 2010 ieee computer society pp 591-596.

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