Hybrid Algorithm for Enhanced Watermark Security with Robust Detection

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Abstract— A variety of imperceptible watermarking schemes have been proposed over the last few years. In general, publications on the subject tend to focus on the technical details of the specific scheme (increase of robustness, improvement of imperceptibility, etc.), paying little attention on the application scenarios where the proposed method could fit in. Most of the methods are said to be suitable for either copyright protection or authentication, i.e. for a single specific application with no investigation is done on the possibility of applying the same scheme to other applications as well. The main reason for this is that no attempt for a detailed and systematic listing and categorization of the existing application scenarios took place so far.

A hybrid algorithm for printed image watermarking with enhanced security employing cryptographic techniques & robust detection with graceful degradation is developed & investigated. Robust detection is achieved by graceful degradation of the recovered image. Various types of attacks on watermark method image have been simulated & their resultant has been observed. Experimental results prove the security & robustness of the proposed algorithm.

Keywords- *Watermarking, Hybrid Algorithm, Cryptography, Graceful Degradation.*

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I. INTRODUCTION

Watermarking is a sort of marker secretively installed in a commotion tolerant flag, for example, sound, and video or picture information. It is normally used to recognize responsibility for copyright of such flag. "Watermarking" is the way toward stowing away advanced data in a bearer flag; the shrouded data should, yet does not have to, contain a connection to the transporter flag. Computerized watermarks might be utilized to confirm the legitimacy or uprightness of the transporter flag or to demonstrate the personality of its proprietors. It is noticeably utilized for following copyright encroachments and for banknote validation.

Like conventional physical watermarks, advanced watermarks are regularly just recognizable under specific conditions, i.e. in the wake of utilizing some calculation. In the event that a computerized watermark mutilates the bearer motion in a way that it turns out to be effortlessly detectable, it might be viewed as less viable relying upon its motivation. Customary watermarks might be connected to noticeable media (like pictures or video), though in computerized watermarking, the flag might be sound, pictures, video, writings or 3D models. A flag may convey a few unique watermarks in the meantime. Not at all like metadata that is added to the bearer flag, does a computerized watermark not change the measure of the transporter flag. The required properties of an advanced watermark rely upon the utilization case in which it is connected. For stamping media documents with copyright data, an advanced watermark must be somewhat powerful against changes that can be connected to the bearer flag. Rather, if trustworthiness must be guaranteed, a delicate watermark would be connected. Both Stegnography and advanced watermarking utilize steganographic systems to implant information secretly in boisterous signs. While Stegnography goes for intangibility to human detects, computerized watermarking tries to control the heartiness as best need. Since an advanced duplicate of information is the same as the first, computerized watermarking is a latent security instrument. It just checks information, however does not debase it or control access to the information. One use of computerized watermarking is source following. A watermark is installed into a computerized motion at each purpose of appropriation. In the event that a duplicate of the work is discovered later, at that point the watermark might be recovered from the duplicate and the wellspring of the dispersion is known. This system apparently has been utilized to identify the wellspring of illicitly duplicated films.

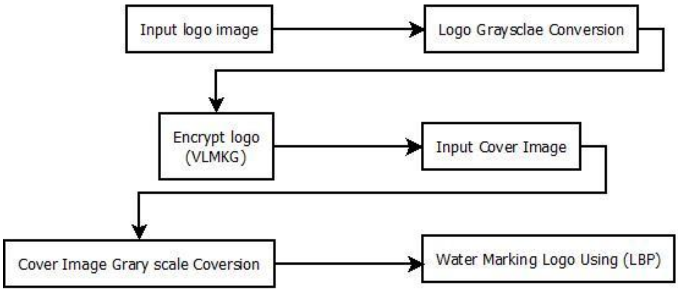
II. LITERATURE REVIEW

Jeng-Shyang Pan, Hao Lu, And Zhe-Ming Lu Described That Nowadays, halftone pictures show up routinely in books, magazines, printer yields, and fax reports. It is attractive to implant information in halftone pictures for copyright security and substance validation. Creators propose a novel watermarking plan for halftone picture verification, misusing picture hash as a delicate watermark. After pixel blocking and requesting, a query table is built by squares' recurrence of event. Watermark implanting is to dislodge the first pieces with the comparing comparative squares in the query table, and in the turn around process watermark is separated. Some additional squares are haphazardly chosen with a mystery key for the query table implanting, and the first information of these pieces are likewise embedded into the picture. In picture confirmation, the query table is remade first with the mystery key, and afterward a basic table-look-into system is utilized to remove the watermark hash, at last we just need to contrast the watermark hash and the hash of recuperated picture: in the event that they are equivalent, the first picture endures no adjustment; else it is changed. As a lossless strategy, the first picture can be superbly recuperated by playing out the switch procedure of the watermark inserting if the watermarked picture is in place. It is important to keep the substance of unique host picture unaltered in some particular applications, where content exactness of the host picture must be ensured, e.g. military maps, restorative pictures, awesome gems, and so forth. As a delicate watermarking, even one pixel flipping can be distinguished. As a result of the little amount of watermark, low quality twisting is acquainted with the halftone picture. Examination comes about show the viability of the plan. Creators exhibit a lossless watermarking plan for halftone picture validation. The hash succession of the picture is inserted as a versatile delicate watermark. To judge whether the first picture is changed or not, we just need to analyze the separated watermark and the hash arrangement of the reestablished picture. On the off chance that they are precisely the same, the picture endures no modification; else it is changed. For whatever length of time that the watermarked picture isn't unapproved changed, the first picture can be culminated recuperated. Furthermore, no data should be spared aside from a mystery key. [1]

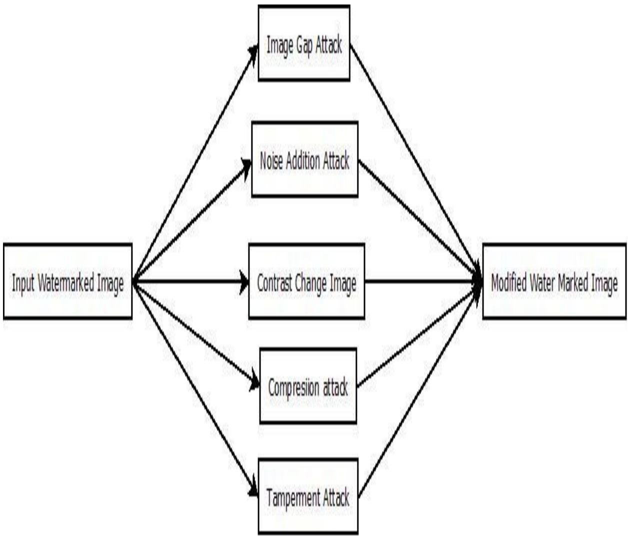
III. METHODOLOGY

System Block Diagram

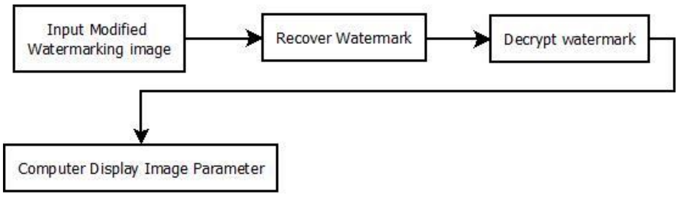
First take input logo image and convert it in logo gray scale and then encrypt the logo through variable logo mixed gray scale then cover the logo image with cover images gray scale conversion through watermarking logo using LBP.


Input logo image
Logo Graysclae Conversion
Encrypt logo (VLMKG)
Input Cover Image
Cover Image Grary scale Coversion
Water Marking Logo Using (LBP)

When we give input logo watermarked image then attack on a watermarked image first image gap attack and noise addition we can add a logo image and we can change the contrast change image and compression attack and temperament attack could be safe as and we can modified water marked logo image with these methods.



After the input modified of watermarking image we can recover the water mark and decrypt watermark and computer display image parameter.


Input Modified Watermarking image
Recover Watermark
Decrypt watermark
Computer Display Image Parameter

IV. RESULT

Process Flow.

First step: In the process we have take images for enhanced for watermarking security with robust detection and encrypt the logo which we have taken for example in put cover image.

Second step: Convert the image into gray scale conversion

Third step: Gary scale conversion image convert into the watermark logo.

Forth step: we will apply the different kind of attack on original images. The various attacks are 1. Image crop attack

2. Noise addition attack
3. Contrast change attack
4. Comparison attack
5. Temperament attack

Fifth step: Recover water mark image

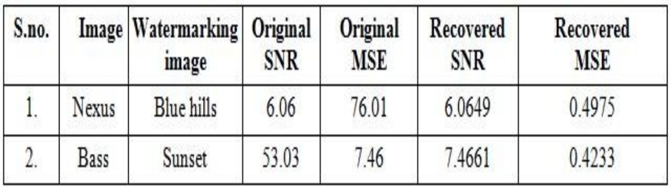
Sixth step: Decrypt them.

Seventh step: and of the last we have write down the reading of original images SNR and MSE and recovered images SNR and MSE.

For example:

In process flow, we encrypted the below images with given cover images. In this process, we have original images (Nexus and Bass) to encrypt with each cover images. First we took Nexus to encrypt with cover images (blue hills and sunset). After that the image generate in VC share1 and VC share 2, these images, they encrypted in Encrypt VC1 and Encrypt VC and then they embedded with each cover images. And found Embedded VC1 and Embedded VC2. And to recover this image, we took both cover image Read Cover Image 1 and Read Cover Image2. Then recovered in Recover VC1 and Recover VC2 After the decryption of these, (Decrypt 1 and 2) we found superimpose VC's.

And then, we took array to encrypt with cover images (nexus and bass). After that the image generate in VC share1 and VC share 2 these images, they encrypted in Encrypt VC1 and Encrypt VC2. And embedded with each cover images and found Embedded VC1 and Embedded VC2 and to recover this image, we took both cover image Read Cover Image 1 and Read Cover Image2.Than recovered in Recover VC1 and Recover VC2. After the decryption of these, (Decrypt 1 and 2) we found superimpose VC's In This Table We Found Space Occupancy In Cover Image.



S.no.	Image	Watermarking image	Original SNR	Original MSE	Recovered SNR	Recovered MSE
1.	Nexus	Blue hills	6.06	76.01	6.0649	0.4975
2.	Bass	Sunset	53.03	7.46	7.4661	0.4233

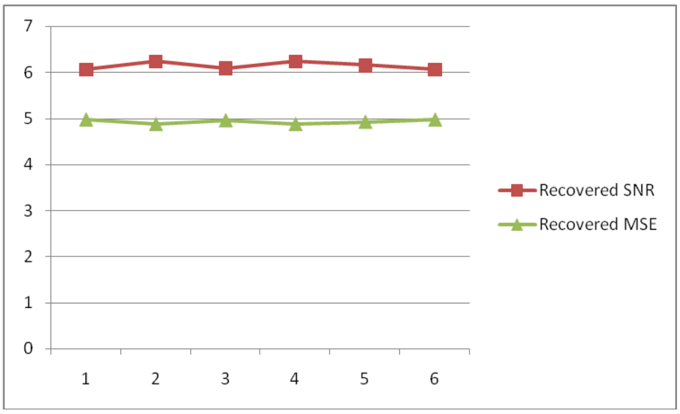
Table 1 Encrypted SNR Space Occupancy In Cover Images

Logo Images 1

We take the process logo images for experimental results and cover image and attack on them and read out them recovered SNR and recovered MSE.

S. No.	Logo Image	Cover image	Attack Type	Original SNR	Original MSE	Recovered SNR	Recovered MSE
1.	Logo.1.jpg	Sunset.jpg	Image crop attack	10.3696	53.0345	6.0649	0.4975
2.	Logo.1.jpg	Sunset.jpg	Noise addition attack	10.3696	53.0345	6.2349	0.4878
3.	Logo.1.jpg	Sunset.jpg	Contrast change attack	10.3696	53.0345	6.0910	0.4960
4.	Logo.1.jpg	Sunset.jpg	Compression attack	10.3696	53.0345	6.2352	0.4878
5.	Logo.1.jpg	Sunset.jpg	Temperament attack	10.3696	53.0345	6.1504	0.4926
6.	Logo.1.jpg	Sunset.jpg	No attack	10.3696	53.0345	6.0662	0.4974

Table 2 Experimental Result of Various Types of Attacks on Logo1 Sunset Water Marking



Graph1.1. Graph of Recovered SNR and Recovered MSE in Logo 1

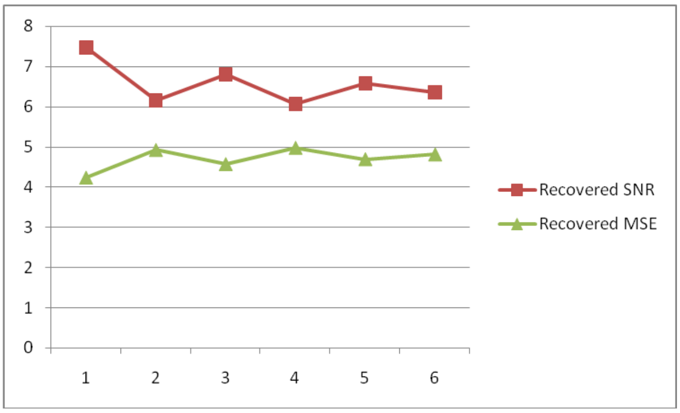
(Recovered MSE Scaled By Factor of 10)

Average Recovered SNR: 6.1404
Average Recovered MSE: 0.4931

Logo Images 2

S. No.	Logo Image	Cover image	Attack Type	Original SNR	Original MSE	Recovered SNR	Recovered MSE
1.	Logo.2.jpg	Blue hills.jpg	Image crop attack	6.7322	76.0104	7.4661	0.4233
2.	Logo.2.jpg	Blue hills.jpg	Noise addition attack	6.7322	76.0104	6.1625	0.4919
3.	Logo.2.jpg	Blue hills.jpg	Contrast change attack	6.7322	76.0104	6.8009	0.4570
4.	Logo.2.jpg	Blue hills.jpg	Compression attack	6.7322	76.0104	6.0673	0.4973
5.	Logo.2.jpg	Blue hills.jpg	Temperament attack	6.7322	76.0104	6.5754	0.4691
6.	Logo.2.jpg	Blue hills.jpg	No attack	6.7322	76.0104	6.3582	0.4809

Table 3 Experimental Result of Various Types of Attacks on Logo2 Blue Hills Water Marking



Graph1.2. Graph of Recovered SNR and Recovered MSE in Logo 2

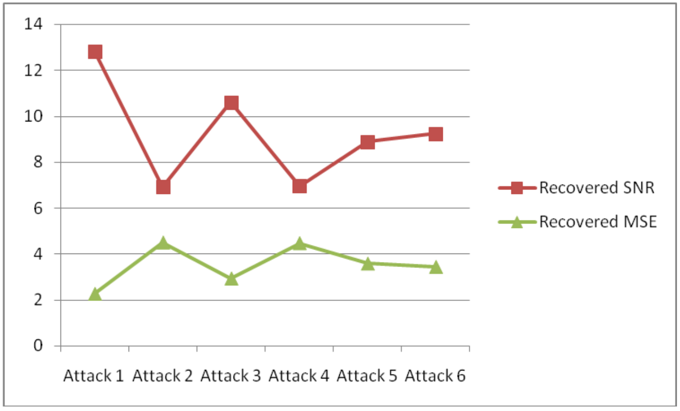
(Recovered MSE Scaled By Factor of 10)

Average Recovered SNR: 6.5717
Average Recovered MSE: 0.4699

Logo Images 3

S. No.	Logo Image	Cover image	Attack Type	Original SNR	Original MSE	Recovered SNR	Recovered MSE
1.	Logo.3.jpg	Pano.jpg	Image crop attack	11.2194	61.2823	12.82	0.2284
2.	Logo.3.jpg	Pano.jpg	Noise addition attack	11.2194	61.2823	6.9212	0.4508
3.	Logo.3.jpg	Pano.jpg	Contrast change attack	11.2194	61.2823	10.6012	0.2951
4.	Logo.3.jpg	Pano.jpg	Compression attack	11.2194	61.2823	6.9693	0.4483
5.	Logo.3.jpg	Pano.jpg	Temperament attack	11.2194	61.2823	8.8853	0.3595
6.	Logo.3.jpg	Pano.jpg	No attack	11.2194	61.2823	9.2365	0.3453

Table 3 Experimental Result of Various Types of Attacks on Logo3 Pano Water Marking



Graph1.3 Graph of Recovered SNR and Recovered MSE in Logo 3

(Recovered MSE Scaled By Factor of 10)

Average Recovered SNR: 9.2389
Average Recovered MSE: 0.3545

V. CONCLUSION

In this work, a novel hybrid scheme for enhancing the security & detection robustness of printed watermarks is presented. LBP (local binary pattern) watermarking is combined with VLMKG (variable length mixed key generation) algorithm to achieve high level security for watermarking data & spatial distribution of watermarking data in cover image to facilitate our robust detection to recover watermark image as much as possible in case of temperament cropping or other type of cover image degradation. Excellent performance of the aspect of security & robustness are observed in the results, with non recognizable output without pre shared private full partial logo recovery in various types of image attacks. Also average SNR of 7.31 & MSE of 0.4931 are observed which clearly demonstrate the superiority of the proposed technique.

VI. FUTURE SCOPE

The proposed system, as demonstrated, has sought tremendous improvement in reliability & security of printed image watermarking technique, however, as the technology is in a nascent stage, a plashes of innovation & improvements are sought in the near future, as this technology becomes more variable popular. One of the roughest innovations would be inclusion of biometric security in printed image watermarking domain. Another much sought improvement is spreading of watermark in spatial & frequency domains to enhance robustness of the system. Also, the system may be improved to integrate multiple image watermarks or hybrid image text watermarks.

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