AN INNOVATIVE APPROACH OF IMAGE TO IMAGE WATERMARKING TECHNIQUE

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Abstract: A novel watermarking plan is proposed that could essentially overhaul stream watermarking systems. This course of action manhandle the features of scaled down scale pictures of watermarks to create partnership controls and implants the standards into a host picture rather than the bit stream of the watermark, which is generally utilized as a bit of bleeding edge watermarking. Next, equivalent scaled down scale pictures with practically identical models are aggregated or even created utilizing the host picture to reproduce a removed watermark. This system, called the Features Classification Forest, can accomplish paralyze extraction and is versatile to any watermarking plan utilizing a quantization-based instrument.

I.INTRODUCTION

Digital images are a basic medium that is much of the time utilized as a part of interchanges and are generally spread all through the Internet. The simple entry to this medium has realized a basic issue, which is licensed innovation encroachment, for example, altering, impermissible replicating, or even unapproved redistribution for business. To shield the proprietors from certain unlawful activities, numerous analysts have attempted to get proper answers for accomplish this objective, and so far, the most well-known procedure in this field is digital watermarking. The fundamental thought of digital watermarking depends on the way that the human visual framework (HVS) isn't delicate to minor modifications in the picture pixel esteems. Along these lines, digital data can be implanted into a digital picture by altering the pixel esteems to a constrained degree that people can scarcely find. Furthermore, by using specific counts, the advanced watermark as a sign to address a copyright, e.g., logo or trademark can be viably introduced and isolated as a recognizing evidence to show the development of the photo. In, the makers master-minded watermarking plans in an extensive variety of ways. Quickly, the plans, contingent upon the area in which the watermark is inserted, can be characterized into the spatial space, the change space or a half and half of those two areas. In addition, for the hybrid system, the watermark might be concealed in either the pixels or change coefficients, and some other colleague information that is used to help the extraction methodology might be introduced into the host picture as well.

II. PICTURE ANALYSIS

A. Presentation of Features

A propelled picture is incorporated boundless. Every last one of the pixels itself exhibits just its energy. Joining a specific number of pixels together will incite a broad assortment of blends, which could make particular surfaces. Here, we set the extent of the piece to be a 3×3 square and the span of the picture to be 120×120, as a subject to be separated, as appeared in fig we use the nearest neighborhood pixel impetus to adjust the lacking amounts of pixels in the regions.

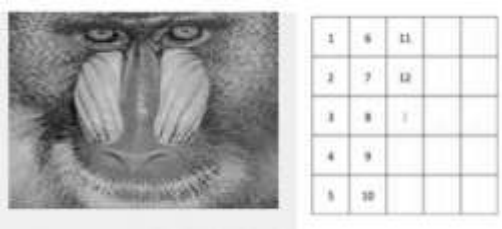

Fig: 1.Block Partion

1) Sobel Veil

The Sobel veil is typically used as a piece of edge revelation for either diminish scale or shading pictures. As showed up in Fig, the fundamental piece is a representation picture. The second square is the y-bearing Sobel veil, and the third piece is the x-course Sobel cover. The y-bearing and x-heading inclination of the essential square are found out, exclusively, by convoluting the second piece and the third piece. The recipe is appeared in (1) and (2). With two slants, we can select the motivation behind the piece by (3), which ranges from $-\pi \sim \pi$. Basically utilizing the part edges and the lengths can portray different geometrical things, for example, triangles, squares, and the sky is the limit starting there.

P_1	P_2	P_3
P_4	P_5	P_6
P_7	P_8	P_9

-1	-2	-1
0	0	0
1	2	1

-1	0	1
-2	0	2
-1	0	1

Fig. 2. Example block and Sobel mask.

$G_Y = -P_1 - 2P_2 - P_3 + P_7 + 2P_8 + P_9$ …… (1)

$G_X = -P_1 - 2P_4 - P_7 + P_3 + 2P_6 + P_9$ …… (2)

Angle = $\tan^{-1}(G_X/G_Y)$ …….. (3)

2) Dark Level Co-event grid

The dim level co-occasion network (GLCM), which is for the most part associated in the photo division field, is another instrument for quantizing the surface of a small scale picture. In Fig. 3, C is the dim level co-occasion network, which should be gathered for any part, and C_{ij} as showed up

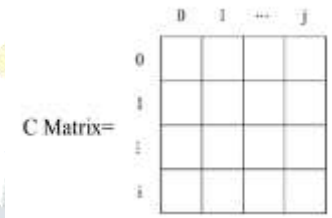

Fig. 3. Gray-level co-occurrence matrix

is the component that is situated in push I and section j in matrix C. Here, I is a certain pixel that is found in a suggesting square, while j is another pixel in a comparable piece. Once the pixel join (I, j) occurs in the square, the part at push I section j should have one added to it, and so forth. In the wake of checking each coordinated relationship in the piece, the grid is detached by the amount of associations N; thusly, every part of network C is a bit in the extent of 0~1. Regardless, we in corporate another 16 associations, the other three pieces in Fig. 4, to make the extent of the separation more broad to engage the surface of the smaller scale picture to be broke down completely.

$C_{ij} = \frac{1}{N} \times$number (Pixel pair (i,j)),N=20...(4)

Contrast = $\sum_{i=0}^{k} \sum_{j=o}^{k} (i-j)^2 c_{ij}$ ….. (5)

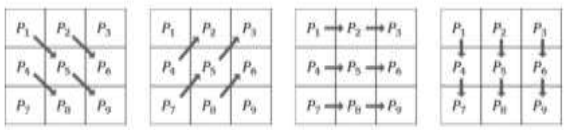

Fig. 4. Pixel pair relationships.

3) Normal Pixel Esteem

Close to the two highlights determined over, the typical pixel estimation of a piece is moreover considered in the highlights used to explore the pictures. As point by point in, the typical pixel estimation of a square is illustrative to exhibit the nature of the piece's dark level using this component can aggregate assorted characteristics of pieces

Average pixel value $=\frac{1}{9}\sum_{k=1}^{9} P_{\mathrm{k}}$ …… (6)

B. Comparability between Images

Near the two features said over, the conventional pixel estimation of a square is in like way considered in the features used to look at the photos. As requested in (6), the regular pixel estimation of a square is illustrative to demonstrate the idea of the piece's diminish level. A three-dimensional Cartesian deal with framework can be set up. As showed up in Figs. 5 and 6, two 120×120 regular pictures, Blonde Woman and Baboon, are used and registered. The x, y, z - estimations are the distinction, typical pixel regard, and point, independently. From the compose systems, we can watch an extensive variety of dark scale shading plates over them.

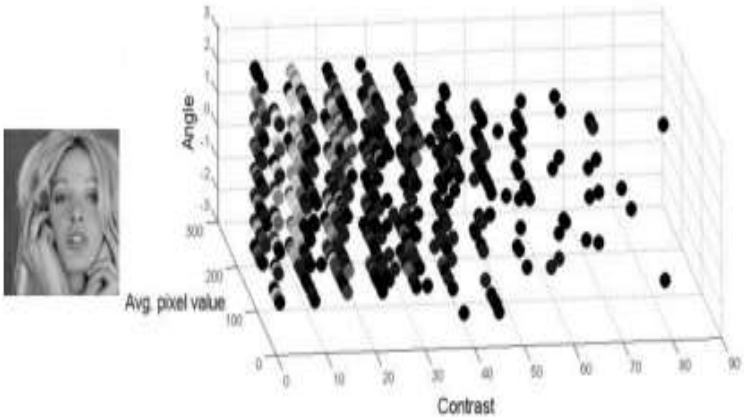

Fig.5. Blonde woman 3D coordinate system.

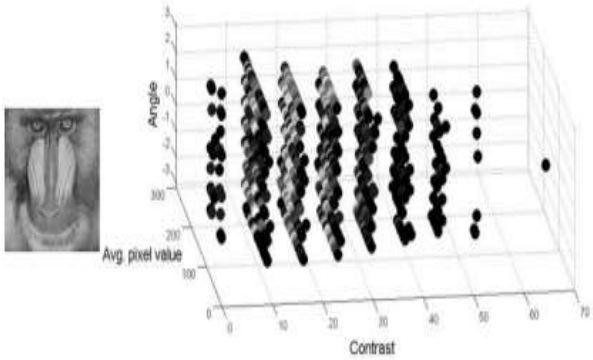

Fig. 6. Baboon 3D coordinate system.

For the best point of view for understanding, the 3D plots have been swung to a specific plot for investigation. From these two plots, we can see that few circles, whose differences are more prominent than 10 however lower than 30, share a similar assessment in the 3D arrange framework, regardless of whether the quantities of focuses are extraordinary. Each point in the 2D organize framework speaks to a 3×3 measured square in the relating images. Without the element edges, we can at any rate judge how comparative they are with two features.

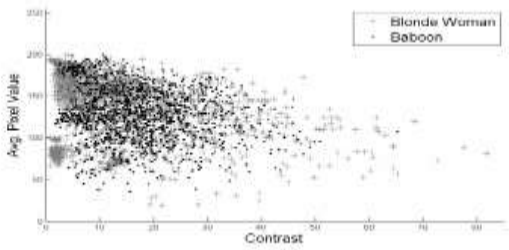

Fig.7. Blonde women and baboon 2D coordinate system.

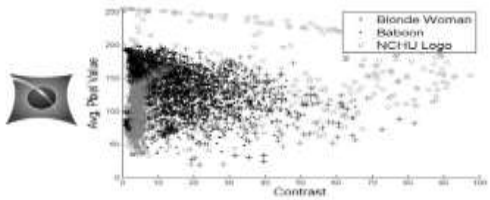

Fig. 8. Blonde Woman, Baboon and NCHU Logo 2D coordinate system.

C. Variations between Images

Fig.8 demonstrates the wonderful complexities between two through and through various pictures. In this subsection, we use line diagram plots to demonstrate clearer capabilities. This ponder has pulled in our thought yet again, and we made more line diagram plots, as showed up in Fig. 9– 11. All things considered, 9 pictures are confined into three extraordinary sets. For each set, it can be settled ostensibly that the pictures are a comparable kind. Each plot demonstrates the piece appropriation of the images in the separate line diagram. As appeared in the figures, the three kinds of plots share a comparative example of conveyance when they are in a similar sort.

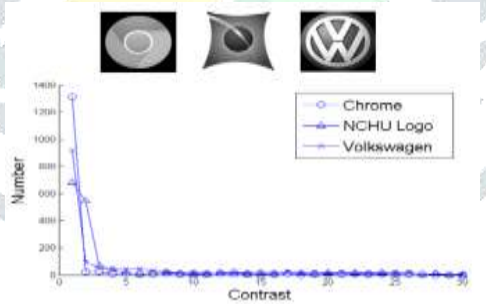

Fig. 9. Line graph of simple type images.

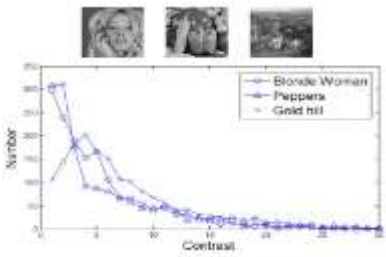

Fig.10.Line graph of general type images.

III. PROPOSED SCHEME

A. Affiliation Rules Related to Watermarking Techniques

Affiliation examination is a noteworthy theme in information mining. By utilizing this technique, huge and significant examples can be misused from a gigantic database. An affiliation administer is a type of example that is identified from the database. To clarify the affiliation rules, we expect that S1 and S2 are itemsets, and I is a thing database, where S1⊆I, S2⊆I, S1∩S2=∅, and |S1 |+|S2 |=k. At that point, S1→S2 is an affiliation decide that is characterized upon k-itemset. With respect to affiliation tents of the digital picture, there are three features: differentiate, normal pixel esteem

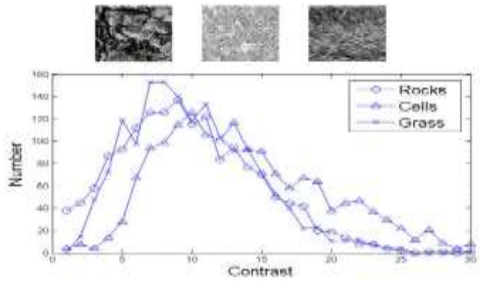

Fig11. Line graph of complex type images.

and point, which have been beforehand chosen. In the first place, we characterize the affiliation administer: Ri {ci, pi, ai} → {a certain texture}, where R demonstrates the affiliation manage, I is the record of a square apportioned from the host picture or watermark, and {ci, pi, ai} is clarified in (7) – (9). In these conditions, the numerator is the resultant element esteem, bi is the square recorded by I, the denominator is the upper bound of the comparing highlight, and C, P, and An are the quantization factors.

$$ci = \frac{contrast(b)}{213.57} \times C \quad \ldots\ldots\ldots\ldots\ldots (7)$$

$$pi = \frac{average\ pixel\ value(b)}{255} \times P \quad \ldots\ldots\ldots (8)$$

$$ai = \frac{angle(b)+\pi}{2\pi} \times A \quad \ldots\ldots (9)$$

For lucidity, the Features Classification Tree (FCT) was made for picturing the way toward discovering affiliation standards of the majority of the pieces shown in fig. 12. All of the squares are either from the host picture or the watermark and are divided into k×k estimated piece (suppose k=3) and the pieces take after the bolt start to finish to locate an appropriate class through (7)– (9). At last, each square has an affiliation run Ri {ci, pi, ai} → {a certain texture}. Particularly, we should take note of that those obstructs that have a similar affiliation rules suggest comparative surfaces or appearances.

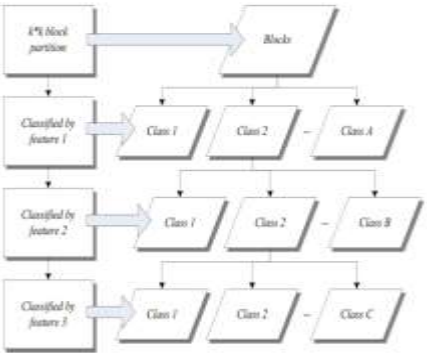

Fig. 12. Features Classification Tree.

B. Highlights Analysis Covert

In the photo examination zone, we have advanced the articulation that those deters that have close highlights share equivalent surfaces or appearances, and hence, the FCT propelled by the association rules is set up. Next, the unmistakable characteristics that assorted pictures have are considered. In the first place, the fundamental sort picture showed up in Fig. 9 has an enormous number frustrates whose separations are lower than 10, while whatever is left of the squares are spread similarly a brief span later. Hence, utilizing a complexity edge can productively sort the majority of the pieces into two classes. Fig. 13 is a FCT for straight forward kind images. At level one, this tree utilizes differentiate as a limit called TS to characterize the pieces to two sides. The left subtree holds straightforward surface obstructs that are along these lines characterized by normal pixel esteems.

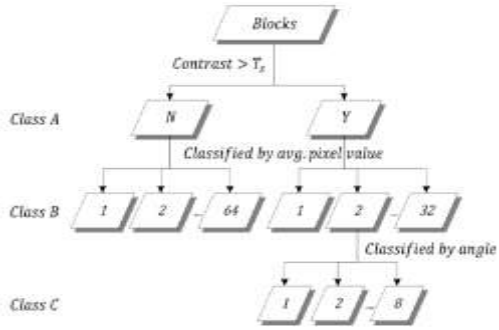

Fig. 13. Simple and general type FCT.

We can see that at level two of the left subtree, the quantization factor is 64 yet without youth focus focuses. That finding happens in light of the way that the obstructs that have a place with the left subtree constitute a fundamental level of squares, and the surfaces of those pieces are amazingly smooth, which proposes that even they are accumulated by the fragment edges, and human eyes won't not see the capability in point course. The hinders whose complexities are

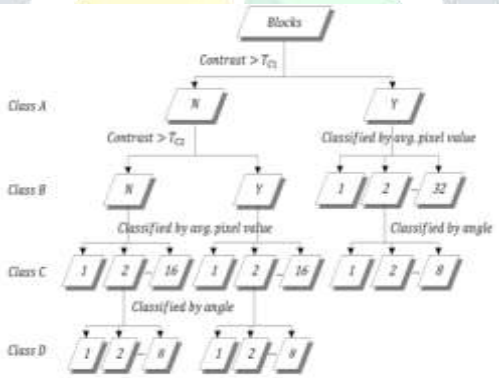

Fig. 14. Complex type FCT.

more prominent than TC1 have a place with an edge-like surface subtree, those that are under TC1 however more prominent than TC2 have a place with the gradient surface subtree, and the rest of, are under TC2, have a place with the smooth surface subtree. Other order strategies are the same as the previous two FCTs.

C. Watermark Implanting and extrication

Up until now, three sorts of FCTs are settled. In this way, the stream outline of the entire watermarking plan will take after. SVD-based change instrument In SVD-based progressed watermarking structures, the rule characteristics are that particular respects guarantee the luminance of the photograph square, and solitary vectors save the geometric properties of the photograph piece. A point by point examination of the impacts of various strikes is given. In the event that the alteration of the particular respect isn't solid, by then the luminance of the photograph piece won't change doubtlessly; as necessities be, we can make utilization

of this trademark to insert a parallel piece without influencing the impalpability. The implanting equations are recorded beneath.

$Z = \sigma \bmod Q$ …… (10)

$\sigma = \{\sigma - Z + Q/4$, if $Z<Q/8$ or $Z>3Q/8$

σ , others ... (11)

$\sigma = \{\sigma - Z + 3Q/4$, if $Z < 5Q/8$ or $Z > 7Q/8$

σ , others … (12)

In the equations above, Z is the buildup when the principal particular esteem σ of each piece does the modulo activity with the divisor Q. While installing the bit '0', we utilize (11) to adjust the particular esteem, and we utilize (12) while implanting the bit '1'. Check the buildup through separating the solitary incentive by the divisor Q. At the point when the deposit is under Q⁄2, the extraction bit is '0', and it is '1' when the buildup is more noteworthy than Q⁄2. Additionally, one more advance ought to be noted, which is the transformation of the affiliation rules Ri {ci, pi, ai} from decimal to double.

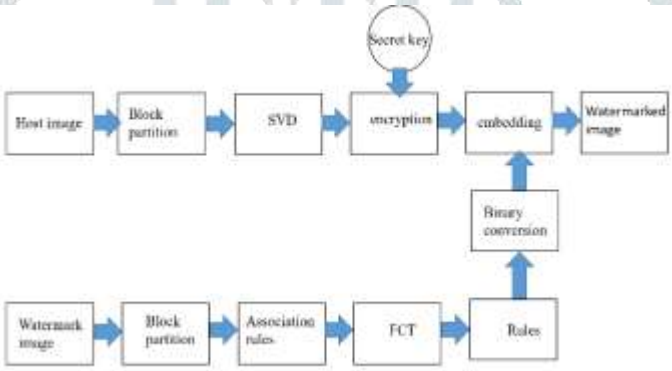

Fig. 15. Embedding flow.

The greater part of the squares continue to SVD for the arrangement of the installing stage. The key is a pseudo arbitrary number generator to adjust the request of the solitary esteems, and each piece of the double stream is inserted into one particular incentive in a systematic way by the alteration component said in the past subsection. Now, the installing procedure finishes, and the watermarked picture is in this manner created.

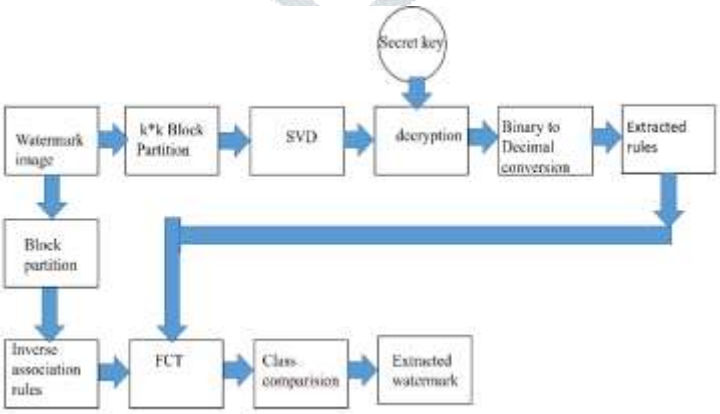

Fig. 16. Extraction flow.

As yet, the concentrations communicated above are clear since they resemble the embedding stream yet in reverse. Nevertheless, the declarations a brief span later are phenomenal, and the inside estimation of the

Features Classification tree is rehashed through and through. The watermarked picture, meanwhile, is divided k×k estimated pieces. These pieces are later organized into different classes by a comparable kind of FCT. They are not requested for the request of connection rules, yet rather stay in the contrasting classes and the ultimate objective that the returned association rules can use them as substitutions to reproduce the bits of the primary watermark. At that point, every affiliation lead utilizes the supposition Ri {ci, pi, ai} to take up the pieces of the watermarked picture into the relating class and process their normal as another k×k measured square, to reassemble the watermark. As of recently, the extraction stream removes another watermark that is reassembled by the affiliation rules.We portray the appropriate response in the following subsection.

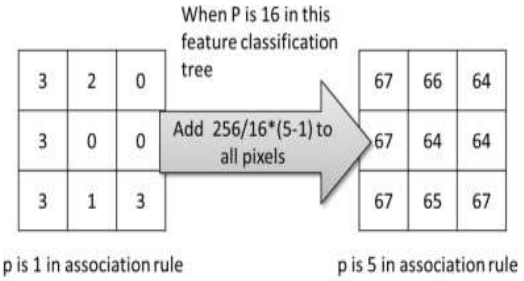

Fig. 17. Block shift at the average pixel level.

As to the edge level issue, we utilize a comparative idea as was utilized to take care of the normal pixel esteem issue. Expect that an affiliation manage of a specific piece is Rj {ci, pi, 3}, where ci and pi are constants also, and the quantization factor is 8. Under similar conditions, the affiliation run searches for class number 3 at the edge level futile. The framework finds that class number 5 is non-exhaust and endeavors to utilize the piece appeared in Fig.18 to supplant class number 3. Since the circumstance is at the edge level, the piece at class number 5 pivots just (5-3) times clockwise to consequently make another square to take care of the point level issue.

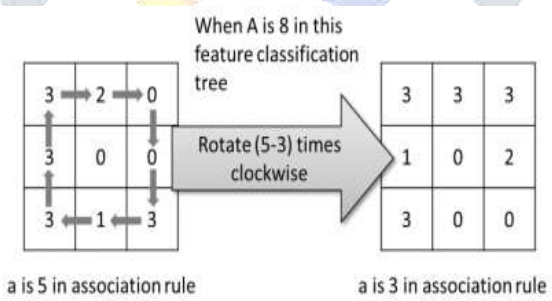

Fig. 18. Block rotations at the angle level.

IV. EXPERIMENTAL RESULTS

Figure 19: Input Cover Image for Watermarking.

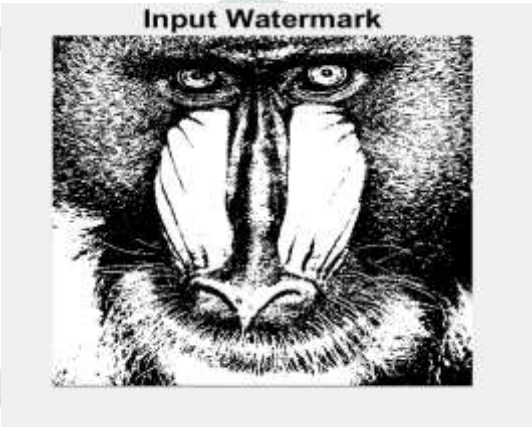

Figure 20: Input Watermark image for Watermarking

Figure 21: Output Watermarked Image.

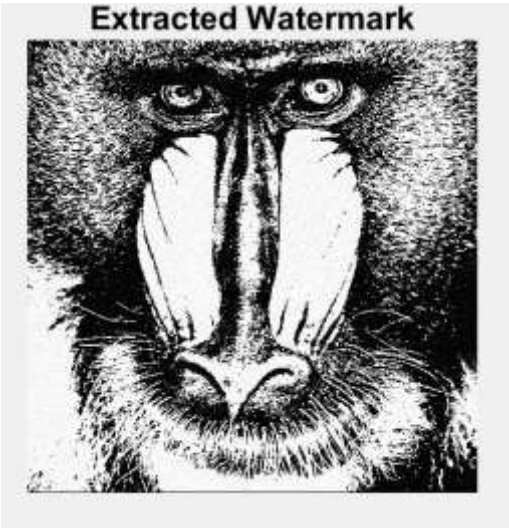

Figure 22: Output extracted watermark.

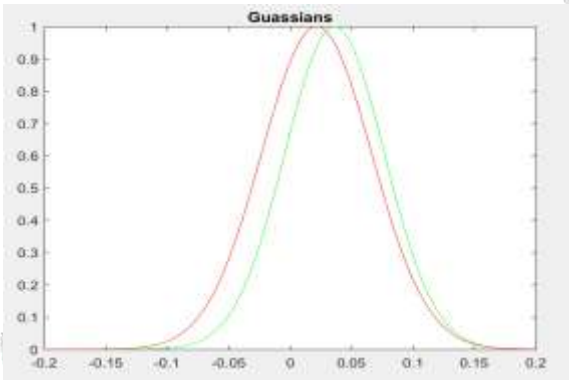

Figure 23: Correlative Gaussian Performance Curves of watermark embedding and extraction.

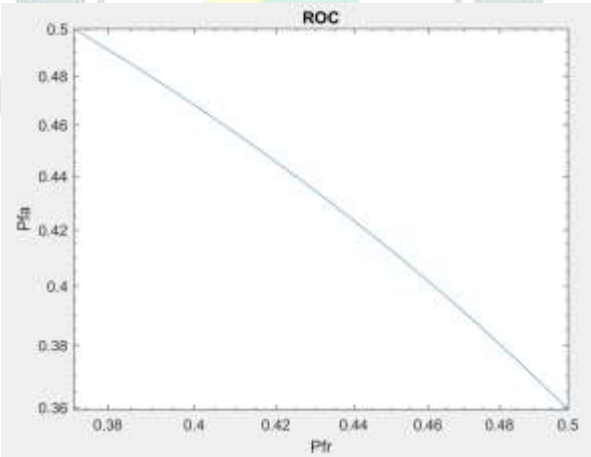

Figure 24: Final Region of Performance Convergence of the proposed Watermarking algorithm.

Table 1: Comparison between the Existing and Proposed Systems.

	Existing System	Proposed system
Cover Image	Watermark Image	Watermark Image

Lena	Chrome	Peppers	Grass	Chrome	Peppers	Grass
Watermarked PSNR	43.9471	43.0485	42.9195	51.8621	51.8538	51.8577
PSNR/NCC	23.6107/0.9919	24.5654/0.9933	19.5405/0.9730	24.4600/0.9913	32.1959/0.9952	26.5912/0.9968

V. CONCLUSION

In this paper, several discussions are proposed to cover the whole concept of the feature classification tree (image to image watermarking). In the beginning, the tradeoff among the three criteria, the imperceptibility, robustness, and capacity, is presented to explain the main topic of digital watermarking technique, the image analysis section clearly introduces the similarity and disparity of blocks of different images based on three features – the contrast, average pixel value, and angle. After the model of the Features Classification classes is established, the next step is to validate the assumption – once the blocks from the different images follow the same association rules, the textures of the blocks would be similar. As such, by methods for the FCT, the watermark can be reassembled by utilizing comparable pieces from the host picture. Furthermore, the versatile SVD-based plan and the other four plans are utilized for demonstrating the materialness and demonstrating the natural qualities inside each plan.

The exploratory outcomes first demonstrate the limit change on the diverse plans. The second test displays the pertinence and inborn power under different assaults. Next, we demonstrate that the three kinds of FCTs handle assorted watermarks well. Generally speaking, the Features Classification tree gives another advancement to additionally enhance the limit without trading off the subtlety and strength.

In spite of the way that our model has various focal points, a couple of subjects can be viewed as and developed better later on. In any case the features can be attempted with substitute perspectives, by then the tree structures can be either improved into more sorts or centered into only a solitary create, which is normally fitting for a watermark. By using this idea, more remarkable frameworks can be made or changed in accordance with upgrade the point of confinement, along these lines giving more convenience to honest to goodness end customers in light of the way that the traverse of the watermark should be more versatile.

REFERENCES

[1] E. H. Adelson, Digital signal encoding and decoding apparatus, 1990.

[2] W. Bender, D. Gruhl, N. Morimoto, "Techniques for data hiding", *Proc. SPIE*, vol. 2420, pp. 40, Feb. 1995.

[3] E. Koch, Z. Zhao, "Toward robust and hidden image copyright labeling", Proc. 1995 IEEE Workshop on Nonlinear Signal and Image Processing, June 1995.

[4] F. T. Leighton, S. Micali, "Secret-key agreement without public-key cryptography", Proc. Cryptology, 1993.

[5] D. Bhowmik and C. Abhayaratne. Evaluation of watermark robustness to JPEG2000 based content adaptation attacks. In Proceedings of the IET 5th International Conference on Visual Information Engineering, VIE ’08, pages 789–794, Xi’an, China, July 2008. IET.

[6] S. Riaz, M.Y. Javed, M.A. Anjum, Invisible watermarking schemes in spatial and frequency domains, Emerging Technologies, 2008. ICET 2008. 4th International Conference on, 2008, pp. 211-216.

[7] G. Bhatnagar, B. Raman, K. Swaminathan, DWT-SVD based dual watermarking scheme, Applications of Digital Information and Web Technologies, 2008. First International Conference on the ICADIWT 2008, pp. 526-531.

[8] Haifeng Li Weiwei Song Shuxun Wang "Robust image watermarking algorithm based on contourlet transform". Journal on Communications vol.27 no.4 pp. 87-94

[9] Paul Bao Xiaohu Ma "Image Adaptive Watermarking Using Wavelet Domain Singular Value Decomposition" IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY vol.15 no.1 pp. 96-102

[10] Shao-min Zhu Jian-ming Liu "A Novel Blind Watermarking Scheme in Contourlet Domain Based on Singular Value Decomposition" Second International Workshop on Knowledge Discovery and Data Mining 2009 pp. 672-675

[11] Feng Liu Ke Han Chang-zheng Wang "A Novel Blind Watermark Algorithm Based On SVD And DCT" Intelligent Computing and Intelligent Systems 2009 pp. 283-286

[12] N. I. Wu, and M. Hwang, Data Hiding: Current Status and Key Issues, International Journal of Network Security, vol.4, no.1, pp.1-9, 2007.

[13] V. Licks and R. Jordan, Geometric Attackes on Image Watermarking Systems, IEEE Multimedia, pp.68-78, IEEE Computer Society, Jul-Sep 2005.

[14] N. Wu, A Study on Data Hiding for Gray-Level and Binary Images, Master Thesis, Chaoyang University of Technology, Taiwan, 2004.

[15] J. Bennour, J. L. Dugelay, and F. Matta, Watermarking Attack: BOWS Contest, Proc of SPIE, Feb 2007.

[16] Y. Wu, Nonlinear Collusion Attack on a Watermarking Scheme for Buyer Authentication, IEEE Transactions on Multimedia, vol.8, no. 3, Jun 2006.

[17] A. M. Zeki and A. A. Manaf, ISB Watermarking Embedding: A Block Based Model, Information Technology Journal, vol.10, no.4, pp.841-848, 2011.

[18] W. Juang, C. Fan and M. Chen, Efficient Fair Content Exchange with Robust Watermarking Ownership, International Journal of Innovative Computing, Information and Control, vol.7, no.8, pp.4653-4667, 2011.

[19] S. Lin, S. Horng, B. Lee, P. Fan, Y. Pan, J. Lai, R. Chen and M. K. Khan, Application of Grey Relational Analysis to find the Most Suiable Watermarking Scheme, International Journal of Innovative Computing, Information and Control, vol.7, no.9, pp.5389-5401, 2011.

[20] C. Chang, C. Lin and Y. Hu, An SVD Oriented Watermark Embedding Scheme with High Qualities for the Restored Images, International Journal of Innovative Computing, Information and Control, vol.3, no.3, pp.609-620, Jun 2007.